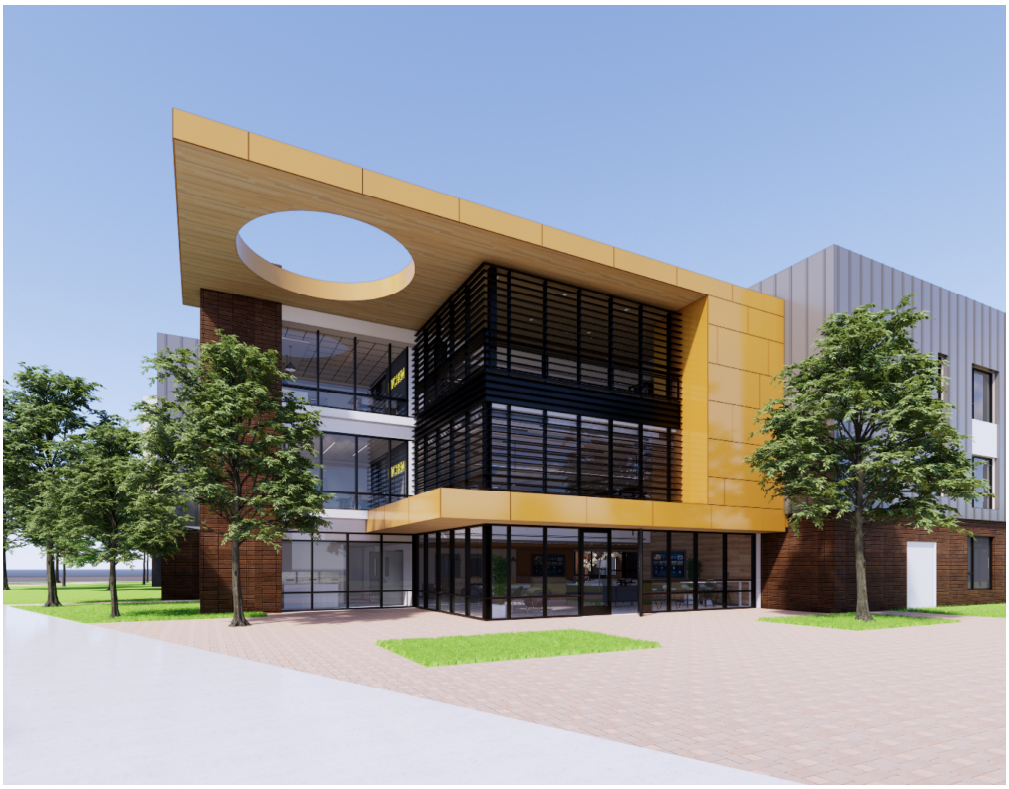
Compton College Student Housing

General Requirements

1111 E. Artesia Blvd., Compton, CA 90221



Specifications

DSA SUBMITTAL

VOLUME 1

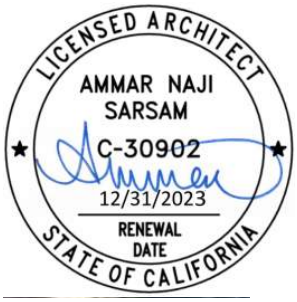
April 17, 2023

HPI architecture

ARCHITECT

HPI Architecture
115 22nd Street
Newport Beach, CA 92663
Tel. (949) 675-6442
Fax: (949) 675-4543

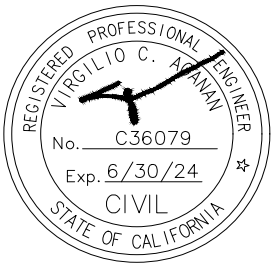
Contacts: Ammar Sarsam, Principal



CIVIL ENGINEER

VCA ENGINEERS, INC.
1041 S. Garfield Ave. #210
Alhambra, CA 91801
Tel. (323) 729-6098
Fax: (323) 729-6043

Contact: Virgil Aoanan



LANDSCAPE ARCHITECT

RLA
8841 Research Drive, Suite 200
Irvine, CA 92618
Tel. (949) 387-1323

Contact: TRAVIS EBBERT

STRUCTURAL ENGINEER

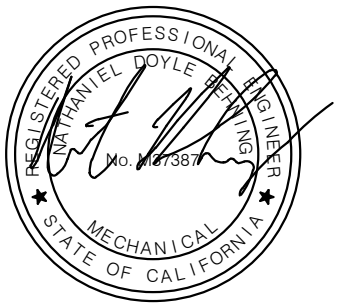
JOHN A. MARTIN & ASSOCIATES (JAMA)
950 S. Grand Ave. Ste. 400
Los Angeles, CA 90015
Tel. (213) 483-6490

Contact: Shane Fitzgerald

MECHANICAL/PLUMBING

P2S, Inc.
5000 East Spring Street, 8th Floor
Long Beach, California 90815
Tel. (562) 497-2999

Contact: Nate Behning

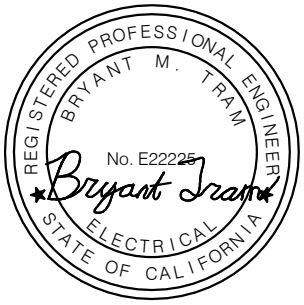


SIGND: 03/22/2023

ELECTRICAL, FIRE ALARM, TECHNOLOGY (DATA/SECURITY/AV), & SOLAR

P2S, Inc.
5000 East Spring Street, 8th Floor
Long Beach, California 90815
Tel. (562) 497-2999

Contact: Bryant Tram



SIGND: 03/22/2023

FIRE PROTECTION ENGINEER

P2S, Inc.
5000 East Spring Street, 8th Floor
Long Beach, California 90815
Tel. (562) 497-2999

Contact: Andres Jimenez

SIGND: 03/22/2023

COMPTON COMMUNITY COLLEGE DISTRICT
BID AND CONTRACT DOCUMENTS
STUDENT HOUSING

TABLE OF CONTENTS

NOTICE TO CONTRACTORS CALLING FOR BIDS

DISTRICT	COMPTON COMMUNITY COLLEGE DISTRICT
PROJECT DESCRIPTION	STUDENT HOUSING
MANDATORY JOB WALK	Click or tap to enter a date. Choose an item. **Meet at the flagpole by the Administration Building**
LATEST TIME/DATE FOR SUBMISSION OF BID PROPOSALS	Choose an item. **To Be Determined**
LOCATION FOR SUBMISSION OF BID PROPOSALS	COMPTON COMMUNITY COLLEGE DISTRICT 1111 East Artesia Boulevard Compton, CA 90221 Building: **C-Row,Business Services Office** Office/Room: **C-34**
LOCATION FOR OBTAINING BID AND CONTRACT DOCUMENTS	The District's Website: http://www.compton.edu/district/administration/businessadmin/Bid_Proposal_Requests.aspx

NOTICE IS HEREBY GIVEN that the above-named California Community College District, through its Board of Trustees ("the District") will accept Bid Proposals for the Contract for **STUDENT HOUSING** ("the Work").

1. Submittal of Bid Proposals. All Bid Proposals shall be submitted on forms furnished by the District at or prior to the date and time set forth above.

2. Bid and Contract Documents. The Bid and Contract Documents can be obtained at:

   http://www.compton.edu/district/administration/businessadmin/Bid_Proposal_Requests.aspx. Bid and Contract Documents will be available after Click or tap to enter a date.. While the Bid and Contract Documents may be available through other Planrooms or sites, the District does not guarantee the authenticity or completeness of the Bid and Contract Documents obtained from such other Planrooms or sites. Bidders shall be solely responsible for reviewing the District's website and downloading any and all Project Documents and Addenda from the District website.

3. Documents Accompanying Bid Proposal. Each Bid Proposal shall be accompanied by: (i) the required Bid Security; (ii) Subcontractors List; (iii) Non-Collusion Affidavit; (iv) Statement of Bidder's Qualifications; (v) CBA Letter of Assent; and (vi) DVBE Worksheets (DVBE Attachments A-G).

4. Prevailing Wage Rates. Pursuant to California Labor Code §1773, the Director of the Department of Industrial Relations of the State of California has determined the generally prevailing rates of wages in the locality in which the Work is to be performed. Copies of these determinations, entitled "PREVAILING WAGE SCALE" are available for review on the internet at http://www.dir.ca.gov/dlsr/statistics_research.html. The Contractor awarded the Contract for the Work shall post a copy of all applicable prevailing wage rates for the Work at conspicuous locations at the Site of the Work. The Contractor and all Subcontractors performing any portion of the Work shall pay not less than the applicable prevailing wage rate for the classification of labor provide by their respective workers in prosecution and execution of the Work. During the Work and pursuant to Labor Code §1771.4(a)(4), the Department of Industrial Relations shall monitor compliance with prevailing wage rate requirements and enforce the Contractor's prevailing wage rate obligations.

5. Bidder and Subcontractors DIR Registered Contractor Status. Pursuant to and in accordance with Labor Code §1771.1, each Bidder must be a DIR Registered Contractor when submitting a Bid Proposal. The Bid Proposal of a Bidder who is not a DIR Registered Contractor when the Bid Proposal is submitted will be rejected for non-responsiveness. All Subcontractors identified in a

Bidder's Subcontractors' List must be DIR Registered contractors at the time the Bid Proposal is submitted.

6. Contractors' License Classification. The District requires that Bidders possess the following classification(s) of California Contractors License at the time that the Contract for the Work is awarded - B - General Building. The Bid Proposal of a Bidder who does not possess a valid and in good standing Contractors' License in the classification(s) set forth above will be rejected for non-responsiveness. Any Bidder not duly and properly licensed is subject to all penalties imposed by law. No payment shall be made for the Work unless and until the Registrar of Contractors verifies to the District that the Bidder awarded the Contract is properly and duly licensed for the Work.

7. Community Benefits Agreement ("CBA"); Letter of Assent. The Work is subject to the Community Benefits Agreement ("CBA") between the District and the Los Angeles/Orange Counties Building and Trades Council. The CBA is incorporated and made a part of the Contract Documents; a copy of the CBA is attached to the Special Conditions as Attachment C. The Each Bidder must submit the completed and executed CBA Letter of Assent concurrently with submitting its Bid Proposal. A Bid Proposal submitted without the executed CBA Letter of Assent will be rejected for non-responsiveness. All Subcontractors must complete and execute the CBA Letter of Assent as a condition to performing any Work.

8. Owner Controlled Insurance Program ("OCIP"). The District has elected to implement an Owner Controlled Insurance Program ("OCIP") under the Statewide Educational Wrap Up Program ("SEWUP") in connection with construction of the Project. The SEWUP Joint Powers Authority ("JPA") will be providing the OCIP on behalf of the District. Subject to meeting underwriter and other requirements of the OCIP, the JPA will provide Workers' Compensation, Employer's Liability, General Liability, Contractors' Pollution Liability, and Builders Risk insurance for the Contractor (along with Enrolled Subcontractors) and other designated parties for Work performed at the Site. The District will pay all premiums associated with the OCIP, unless otherwise indicated in the Contract Documents. Insurance coverage provided under the OCIP is limited in scope and specific to Work performed after the inception date of enrollment into the OCIP. Labor and operations relating to the Work conducted away from the Site ("Offsite Operations") are not covered by the OCIP; the Contractor and Subcontractors shall obtain insurance for Offsite Operations as required by the Contract Documents. In addition to any insurance provided by the District through the OCIP, the Contractor and Subcontractors are responsible for obtaining insurance coverages required by General Conditions, Article 6. The District encourages Bidders to carefully review provisions of the Contract Documents relating to the OCIP and other insurance required to be maintained by the successful Bidder and to discuss insurance requirements with their insurance agents, brokers or insurance consultants to assure that all required insurance policies and minimum coverage amounts are maintained during the Work.

9. Disabled Veteran Business Enterprises ("DVBE") Participation Goal. Pursuant to Military & Veterans Code §999.2, the District has established a Good Faith Participation Goal for DVBEs of three percent (3%) of the value of the Work. The District's DVBE Participation Goal Policy ("DVBE Policy") is set forth in the Contract Documents. All Bidders shall submit to the District DVBE Worksheets establishing achievement of the DVBE Participation Goal or Good Faith Efforts to achieve the DVBE Participation Goal. Failure of any Bidders to comply with the DVBE Worksheet submission requirement will result in rejection the Bidder's Bid Proposal for non-responsiveness.

10. Contract Time. Substantial Completion of the Work shall be achieved as set forth in the Contract Documents; Liquidated Damages will be assessed for delayed Substantial Completion.

11. Bid Security. Each Bid Proposal shall be accompanied by Bid Security in an amount not less than ten percent (10%) of the maximum amount of the Bid Proposal, inclusive of any additive Alternate Bid Item(s). A Bid Proposal which is not accompanied by the required Bid Security is non-

responsive and will be rejected by the District.

12. Alternate Bid Items. If the bidding include(s) Alternate Bid Items for which each Bidder must propose pricing for each Alternate Bid Item, the District's selection of Alternate Bid Items for determination of the lowest bid shall be as set forth in the Instructions to Bidders.

13. No Withdrawal of Bid Proposals. Bid Proposals shall not be withdrawn by any Bidder for sixty (60) days after the opening of Bid Proposals. During this time, all Bidders shall guarantee prices quoted in their respective Bid Proposals.

14. Job-Walk. The District will conduct a Mandatory Job Walk on To Be Determined beginning at 2:00 PM Bidders are to meet at the flag pole just south of the Administration Building at Compton College for the Job Walk. Parking permit is $3.00 and permits are available at parking kiosks in the parking lots. Please plan accordingly. If the Job Walk is mandatory, the Bid Proposal submitted by a Bidder whose representative(s) did not attend the entirety of the Mandatory Job Walk will be rejected by the District as being non-responsive.

15. Pre-Bid Inquiries. Bidders may submit pre-bid inquiries or clarification requests no later than 2:00 PM on Click or tap to enter a date.. Pre-bid inquiries or clarification requests shall be submitted only to Carol Kober at: ckober@pcm3.com. **Do not submit pre-bid inquiries directly to the District.**

16. Copies of Agreement and Bonds. The number of required executed copies of the Agreement are THREE (3) The number of required executed copies of the Performance Bond and the Labor & Materials Payment are THREE (3).

17. Award of Contract; Waiver of Irregularities. The Contract, if awarded, will be by action of the District's Board of Trustees to the responsible Bidder submitting the lowest priced responsive Bid Proposal. If Alternate Bid Items are included in the bidding, the lowest priced Bid Proposal will be determined on the basis of the Base Bid Proposal or on the Base Bid Proposal and the combination of Alternate Bid Items selected in accordance with the above. The District reserves the right to reject any or all Bid Proposals or to waive any irregularities or informalities in any Bid Proposal or in the bidding.

Advertisement publication dates:

To Be Determined
To Be Determined

[End of Section]

INSTRUCTIONS FOR BIDDERS

1. Bid Proposal. Bid Proposals not conforming to these Instructions for Bidders and the Notice to Contractors Calling for Bids ("Call for Bids") may be deemed non-responsive and rejected.

   1.1. Completion of Bid Proposal. Where required, numbers shall be stated by words and figures; words; conflicts between numbers stated in words and in figures are governed by the words. Bid Proposals are non-responsive and will be rejected if: (i) partially completed; (ii) submitted on forms other than those required by the District; (iii) erasures, interlineations or other corrections are not suitably authenticated by the initials of the person(s) signing the Bid Proposal adjacent to such erasure, interlineations or correction; (iv) a Bid Proposal, or portions thereof, is/are determined by the District to be illegible, ambiguous or inconsistent.

   1.2. Submittal. Bid Proposals shall be submitted in sealed envelopes bearing on the outside the Bidder's name and address along with an identification of the Work for which the Bid Proposal is submitted. A Bid Proposal is deemed submitted only if the outer envelope containing the Bid Proposal is stamped by the District's date/time stamp machine at the location where Bid Proposals are to be submitted.

   1.3. Withdrawal; Modification. No oral modification or withdrawal of a submitted Bid Proposal will be considered; a written request to modify or withdraw a submitted Bid Proposal will be considered only if the written request is received by the District before the public opening of Bid Proposals.

2. Bid Security. Each Bid Proposal shall be accompanied by Bid Security in the form of: (i) cash; (ii) certified or cashier's check payable to the District; or (iii) a Bid Bond, in the form and content incorporated into the Contract Documents (the "Bid Security") in an amount not less than ten percent (10%) of the maximum amount of the Bid Proposal. Bid Bonds must conform to the following: (i) the Bid Bond is in the form and content included herein; and (ii) the Surety is an Admitted Surety Insurer under Code of Civil Procedure §995.120; (iii) authorized employees or representatives of the Bidder and Surety execute the Bid Bond and their signatures are duly notarized; (iv) the Surety's representative's authority to bind the Surety is attached to the Bid Bond and duly attested to by the Surety; and (v) all other information required by the form of the Bid Bond is completely and accurately provided.

3. Erasures; Inconsistent or Illegible Bid Proposals. Bid Proposals must not contain any erasures, interlineations or other corrections unless the same are suitably authenticated by affixing in the margin immediately opposite such erasure, interlineations or correction the initials of the person(s) signing the Bid Proposal. If a Bid Proposal, or portions thereof, are determined by the District to be illegible, ambiguous or inconsistent, whether by virtue of any erasures, interlineations, corrections or otherwise, the District may reject such a Bid Proposal as being non-responsive.

4. Examination of Site and Contract Documents. Each Bidder shall, at its sole cost and expense, inspect the Site and to become fully acquainted with the Contract Documents prior to bid and conditions affecting the Work. The submission of a Bid Proposal is prima facie evidence of the Bidder's full compliance with the foregoing requirements.

5. Agreement and Bonds Upon Award of Contract. If the Bidder submitting this Bid Proposal is awarded the Contract, the undersigned will execute and deliver to the District the Contract in the form attached hereto within five (5) calendar days after notification of award of the Contract. Concurrently with delivery of the executed Agreement to the District, the Bidder awarded the Contract shall deliver to the District: (a) Certificates of Insurance evidencing all insurance coverage required under the Contract Documents; (b) the Performance Bond; (c) the Labor and Material Payment Bond; (d) the Certificate of Workers' Compensation Insurance; and (e) the Drug-Free Workplace Certificate. Failure of the Bidder awarded the Contract to strictly comply with the preceding may result in the District's rescission of the award of the Contract and/or forfeiture of

the Bidder's Bid Security. In such event, the District may, in its sole and exclusive discretion elect to award the Contract to the responsible Bidder submitting the next lowest Bid Proposal, or to reject all Bid Proposals. The required number of executed copies of the Agreement and the form and content of the Performance Bond and the Payment Bond and other documents or instruments required at the time of execution of the Agreement are specified in the Contract Documents.

6. Pre-Bid Questions; Contract Document Interpretation and Modifications. Any Bidder in doubt as to the true meaning of any part of the Contract Documents; finds discrepancies, errors or omissions therein; or finds variances in any of the Contract Documents with the Laws ("Pre-Bid Questions"), shall submit a request for an clarification, interpretation or correction thereof using the form of Pre-Bid Inquiry included with the Contract Documents. Bidders are solely and exclusively responsible for submitting Pre-Bid Questions no later than the time/date designated in the Call for Bids. Responses to Pre-Bid Questions will be by written addendum issued by, or on behalf of, the District. A copy of any such addendum will be mailed or otherwise delivered to each Bidder receiving a set of the Contract Documents. Failure to request interpretation or clarification of any portion of the Contract Documents pursuant to the foregoing is a waiver of any discrepancy, defect or conflict therein.

7. Interpretation of Drawings, Specifications or Contract Documents. Interpretations, modifications or corrections of the Contract Documents will be by written addendum issued by or on behalf of the District. No person is authorized to render an oral interpretation or correction of any portion of the Contract Documents to any Bidder, and no Bidder is authorized to rely on any such oral interpretation or correction.

8. Bidder's Assumptions. The District is not responsible for any assumptions made or used by the Bidder in calculating its Bid Proposal Amount including, without limitation, assumptions regarding costs of labor, materials, equipment or substitutions/alternatives for any material, equipment, product, item or system incorporated into or forming a part of the Work which have not been previously expressly approved and accepted by the District. The successful Bidder, upon award of the Contract by the District, if any, will be required to complete the Work for the amount bid in the Bid Proposal within the Contract Time and in accordance with the Contract Documents.

9. District's Right to Modify Contract Documents. Before the public opening and reading of Bid Proposals, the District may modify the Work, the Contract Documents, or portion(s) thereof by the issuance of written addenda disseminated to all Bidders who have obtained a copy of the Specifications, Drawings and Contract Documents pursuant to the Call for Bids. Failure of a Bidder to acknowledge addenda in its Bid Proposal will render the Bid Proposal non-responsive and rejected.

10. Bidders Interested in More Than One Bid Proposal; Non-Collusion Affidavit. No person, firm, corporation or other entity shall submit or be interested in more than one Bid Proposal for the same Work; provided, however, that a person, firm or corporation that has submitted a sub-proposal to a Bidder or who has quoted prices for materials to a Bidder is not thereby disqualified from submitting a sub-proposal, quoting prices to other Bidders or submitting a Bid Proposal for the proposed Work to the District. Failure of a Bidder to submit a completed and executed Non-Collusion Affidavit with its Bid Proposal will render the Bid Proposal non-responsive.

11. Award of Contract. The District reserves the right to reject any and all Bid Proposals or to waive any irregularities or informalities in any Bid Proposal or in the bidding. Award of the Contract, if made by the District through action of its Board of Trustees, will be to the responsible Bidder submitting the lowest priced responsive Bid Proposal.

    11.1. Responsive Bid Proposal. A responsive Bid Proposal shall mean a Bid Proposal which conforms, in all material respects, to the Bid and Contract Documents.

    11.2. Responsible Bidder. A responsible Bidder is a Bidder who has the capability in all respects,

to perform fully the requirements of the Contract Documents and the moral and business integrity and reliability which will assure good faith performance. In determining responsibility, the following criteria will be considered: (i) the ability, capacity and skill of the Bidder to perform the Work of the Contract Documents; (ii) whether the Bidder can perform the Work promptly and within the time specified, without delay or interference; (iii) the character, integrity, reputation, judgment, experience and efficiency of the Bidder; (iv) the quality of performance of the Bidder on previous contracts, by way of example only, the following information will be considered: (a) the administrative, consultant or other cost overruns incurred by the District on previous contracts with the Bidder; (b) the Bidder's compliance record with contract general conditions on other projects; (c) the submittal by the Bidder of excessive and/or unsubstantiated extra cost proposals and claims on other projects; (d) the Bidder's record for completion of work within the contract time and the Bidder's compliance with the scheduling and coordination requirements on other projects; (e) the Bidder's demonstrated cooperation with the District and other contractors on previous contracts; (f) whether the work performed and materials furnished on previous contracts was in accordance with the Contract Documents; (v) the previous and existing compliance by the Bidder with laws and ordinances relating to contracts; (vi) the sufficiency of the financial resources and ability of the Bidder to perform the work of the Contract Documents; (vii) the quality, availability and adaptability of the goods or services to the particular use required; (viii) the ability of the Bidder to provide future maintenance and service for the warranty period of the Contract; (ix) whether the Bidder is in arrears on debt or contract or is a defaulter on any surety bond; (x) such other information as may be secured by the District having a bearing on the decision to award the Contract, to include without limitation the ability, experience and commitment of the Bidder to properly and reasonably plan, schedule, coordinate and execute the Work of the Contract Documents and whether the Bidder has ever been debarred from bidding or found ineligible for bidding on any other projects. The ability of a Bidder to provide the required bonds will not of itself demonstrate responsibility of the Bidder.

11.3. Alternate Bid Items. The following shall apply if Alternate Bid Item(s) are included in the bidding for the Work.

11.3.1. Lowest Priced Responsive Bid Proposal. The lowest priced Bid Proposal shall be determined based on the Bidder's proposed pricing for the Base Bid Proposal and the cumulative proposed pricing for all Alternate Bid Items.

11.3.2. Alternate Bid Items Proposal. If the bidding includes Alternate Bid Items, the price(s) proposed by a Bidder for each Alternate Bid Item shall be set forth in the appropriate line item of the Alternate Bid Items Proposal form. If Alternate Bid Items are included in the bidding, each Bidder shall submit its completed and executed Alternate Bid Items Proposal Form with submission of the Bid Proposal. The Bid Proposal of a Bidder will be rejected for non-responsiveness if the Bidder fails to propose prices for each Alternate Bid Item included in the bidding.

11.3.3. Alternate Bid Items Not Included in Award of Contract. Bidders are referred to the provisions of the Contract Documents permitting the District, during performance of the Work, add or delete from the scope of the Work any or all of the Alternate Bid Items with the cost or credit of the same being the amount(s) set forth by in the Alternate Bid Items Proposal.

12. Subcontractors. Each Bidder shall submit a list of its Subcontractors for the Work as required by California Public Contract Code §§4100 et seq. on the form furnished. If a Bidder requires bonds of its Subcontractor(s), such requirements shall be specified in the Bidder's written or published request for sub-bids.

13. Workers' Compensation Insurance. Pursuant to California Labor Code §3700, the successful Bidder shall secure Workers' Compensation Insurance for its employees engaged in the Work of the Contract. The successful Bidder shall sign and deliver to the District the Certificate of Workers Compensation Insurance incorporated into the Contract Documents.

14. OCIP.

    14.1. General. Pursuant to Government Code §4420.5, Labor Code §§6300, et seq. and Title 8 of the California Code of Regulations, the District has implemented an OCIP for the Work as more particularly set forth herein and in the Contract Documents. Pursuant to the OCIP, the District shall purchase, provide and maintain for the benefit of the Contractor and its Subcontractors and Sub-Subcontractors, certain insurance for Workers' Compensation/Employer's Liability, General Liability, and Contractor's Pollution Liability as more particularly set forth in the Contract Documents, including but not limited to Article 6 of the General Conditions. Notwithstanding insurance coverages provided under the OCIP, the Contractor and its Subcontractors, Sub-Subcontractors and others shall purchase, provide and maintain certain other insurance coverage's not provided for under the OCIP as set forth in the Contract Documents, including but not limited to Article 6 of the General Conditions.

    14.2. Bid Proposals Exclusion of Contractor/Subcontractor Insurance Costs. Bidders' pricing proposals in their Bid Proposals shall be exclusive of premium and other costs of the Bidder and its Subcontractors for the insurance coverages provided under the OCIP. The price proposal in each Bidder's Bid Proposal shall be inclusive of premium and other costs for obtaining and maintaining insurance coverages required by the Contract Documents, but not included in the scope of coverages afforded under the OCIP. Excluded insurance costs shall include self-funded insurance coverages, coverages requiring large deductibles and costs for any coverage above the self-funded or deductible portions. The foregoing notwithstanding, the District may require the Bidder and its Subcontractors propose pricing for obtaining insurance coverages similar to those provided by the OCIP as an Alternate Bid Item.

    14.3. Minimum Safety Requirements; Responsive Bid Proposal. In addition to other standards and requirements set forth herein relating to responsive Bid Proposals, a Bid Proposal will be deemed non-responsive and rejected by the District if the Minimum Safety Requirements under the OCIP are not met or exceeded. Pursuant to Government Code §4420.5, the District has established the Minimum Safety Requirements set forth below. The Bidder and each of the Bidder's Subcontractors who are identified on the Bidder's Subcontractors List must meet the Minimum Safety Requirements. The Bid Proposal will be rejected for non-responsiveness if the Bidder does not meet the Minimum Safety Requirements.

        14.3.1. No Cal-OSHA Violations deemed Serious and Willful. No (zero) violations deemed serious and willful, or repeat under Labor Code §§6300 et seq. within the past five (5) years.

        14.3.2. Injury and Illness Prevention Program ("IIPP"). The Bidder and all listed Subcontractors of the Bidder shall have a current IIPP conforming to Labor Code §3201.5 or Labor Code §6401.7.

        14.3.3. Workers Compensation Insurance EMR. The Bidder and the Bidder's listed Subcontractors shall have a current Workers Compensation Insurance Experience Modification Rating ("EMR") of no more than 1.25.

    14.4. District Verification of Compliance with Minimum OCIP Requirements. The District will verify compliance with Minimum OCIP Requirements, including the EMR of Bidders. Any information found to be incorrect or untrue shall render Bidder's Bid Proposal non-responsive.

15. DVBE Participation Goal. Bidders must meet the DVBE Participation Goal or demonstrate that Good Faith Efforts were made to meet the DVBE Participation Goal. The DVBE Participation Goal

is not a quota or a set-aside, but Good Faith Efforts must be made to achieve the DVBE Participation Goal. The DVBE Participation Goal and related documents establishing a Bidder's achievement of the DVBE Participation Goal are set forth in the DVBE Participation Policy and DVBE Worksheets. All Bid Proposals be submitted with the completed DVBE Worksheets. The Bid Proposal of a Bidder who did not meet the DVBE Participation Goal and who does not demonstrate by the DVBE Worksheets that Good Faith Efforts were made to achieve the DVBE Participation Goal will be rejected for non-responsiveness.

16. Bid Security Return. The Bid Security of the Bidders submitting the three (3) lowest priced responsive Bid Proposals will be held by the District for ten (10) days after the period for which Bid Proposals must be held open, as set forth the Call for Bids, or until posting by the successful Bidder(s) of the bonds, certificates of insurance required and return of executed copies of the Agreement, whichever first occurs, at which time the Bid Security of such other Bidders will be returned to them.

17. Forfeiture of Bid Security. If the Bidder awarded the Contract fails or refuses to execute the Agreement within five (5) calendar days from the date of receiving notification that it is the Bidder to whom the Contract has been awarded, the District may declare the Bidder's Bid Security forfeited as damages caused by the failure of the Bidder to enter into the Contract and may thereupon award the Contract for the Work to the responsible Bidder submitting the next lowest priced Bid Proposal or may call for new bids, in its sole and exclusive discretion.

18. Contractor's License. No Bid Proposal will be considered from a Bidder who, at the time Bid Proposals are opened, is not licensed to perform the Work of the Contract Documents, in accordance with the Contractors' License Law, California Business & Professions Code §§7000 et seq. This requirement will not be waived by the District or its Board of Trustees.

19. Bidder's Qualifications. Each Bidder shall submit with its Bid Proposal the form of Statement of Qualifications, which is included within the Contract Documents. All information required by Statement of Qualifications shall be completely and fully provided. Any Bid Proposal which is not accompanied by the Statement of Qualifications completed with all information required and bearing the signature of the Bidder's duly authorized representative under penalty of perjury will render the Bid Proposal non-responsive and rejected. The Bid Proposal of a Bidder whose response to any question in the Essential Requirements section of the Statement of Qualifications resulted in a "Not Qualified" status will be rejected for non-responsiveness. If the District determines that any information provided by a Bidder in the Statement of Qualifications is false or misleading, or is incomplete so as to be false or misleading, the District may reject the Bid Proposal submitted by such Bidder as being non-responsive.

20. Job-Walk. The District will conduct a Job-Walk at the time(s) and place(s) designated in the Call for Bids. Attendance by representatives of the Bidder's Subcontractors at a Mandatory Job Walk without attendance by a representative of the Bidder is not sufficient to meet the Bidder's obligations hereunder and will render the Bid Proposal of such Bidder to be non-responsive. Notwithstanding the non-compulsory attendance of Bidders at a Non-Mandatory Job Walk, all Bidders are encouraged to attend Non-Mandatory Job Walks.

21. Public Records. Bid Proposals and other documents responding to the Call for Bids become the exclusive property of the District upon submittal to the District. At such time as the District issues he Notice of Intent to award the Contract pursuant to these Instructions for Bidders, all Bid Proposals and other documents submitted in response to the Call for Bids become a matter of public record and shall be thereupon be considered public records, except for information contained in such Bid Proposals deemed to be Trade Secrets (as defined in California Civil Code §3426.1) confidential or proprietary. The District is not liable or responsible for the disclosure of such records, including those exempt from disclosure if disclosure is deemed required by law, by an order of Court, or which occurs through inadvertence, mistake or negligence on the part of the

District or its officers, employees or agents. When Bid Proposals are deemed a matter of public record, pursuant to the above, any Bidder or other party shall be afforded access for inspection and/or copying of such Bid Proposals pursuant to the California Access to Public Records Act, California Government Code §§7920, et. seq. If the District is required to defend or otherwise respond to any action or proceeding wherein request is made for the disclosure of the contents of any portion of a Bid Proposal deemed exempt from disclosure hereunder, the Bidder submitting the materials sought by such action or proceeding agrees to defend, indemnify and hold harmless the District in any action or proceeding from and against any liability, including without limitation attorneys' fees arising there from. The party submitting materials sought by any other party shall be solely responsible for the cost and defense in any action or proceeding seeking to compel disclosure of such materials; the District's sole involvement in any such action shall be that of a stakeholder, retaining the requested materials until otherwise ordered by a court of competent jurisdiction.

22. Drug Free Workplace Certificate. The successful Bidder will be required to execute a Drug Free Workplace Certificate pursuant to California Government Code §§8350 et seq., concurrently with execution of the Agreement.

23. Notice of Intent to Award Contract. Following the public opening and reading of Bid Proposals, the District will issue a Notice of Intent to Award the Contract, identifying the Bidder to whom the District intends to award the Contract and the date/time/place of the District's Board of Trustees meeting at which award of the Contract will be considered.

24. Bid Protest. Any Bidder submitting a Bid Proposal to the District may file a protest of the District's intent to award the Contract provided that each and all of the following are complied with: (i) the bid protest is in writing; (ii) the bid protest is filed and received by the District's Vice President of Administrative Services, not more than five (5) calendar days following the date of bid opening; and (iii) the written bid protest sets forth, in detail, all grounds for the bid protest, including without limitation all facts, supporting documentation, legal authorities and argument in support of the grounds for the bid protest; any matters not set forth in the written bid protest shall be deemed waived. All factual contentions must be supported by competent, admissible and credible evidence. Any bid protest not conforming to the foregoing shall be rejected by the District as invalid. Provided that a bid protest is filed in strict conformity with the foregoing, the District's Vice President of Administrative Services, or such individual(s) as may be designated by him/her, shall review and evaluate the basis of the bid protest. Either the Vice President of Administrative Services, or other individual designated by him/her shall provide the bidder submitting the bid protest with a written statement concurring with or denying the bid protest. The rendition of a written statement by the District's Vice President of Administrative Services, (or his/her designee) is an express conditions precedent to the institution of any judicial proceedings relative to the bidding process, the District's intent to award the Contract, the District's disposition of any bid protest or the District's decision to reject all Bid Proposals. If any such judicial proceedings are instituted and the District is named as a party thereto, the prevailing party(ies) shall recover from the other party(ies), as costs, all attorneys' fees and costs incurred in connection with any such proceeding, including any appeal arising there from.

[END OF SECTION]

BID PROPOSAL
PROJECT: STUDENT HOUSING ("the Work")

Bidder Name	_____	
Bidder Representative(s)	_____ Name and Title _____ Name and Title	
Bidder Representative(s) Contact Information	Email _____ _____	Phone/Fax (_____) _____ Telephone (_____) _____ Fax
Bidder Mailing Address	_____ Address _____ City/State/Zip Code	
California Contractors' License	_____ Number _____ Classification and Expiration Date	

1. Bid Proposal.

1.1. Base Bid Price. The undersigned Bidder, having become familiarized with the Contract Documents and the local conditions affecting the performance or cost of to perform the Work, the Bidder proposes and agrees to perform the Work of the Contract Documents including, without limitation, providing and furnishing any and all of the labor, materials, tools, equipment and services necessary to perform all obligations under the Contract Documents for the sum of: _____ Dollars ($_____).

1.2. Allowances. The District has established the following Allowance Amount for each Allowance Item set forth in the following.

Allowance Item No.	Allowance Item Description	Allowance Amount
A-1	Unforeseen Conditions; District Authorized Scope Modifications.	$_____
	Aggregate Allowance Amount	$_____

1.3. Bid Proposal Price. The Bid Proposal Price is the sum of the Base Bid Price (Paragraph 1.1) plus Aggregate Allowance Amount (Paragraph 1.2) which is:

_____ Dollars ($_____).

1.4. Alternate Bid Items. If the bidding includes Alternate Bid Items, the Bidder's price proposal(s) for Alternate Bid Items is/are set forth in the form of Alternate Bid Item Proposal attached to this Bid Proposal. Price proposal(s) for Alternate Bid Item(s) will not form the basis for the District's award of the Contract unless an Alternate Bid Item is incorporated into the scope of Work of the Contract awarded.

2. Addenda. The Bidder confirms that: (i) it has received and reviewed all Addenda issued by the District, if any, as set forth below; and (ii) that this Bid Proposal incorporates and is inclusive of, all items or other matters contained in all Addenda, if any, issued by or on behalf of the District. ***Failure of the Bidder to acknowledge all Addenda may result in rejection of the Bid Proposal for non-responsiveness.***

ADDENDUM NO.	ADDENDUM ISSUE DATE

3. **Documents Accompanying Bid Proposal**. The Bidder has submitted with this Bid Proposal the following: (i) Bid Security; (ii) Subcontractors List; (iii) Statement of Qualifications; (iv) Non-Collusion Affidavit; (v) CBA Letter of Assent; and (vi) DVBE Worksheets, Attachments A-G. The Bidder acknowledges that if this Bid Proposal and the foregoing documents are not fully in compliance with applicable requirements set forth in the Call for Bids, the Instructions for Bidders and in each of the foregoing documents, the Bid Proposal may be rejected for non-responsiveness.

4. **Award of Contract**. Within five (5) days after notification of award of the Contract, the Bidder awarded the Contract shall execute and deliver to the District three original signature copies of the Contract in the form attached hereto along with: (i) Certificates of Insurance evidencing all insurance coverages required under the Contract Documents; (ii) the Performance Bond; (iii) the Labor and Material Payment Bond; (iv) the Certificate of Workers' Compensation Insurance; and (v) the Drug-Free Workplace Certificate. Failure of the Bidder awarded the Contract to strictly comply with the preceding may result in the District's recession of the award of the Contract and/or forfeiture of the Bidder's Bid Security. In such event, the District may, in its sole and exclusive discretion elect to award the Contract to the responsible Bidder submitting the next lowest priced Bid Proposal, or to reject all Bid Proposals.

5. **Contractors' License**. The Bidder certifies that: (i) it is duly licensed, in the necessary class(es), for performing the Work of the Contract Documents, as designated by the District; (ii) that such license shall be in full force and effect throughout the duration of the performance of the Work under the Contract Documents; and (iii) that all Subcontractors providing or performing any portion of the Work are and shall remain properly licensed to perform or provide such portion of the Work.

6. **Agreement to Bidding Requirements and Attorneys' Fees**. The undersigned Bidder acknowledges and confirms its receipt, review and agreement with, the contractual requirements set forth in this Bid Proposal and the Contract Documents. By executing this Bid Proposal hereinbelow, the Bidder expressly acknowledges and agrees that if the Bidder institutes any legal or equitable proceedings in connection with this Bid Proposal and the District is named as a party thereto, the prevailing party(ies) shall recover from the other party(ies), as costs, all attorneys' fees and costs incurred in connection with any such proceeding, including any appeal arising therefrom. This provision shall constitute a binding attorneys' fee agreement in accordance with and pursuant to California Civil Code §1717 which shall be enforceable against the Bidder and the District. This attorney fee provision shall be solely limited to legal or equitable proceedings arising out of a bid protest or the bidding process and shall not extend to or have any force and effect on the Contract for the Work or to modify the terms of the Contract Documents for the Work.

7. **Acknowledgment and Confirmation**. The undersigned Bidder acknowledges its receipt, review and understanding of the Drawings, the Specifications and other Contract Documents pertaining

to the proposed Work. By submitting this Bid Proposal, the undersigned Bidder certifies that the Contract Documents are, in its opinion, adequate, feasible, accurate and complete for the Bidder to complete the Work in a workmanlike manner within the Contract Time and for the price proposed herein. The undersigned Bidder warrants and represents to the District that it has, or has available, all necessary equipment, personnel, materials, facilities and technical and financial ability to complete the Work for the amount bid herein, within the Contract Time and in accordance with the Contract Documents.

Dated: _____

By: _____
(Signature of Bidder's Authorized Officer or Representative)

_____
(Typed or Printed Name)

Title: _____

PRE-BID INQUIRY FORM

Project: STUDENT HOUSING

Submittal Date _____

Bidder inquiries will be responded to only if: (i) submitted on this Pre-Bid Inquiry Form; (ii) this completed Pre-Bid Inquiry Form is submitted prior to the latest date/time for submittal of pre-bid inquiries as set forth in the Call for Bids; and (ii) this completed Pre-Bid Inquiry Form is submitted to the person or entity noted in the Call for Bids.

Item No.	Item Description	DrawingSheet No. &Detail No. Reference	Specifications Section and Paragraph No. Reference

Submitted By:

_____
(Bidder Name)

_____
(Signature of Bidder's Authorized Employee, Officer or Representative)

Bidder Contact Information:

_____
(Bidder Contact Name)

_____
(Phone and Fax)

_____
(Email Address)

SUBCONTRACTORS LIST

Project ("the Work")	**STUDENT HOUSING**
Bidder Name	_____
Bidder's Representative Signature	_____ (Signature) _____ (Typed or Printed Name)

Licensed Name of Subcontractor	Address of Office, Mill or Shop	Contractor's License Number	Trade or Portion of Work	DIR Registration Number

[DUPLICATE THIS FORM FOR ADDITIONAL SUBCONTRACTORS]

STATEMENT OF QUALIFICATIONS

Each Bidder must complete and submit this Statement of Qualifications with the Bidder's Bid Proposal. The Statement of Qualifications must be executed under penalty of perjury by an authorized employee or officer of the Bidder. All portions of the Statement of Qualifications must be completed failure to do so will render the Bid Proposal non-responsive and rejected. If a Bidder's response to any Essential Requirement results in a "Not Qualified" response, the Bid Proposal of such a Bidder will be rejected for failure of the Bidder to meet Essential Requirements for the Project.

Bidder Name: _____

1. Bidder Information.

1.1. Contact Information

Mailing Address	_____ Company Name _____ Street Address _____ City, State, Zip Code
Physical Location (if different from mailing address)	_____ Street Address _____ City, State, Zip Code
Telephone/Fax	(_____) _____ Telephone (_____) _____ Fax

1.2. Bidder Contacts.

Name	_____
Contact Information	Telephone: (_____)_____ Fax (_____)_____ Email _____

1.3. California Contractors' License.

License Number(s)	_____
License Classification(s)	_____
Responsible Managing Employee; Responsible Managing Officer	_____
Expiration Date(s)	_____

[CONTINUED NEXT PAGE]

1.4. Bidder Form of Entity.

- ☐ Corporation
- ☐ General Partnership
- ☐ Limited Partnership
- ☐ Limited Liability Company
- ☐ Limited Liability Partnership
- ☐ Joint Venture
- ☐ Sole Proprietorship

2. Revenue. Complete the following for the Applicant's construction operations; if any portion of the revenue disclosed is generated by non-construction operations or activities, the Applicant must identify the portion of revenue attributed to construction operations and generally describe business activities of the Applicant that generates non-construction operations related revenue.

Calendar Year/ Fiscal Year	Annual Gross Revenue	Average Dollar Value of all Contracts	Dollar Value of Largest Contract
2019 (2018/2019)			
2020 (2019/2020)			
2021 (2020/2021)			

3. References.

DSA Project Inspectors			
Firm Name	Address	Telephone No.	Contact Name
Owners (K-12 School Districts or Community Colleges preferred)			
Owner Name	Address	Telephone No.	Contact Name
Architects (K-12 or Community College Projects)			
Architect Firm Name & Architect Firm Contact Name	Address	Telephone No.	Contact Name

4. Insurance.

Commercial General Liability Insurance	Insurer: _____ Policy No._____ Broker _____
Commercial General Liability Insurance Broker	(Contact Name) _____ _____ (Street Address) _____ (City, State & Zip Code) (_____) _____ (_____) _____ Telephone Fax _____ (Email address)
Bid, Performance and Labor & Materials Payment Bond Surety	Surety: _____ Surety Broker _____ _____ (Surety Broker Contact Name) _____ (Street Address) _____ (City, State & Zip Code) (_____) _____ (_____) _____ Telephone Fax _____ (Email address)
Workers Compensation Insurance	Insurer:_____ Policy No._____ Broker _____
Workers Compensation Insurance Broker	(Contact Name) _____ _____ (Street Address) _____ (City, State & Zip Code) (_____) _____ (_____) _____ Telephone Fax _____ (Email address)

[CONTINUED NEXT PAGE]

5. Essential Requirements. A Bidder will not be deemed qualified if the answer to any of the following questions results in a "not qualified" response and the Bid Proposal submitted by such a Bidder will be rejected for failure of the Bidder to meet minimum qualifications for the Work.

5.1. Bidder possesses a valid and currently in good standing California Contractors' license for the Classification(s) of Contractors' License required by the Call for Bids.

☐ Yes ☐ No (Not Qualified)

5.2. Bidder is currently a DIR Registered Contractor?

☐ Yes ☐ No (Not Qualified)

5.3. Bidder has a current commercial general liability insurance policy with coverage limits equal to or exceeding minimum coverage limits required for the Work.

☐ Yes ☐ No (Not Qualified)

5.4. Bidder has a current workers' compensation insurance policy as required by the Labor Code or is legally self-insured pursuant to Labor Code §3700.

☐ Yes ☐No (Not Qualified)

☐ Bidder is exempt from this requirement, because it has no employees

5.5. The Bidder is ineligible or debarred from submitting Bid Proposals for public works projects or public works contracts pursuant Labor Code §1777.1 or Labor Code §1777.7.

☐ Yes (Not Qualified) ☐No

5.6. A public agency, within the past five (5) years conducted proceedings that resulted in a finding that the Bidder, or any predecessor to the Bidder, is not a "responsible" bidder for a public works project or a public works contract.

☐ Yes (Not Qualified) ☐No

5.7. During the last five (5) years, the Bidder or any predecessor to the Bidder, or any of the equity owners of the Bidder have been convicted of a federal or state crime involving fraud, theft, or any other act of dishonesty.

☐ Yes (Not Qualified) ☐No

5.8. During the past five (5) years a Surety has completed any project or the Bidder's obligations under a construction contract.

☐ Yes (Not Qualified) ☐No

5.9. During the past five (5) years the Bidder has been declared in default under any construction contract to which the Bidder was a party.

☐ Yes (Not Qualified) ☐No

5.10. Within the past five (5) years, has the Bidder, or any predecessor-in-interest of the Bidder, entered into a written agreement or verbally/orally agreed with any public agency not to submit bid proposals, proposals, quotes, or respond to any notice of bids, request for proposals/qualifications or other similar procurement requests of the public agency for any construction, construction management, or related services?

☐ Yes (Not Qualified) ☐No

5.11. The Bidder's Worker's Compensation Insurance current EMR is more than 1.25.

☐ Yes (Not Qualified) ☐No

☐ The Bidder is not eligible for an experience modification rating whether due to not meeting minimum threshold eligibility standard or for any other reason (Not Qualified)

5.12. The Bidder's Worker's Compensation Insurance average EMR over the past five (5) years is more than 1.25.

☐ Yes (Not Qualified) ☐No

6. Legal/Administrative Proceedings and Surety. If the response to any of the following questions is a "yes" complete and accurate details must be attached; failure to attach such details will render the Bid Proposal of the Bidder to be non-responsive and rejected. Responses to the following will be used to evaluate Bidder responsibility.

6.1. Have legal, arbitration or administrative proceedings been brought by construction project owner against the Bidder or any of the principals, officers or equity owners of the Bidder within the past ten (10) years which arise out of or are related to any construction project?

☐ Yes ☐No

If "yes," on a separate attachment, include the following details: (i) name of party initiating proceedings against the Bidder; (ii) contact name, address, phone and email address of party initiating proceedings; (iii) circumstances resulting in the initiation of proceedings; (iv) amount or other relief demanded; and (v) outcome of proceedings.

6.2. Has the Bidder brought any legal, arbitration or administrative proceedings against the owner of a construction project within the past ten (10) years which arise out of or are related to the construction project, excluding claims for personal injury?

☐ Yes ☐No

If "yes", on a separate attachment, include the following details: (i) name of owner; (ii) contact name, address, phone and email address of contact person for owner; (iii) circumstances resulting in the initiation of proceedings; (iv) amount or other relief demand; and (v) outcome of proceedings.

6.3. Has the Bidder brought any legal, arbitration or administrative proceedings against the architect or design professional for a construction project within the past ten (10) years which arise out of or are related to the construction project?

☐ Yes ☐No

If "yes," on a separate attachment, include the following details: (i) name of architect; (ii) contact name, address, phone and email address of contact person for architect or design professional; (iii) circumstances resulting in the initiation of proceedings; (iv) amount or other relief demand; and (v) outcome of proceedings.

6.4. Has the Bidder brought any legal, arbitration or administrative proceedings against the construction/project manager for a construction project within the past ten (10) years which arise out of or are related to the construction project?

☐ Yes ☐No

If "yes," on a separate attachment, include the following details: (i) name of construction/project manager; (ii) contact name, address, phone and email address of contact person for construction/project manager; (iii) circumstances resulting in the initiation of proceedings; (iv) amount or other relief demand; and (v) outcome of proceedings.

6.5. At any time during the past five (5) years, has any surety company made any payments on behalf the Bidder to satisfy any claims made against a bid, performance or payment bond issued to the Bidder, in connection with a construction project, either public or private?

☐ Yes ☐No

If "yes," on a separate attachment set forth: (i) the amount of each such claim; (ii) the name and telephone number of the claimant; (iii) the date of the claim; (iv) the grounds for the claim; (v) the present status of the claim; (vi) the date of resolution of such claim if resolved; (vii) the method by which such was resolved if resolved; (viii) the nature of the resolution; and (ix) the amount, if any, at which the claim was resolved.

6.6. During the past five (5) years, has a surety declined to issue a surety bond for your organization in connection with a construction project?

☐ Yes ☐No

If "yes" on a separate attachment provide details of the denial of bond coverage and the name of the company or companies which denied coverage.

6.7. At any time during the past five (5) years, has any surety company made any payments on behalf the Bidder to satisfy any claims made against a bid, performance or payment bond issued to the Bidder, in connection with a construction project, either public or private?

☐ Yes ☐No

If "yes," on a separate attachment set forth: (i) the amount of each such claim; (ii) the name and telephone number of the claimant; (iii) the date of the claim; (iv) the grounds for the claim; (v) the present status of the claim; (vi) the date of resolution of such claim if resolved; (vii) the method by which such was resolved if resolved; (viii) the nature of the resolution; and (ix) the amount, if any, at which the claim was resolved.

6.8. In the last five (5) years has any insurance carrier, for any policy of insurance, refused to renew the insurance policy for your firm?

☐ Yes ☐No

6.9. Within the past five (5) years, has the Bidder been required to pay either back wages or penalties for the Bidder's failure to comply with California prevailing wage laws? This question refers only to the Bidder's violation of prevailing wage laws, not to violations of the prevailing wage laws by a subcontractor.

☐ Yes ☐No

If "yes," on a separate attachment: (i) describe each instance of prevailing wage rate violation; (ii) identify the project on which a prevailing wage rate violation occurred; (iii) the public agency owner of the project; (iv) the number of employees affected by each prevailing wage rate violation; and (v) amount of back wages and penalties the Bidder was required to pay.

6.10. Within the past five (5) years, has there been more than one occasion in which the Bidder was penalized or required to pay back wages for failure to comply with the Federal Davis-Bacon prevailing wage requirements?

☐ Yes ☐No

If "yes," on a separate attachment: (i) describe each instance of prevailing wage rate violation; (ii) identify the project on which a prevailing wage rate violation occurred; (iii) the number of employees affected by each prevailing wage rate violation; and (iv) amount of back wages and penalties the Bidder was required to pay.

6.11. Within the past five (5) years, has the Bidder been found to have violated any provision of California apprenticeship laws or regulations, or the laws pertaining to use of apprentices on public works projects?

☐ Yes ☐No

If "yes", provide the date(s) of such findings, and attach copies of the Apprenticeship Counsel's final decision(s).

7. Projects. Duplicate the forms in Paragraphs 7.1, 7.2 and 7.3; attach the completed forms set forth in Paragraphs 7.1, 7.2 and 7.3 to the Statement of Qualifications.

7.1. Similar Completed Projects. Provide the following for three (3) projects the Bidder has completed within the past five (5) years similar in size, scope, function and construction value as the Work:

Project Name	
Project Owner; Contact Information	

Function/Use of Project	
Original Contract Duration	
Actual Project Completion Duration	
Original Contract Price	
Final Adjusted Contract Price	

7.2. All Completed Projects. On a separate attachment, identify all projects the Bidder has completed within the three (3) years, including the following information for each identified Project:

Project Name	
Project Owner; Contact Information	
Function/Use of Project	
Original Contract Duration	
Actual Project Completion Duration	
Original Contract Price	
Final Adjusted Contract Price	

7.3. Projects In Progress. On a separate attachment, identify all projects the Bidder currently has in progress, including the following information for each identified Project:

Project Name	
Project Owner; Contact Information	
Function/Use of Project	
Original Contract Duration	
Actual Project Completion Duration	
Original Contract Price	
Current Adjusted Contract Price	

8. Accuracy and Authority. The undersigned is duly authorized to execute this Statement of Qualifications under penalty of perjury on behalf of the above-identified Bidder. The undersigned warrants and represents that he/she has personal knowledge of each of the responses to this Statement of Qualifications and/or that he/she has conducted all necessary and appropriate inquiries to determine the truth, completeness and accuracy of responses to this Statement of Qualifications. The undersigned declares and certifies that the responses to this Statement of Qualifications are complete and accurate; there are no omissions of material fact or information that render any response to be false or misleading and there are no misstatements of fact in any of the responses. The above-identified Bidder acknowledges and agrees that if the District determines that any response herein is false or misleading or contains misstatements of fact so as to be false or misleading, the Bidder's Bid Proposal may be rejected by the District for non-responsiveness.

Executed this___ day of _____ 20__ at_____
(City and State)

I declare under penalty of perjury under California law that the foregoing is true and correct.

By: _____
(Signature of Bidder's Authorized Officer or Representative)

_____
(Typed or Printed Name)

Title: _____

NON-COLLUSION AFFIDAVIT

STATE OF CALIFORNIA)
COUNTY OF _____)

PROJECT: **STUDENT HOUSING**

I, _____, being first duly sworn, deposes and says that I am the
(Typed or Printed Name)
_____ of _____, the party submitting
(Title) (Bidder Name)
the foregoing Bid Proposal ("the Bidder"). In connection with the foregoing Bid Proposal, the undersigned declares, states and certifies that:

1. The Bid Proposal is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization or corporation.
2. The Bid Proposal is genuine and not collusive or sham.
3. The bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any other bidder or anyone else to put in sham bid, or to refrain from bidding.
4. The bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price, or that of any other bidder, or to fix any overhead, profit or cost element of the bid price or that of any other bidder, or to secure any advantage against the public body awarding the contract or of anyone interested in the proposed contract.
5. All statements contained in the Bid Proposal and related documents are true.
6. The bidder has not, directly or indirectly, submitted the bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any fee to any person, corporation, partnership, company, association, organization, bid depository, or to any member or agent thereof to effectuate a collusive or sham bid.

Executed this ____ day of _____, 20__ at _____.
(City, County and State)

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Dated _____

By: _____
(Signature of Bidder's Authorized Officer or Representative)

_____
(Typed or Printed Name)

Title: _____

CERTIFICATE OF WORKERS' COMPENSATION INSURANCE

I, _____ (Name) the _____ (Title) of _____ (Contractor Name), declare state and certify that:

I am aware that California Labor Code §3700(a) and (b) provides:

"Every employer except the state shall secure the payment of compensation in one or more of the following ways:

(a) By being insured against liability to pay compensation in one or more insurers duly authorized to write compensation insurance in this state.

(b) By securing from the Director of Industrial Relations a certificate of consent to self-insure either as an individual employer, or one employer in a group of employers, which may be given upon furnishing proof satisfactory to the Director of Industrial Relations of ability to self-insure and to pay any compensation that may become due to his or her employees."

I am aware that the provisions of California Labor Code §3700 require every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of this Contract.

I am authorized to execute this Certificate of Workers Compensation Insurance on behalf of the above-identified Contractor.

Dated: _____

By: _____

_____
(Name Printed or Typed)

Title: _____

DRUG-FREE WORKPLACE CERTIFICATION

I, _____, am the _____ of _____
(Print Name) (Title) (Contractor Name)

I declare, state and certify to all of the following:

1. I am aware of the provisions and requirements of California Government Code §§8350 et seq., the Drug Free Workplace Act of 1990.
2. I am authorized to certify, and do certify, on behalf of Contractor that a drug free workplace will be provided by Contractor by doing all of the following:
   2.1. Publishing a statement notifying employees that the unlawful manufacture, distribution, dispensation, possession or use of a controlled substance is prohibited in Contractor's workplace and specifying actions which will be taken against employees for violation of the prohibition.
   2.2. Establishing a drug-free awareness program to inform employees about all of the following: (i) the dangers of drug abuse in the workplace; (ii) Contractor's policy of maintaining a drug-free workplace; (ii) the availability of drug counseling, rehabilitation and employee-assistance programs; and (iii) the penalties that may be imposed upon employees for drug abuse violations.
   2.3. Requiring that each employee engaged in the performance of the Contract be given a copy of the statement required by Paragraph 2.1 above, and that as a condition of employment by Contractor in connection with the Work of the Contract, the employee agrees to abide by the terms of the statement.
3. Contractor agrees to fulfill and discharge all of Contractor's obligations under the terms and requirements of California Government Code §8355 by, inter alia, publishing a statement notifying employees concerning: (i) the prohibition of any controlled substance in the workplace, (ii) establishing a drug-free awareness program, and (iii) requiring that each employee engaged in the performance of the Work of the Contract be given a copy of the statement required by California Government Code §8355(a) and requiring that the employee agree to abide by the terms of that statement.
4. Contractor and I understand that if the District determines that Contractor has either: (i) made a false certification herein, or (ii) violated this certification by failing to carry out and to implement the requirements of California Government Code §§8355, the Contract awarded herein is subject to termination, suspension of payments, or both. Contractor and I further understand that, should Contractor violate the terms of the Drug-Free Workplace Act of 1990, Contractor may be subject to debarment in accordance with the provisions of California Government Code §§8350, et seq.
5. Contractor and I acknowledge that Contractor and I are aware of the provisions of California Government Code §§8350, et seq. and hereby certify that Contractor and I will adhere to, fulfill, satisfy and discharge all provisions of and obligations under the Drug-Free Workplace Act of 1990.

I declare under penalty of perjury under the laws of the State of California that all of the foregoing is true and correct. Executed this ___ day of _____ 20__ at _____.
(City and State)

By: _____
(Signature of Bidder's Authorized Officer or Representative)

_____
(Typed or Printed Name)

Title: _____

DISABLED VETERAN BUSINESS ENTERPRISE ("DVBE") PARTICIPATION GOAL PROGRAM POLICY

1. DVBE Participation Goal Program Policy. COMPTON COMMUNITY COLLEGE DISTRICT ("the District") is committed to achieving the legislatively and administratively established Participation Goal for Disabled Business Enterprises ("DVBEs"). Through the DVBE Participation Goal Program, the District encourages contractors to ensure maximum opportunities for the participation of DVBEs in the Work of the Contract. The District's commitment to the achievement of DVBE Participation Goal for the Work of the Contract shall not, however, result in the District's discrimination in the award of the Contract on the basis of ethnic group identification, ancestry, religion, age, sex, race, color, or physical or mental disability.

2. Definitions.

   2.1. Disabled Veteran. A "Disabled Veteran" means a veteran of the military, naval, or air service of the United States with at least ten percent (10%) service-connected disability who is a resident of the State of California.

   2.2. Disabled Veteran Business Enterprise. A "Disabled Veteran Business Enterprise" ("DVBE") means a business enterprise certified by the Office of Small and Minority Business, State of California, Department of General Services, as a "Disabled Veteran Business Enterprise."

   2.3. Good Faith Efforts. As use herein, the term "Good Faith Efforts" shall be deemed to mean demonstrable and effective efforts of the Bidder to seek out, consider and secure DVBEs as potential Subcontractors or Material Suppliers, or both, in order to meet the Participation Goal; the Good Faith Efforts must be an active and aggressive effort to meet the Participation Goal, as more particularly set forth herein.

3. Participation Goal.

   3.1. Participation Goal Defined. The term "Participation Goal" is a numerically expressed objective for DVBE participation in performing the Work of the Contract. The DVBE Participation Goal is not a quota, set-aside, or rigid proportion.

   3.2. DVBE Participation Goal. The DVBE Participation Goal is Three Percent (3%) of total amount of Bidder's Bid Proposal, inclusive of the value of additive Alternate Bid Items, if any.

4. Good Faith Efforts to Meet Participation Goal.

   4.1. Good Faith Efforts. The Bid Proposal submitted by any Bidder who has not met the DVBE Participation Goal shall be considered responsive only if the Bidder represents that it made Good Faith Efforts to meet the DVBE Participation Goal.

   4.2. Good Faith Efforts to Meet DVBE Participation Goal. A Bidder must secure the participation of DVBEs in a timely manner to ensure that potential DVBE Subcontractors or Material Suppliers have an adequate opportunity to respond to the Bidder's solicitation of sub-bids and be given serious consideration by the Bidder prior to the closing time for the receipt of Bid Proposals. Such Good Faith Efforts shall include, without limitation:

      4.2.1. DVBE Work and Active Solicitation of DVBEs. The Bidder's identification of portions of the Work which may be provided or performed by DVBE Subcontractors and/or Material Suppliers and the Bidder's active and sincere solicitation of DVBEs for those identified portions of the Work.

      4.2.2. Contact Agencies for DVBEs. Contact local, state and/or federal agencies, and local DVBE organizations to identify potential DVBEs for performing portions of the Work.

      4.2.3. Advertisements. Advertise (with sufficient time for submission of sub-bids and the Bidder's good faith consideration of the same) prior to the last date for submittal of Bid

Proposals in: (i) one or more daily or weekly newspapers of general circulation published in the locality of the Work, and (ii) one or more construction trade publications, and (iii) one or more construction trade publications, journals or papers focusing on DVBEs. Each of the advertisements pursuant to the preceding, must state the following: (i) identification of the general description of the Work and an identification of the District; (ii) state the closing date and time for the District's receipt of Bid Proposals; (iii) state the last date and time for submission of sub-bids from DVBEs to the Bidder; (iv) request sub-bids from DVBE Subcontractors or Material Suppliers; (v) identify the type of Work of the Contract available for sub-bids by DVBEs; and (vi) unequivocally state the requirement of bonds, if any, of a DVBE sub-Bidder and who is to bear the expense of obtaining any required bonds.

4.2.4. Direct Solicitation of DVBEs. Solicit by direct mail, telephone or personal contact a sufficient number of DVBEs who offer work or services appropriate for the Work identified by the Bidder under Paragraph 4.2.1 above. Solicitations shall be made in a timely manner and contain sufficient information for a sub-Bidder to make a reasonable sub-bid and the Bidder's good faith consideration of the same, including, without limitation, the following: (i) identification of the general description of the Work and an identification of the District; (ii) state the closing date and time for the District's receipt of Bid Proposals; (iii) state the last date and time for submission of bids from DVBEs to the Bidder; (iv) request sub-bids from Subcontractors or Material Suppliers; (v) identify the type of Work of the Contract available for sub-bids by DVBEs; and (vi) unequivocally state the requirement of bonds of a DVBE sub-Bidder and who is to bear the expense of obtaining any required bonds.

4.2.5. Bidder Follow-Up To DVBE Interest. The Bidder shall follow-up initial expressions of interest of DVBEs in performing a portion of the Work by contacting such DVBEs to determine with certainty whether such DVBEs are interested in performing specific items of the Work of the Contract and submitting a sub-bid for a portion of the Work.

4.2.6. Good Faith Negotiations With Potential DVBE Subcontractors. The Bidder shall negotiate in good faith with potential DVBEs Subcontractors or Material Suppliers and shall not unjustifiably reject, as unsatisfactory, bids prepared by any DVBE for a portion of the Work of the Project. In the event that the District shall reasonably determine that the Bidder has failed to engage in good faith negotiations with a potential DVBE participant or rejects the sub-bid of a DVBE without justification, the District may deem the Bid Proposal of such Bidder to be non-responsive.

5. Documentation of Achievement of Participation Goal or Good Faith Efforts. Each Bidder shall note, where indicated, in the form of Bid Proposal whether the DVBE Participation Goal was achieved and if not, that Good Faith Efforts were made to achieve the DVBE Participation Goal. **All Bidders shall submit with their Bid Proposals documentation and supporting evidence of achievement of the DVBE Participation Goal or Good Faith efforts to achieve the DVBE Participation Goal.** Such documentation and supporting evidence shall be in the form of duly completed forms of the DVBE Participation Worksheets.

6. Counting of DVBE Participation.

6.1. Certification. DVBEs must be certified in the category identified prior to the closing time for the District's receipt of Bid Proposals; any DVBE who is not so certified will result in such DVBE not counting towards the DVBE Participation Goal.

6.2. Bidder Acceptance of Sub-Bid. Sub-bids of DVBEs shall be accepted by the Bidder prior to the closing time for the District's receipt of Bid Proposals, with such acceptance subject only to the District's award of the Contract to the Bidder.

6.3. Value of Participation Goal. The total dollar value of a contract between the Bidder and a certified DVBE will count towards the DVBE Participation Goal.

6.4. Joint Ventures. If a DVBE is a member of a joint venture, only the dollar value of the Work actually performed by the DVBE member of the joint venture will count towards the DVBE Participation Goal, unless the joint venture entity itself is certified as a DVBE.

6.5. Bidder as DVBE. A Bidder certified as a DVBE may count towards the Participation Goal the dollar value of the Work actually performed by the Bidder's own forces. A Bidder certified as a DVBE is not relieved from meeting the DVBE Participation Goal or making Good Faith Efforts to achieve the Participation Goal if the value of its Work is less than the DVBE Participation Goal.

6.6. Lower Tier Subcontractors; Material Suppliers. The Bidder may count towards the DVBE Participation Goal the total dollar value of contracts let by its Subcontractors or Material Suppliers to lower tier Subcontractors or Material Suppliers certified as DVBEs provided that such lower tier Subcontractors or Material Suppliers actually assume the contractual responsibility and obligation for the total dollar value of the Work or materials to be supplied by such lower tier Subcontractors or Material Suppliers.

6.7. Commercially Useful Functions. DVBEs used by the Bidder to establish achievement of the Participation Goal shall be considered as meeting the Participation Goal only if the DVBE is responsible for execution of a distinct element of the Work of the Contract, carry out its obligations by actually performing, managing, or supervising the Work for which the DVBE is responsible for executing. Such DVBEs must be responsible for the portion of the Work which is normal for its business services and functions. A DVBE Subcontractor who subcontracts a significantly greater portion of the Work assumed by the DVBE Subcontractor than would be considered normal and usual under industry standards and practices will not be presumed to be performing a commercially useful function, and such DVBE Subcontractor will not count or be considered for purposes of achieving the Participation Goal.

7. Substitution of DVBEs. In the event that Bidder awarded the Contract deems it necessary to substitute a DVBE Subcontractor or Material Supplier identified in the Subcontractor's List submitted with the Bidder's Bid Proposal, all provisions of the Contract Documents relating to the substitution of Subcontractors shall be applicable and complied with by the successful Bidder. In addition to the provisions of the Contract Documents relating to the substitution of listed Subcontractors, if a DVBE under a direct contract with the Bidder is to be substituted, the successful Bidder is strongly encouraged to substitute the listed DVBE with an equivalent and certified DVBE.

8. Monitoring of DVBE Participation.

8.1. DVBE Participation Worksheets. If the Bidder awarded the Contract is required by the District to complete and submit DVBE Participation Worksheets, the completed forms of DVBE Participation Worksheets submitted by the Bidder shall be deemed a part of the Contract Documents.

8.2. Continuing Responsibilities. Efforts of the successful Bidder to include the participation of DVBEs in the performance of the Work of the Contract shall not terminate with the award of the Contract to such Bidder. The successful Bidder's efforts to secure the participation of DVBEs shall continue for the duration of the Work of the Contract, including when the successful Bidder is purchasing materials, equipment, supplies, and/or needs additional Subcontractors (including substitution of listed Subcontractors).

8.3. DVBE Participation Reports and Data. During performance of the Work of the Contract, the successful Bidder shall maintain complete and accurate records of DVBE Participation in executing the Work. From time-to-time, upon the request of the District the Bidder awarded

the Contract shall submit reports, in form and content satisfactory to the District, regarding DVBE Participation in the Work of the Contract, including the participation of DVBEs in the performance of approved Changes to the Work. The failure or refusal of the successful Bidder to submit reports of DVBE Participation during performance of the Work within ten (10) days of the District's request for such reports may be deemed by the District to be the successful Bidder's default of a material obligation of the Contract and thereupon, the District may exercise any right or remedy provided for under the Contract Documents or at law, including without limitation termination of the Contract for default or the withholding of payments otherwise due under the Contract Documents until such report(s) is/are received. If requested by the District, upon completion of the Work of the Contract, the successful Bidder shall submit a final report identifying all DVBEs utilized in the performance of the Work, the type or classification of the Work performed by each such DVBE and the dollar value of the Work performed by each such DVBE. In the event that the District shall request a report of DVBE utilization upon completion of the Work of the Contract, the submission of such report in form and content satisfactory to the District shall be deemed a condition precedent to the District's obligation to make payment of the Final Payment under the Contract Documents. In such event, the submission of such final report shall be in addition to, and not in lieu of any other conditions precedent set forth in the Contract Documents for the District's obligation to make payment of the Final Payment. The Bidder awarded the Contract shall maintain books and records of DVBE Participation in the Work for at least three (3) years following completion of the Project; during such time, the District shall have access, upon reasonable advance notice, to such books and records for inspection or reproduction.

8.4. Contract Audit. The successful Bidder awarded the Contract agrees that the District, or its designee, shall have the right to review, obtain and/or copy any and all writings, materials, documents and other records pertaining to utilization of DVBEs in performance of the Contract. The successful Bidder awarded the Contract agrees that the District, or its designee, shall have access to any of the successful Bidder's premises upon reasonable notice, during usual business hours for the purpose of interviewing employees and inspecting and/or copying such writings, materials, documents and other documents which may be relevant to a matter under investigation for the purpose of determining compliance with the DVBE Participation Goal Program Policy.

9. Capitalized Terms. Capitalized terms used herein shall be as defined herein or elsewhere in the Contract Documents.

[END OF SECTION]

DVBE PARTICIPATION WORKSHEETS
ATTACHMENT A
BIDDER'S DVBE STATEMENT

Bidder: _____

1. Bidder's Compliance With DVBE Participation Program. (Check the appropriate statement).
   - ☐ The Bidder has achieved or exceeded the DVBE Participation Goal and all DVBEs counting towards the DVBE Participation Goal are set forth and identified in Attachments C-1, C-2 and C-3.
   - ☐ The Bidder did not achieve the Participation Goal for DVBEs, but has made the required Good Faith Efforts to secure the participation of DVBEs in accordance with guidelines established in the District's DVBE Participation Goal Program.
2. DVBE Participation Achieved. The Bidder achieved a DVBE Participation Goal of ___% of the amount of the Bidder's Bid Proposal.
3. Submittal of Documentation. Concurrently with the submittal of this Bidder's DVBE Statement, the Bidder has also submitted duly completed, and executed if required, forms of Attachments B, C, D, E, F, G and H of these DVBE Participation Worksheets. All of the information provided by the Bidder in its responses to Attachments B, C, E, F, G and H are true, correct and accurate; there are no omissions in the responses of the Bidder to the foregoing Attachments which render any of the Bidder's statements or information provided therein to be false or misleading. Incomplete, inaccurate, false, misleading responses or omissions rendering responses to be false or misleading will render the Bid Proposal non-responsive and rejected.
4. Certification of DVBE Status. The Bidder certifies, warrants and represents to the District that the Bidder has exercised due diligence in ascertaining the status of each proposed DVBE identified in Attachment C as a DVBE in compliance with the applicable provisions of the District's DVBE Participation Program Policy and applicable law. By executing and submitting this Bidder's DVBE Statement, the Bidder represents to the District that each DVBE identified in Attachment C is duly and properly certified as a DVBE in conformity with the District's DVBE Program Goal Policy and applicable law. The Bidder acknowledges that in the event that the District shall reasonably determine that any DVBE identified in the Bidder's responses to Attachment C is not a duly and properly certified DVBE, the Bid Proposal may be rejected by the District as being non-responsive. For each DVBE identified in Attachment C, the Bidder has submitted forms of DVBE Certification (Attachment D) duly completed and executed by each such DVBE.

[CONTINUED NEXT PAGE]

5. Authority to Execute. The individual executing this Bidder's DVBE Statement on behalf of the Bidder warrants and represents to the District that she/he is duly authorized to execute this Bidder's DVBE Statement on behalf of the Bidder.

Executed this __ day of _____ 20____, at _____.
(City and State)

I declare under penalty of perjury under the laws of the State of California that all of the foregoing is true and correct.

_____
(Signature)

_____
(Name of Individual Executing Statement)
[Printed or Typed]

DVBE PARTICIPATION WORKSHEETS
ATTACHMENT B
SUBCONTRACTIBLE ITEMS OF WORK

Bidder Name: _____
Project Name: **STUDENT HOUSING**

List each item of Work, including supplies, equipment, services, and trucking made available to DVBEs. Also list the approximate dollar value and approximate percentage of the Bidder's total Bid Proposal amount that each item of Work identified below represents. (Photocopy if additional sheets are needed.)

Item or Description of Work	Approximate Dollar Value	Approximate Percentage of Total Amount of Bid Proposal

INSTRUCTIONS FOR COMPLETION OF ATTACHMENT C DVBE PARTICIPATION SUMMARY

1. Submittal of Attachment C. The Bidder shall complete and submit Attachment C regardless of whether or not such Bidder achieved the Participation Goal. Failure of the Bidder to submit completed form of Attachment C will result in the District rejecting the Bid Proposal of such Bidder as being non-responsive.
2. Firm Name. State name of the enterprise proposed by the Bidder for meeting DVBE Participation Goal; the full name of each enterprise identified must be listed and if the enterprise conducts business under a fictitious business name, the same shall be stated. If the Bidder is a certified DVBE and wishes to be counted in the category certified for purposes of meeting the Participation Goal, the Bidder must be identified in Attachment C.
3. Item or Description of Work. Identify, with specificity, the item or portion of the Work of the Contract to be provided or performed by the proposed DVBEs identified.
4. Contracting With. Identify the name of the company or firm with whom the proposed DVBE will be contracting with in connection with the Work of the Contract.
5. Tier. Identify the tier of contracting for each proposed DVBE with the following designations:

   0 = Bidder.

   1 = First Tier Subcontractor or Material Supplier under a direct contract with the Bidder.

   2 = Second Tier Subcontractor or Material Supplier under a direct contract with a First Tier Subcontractor or Material Supplier, regardless of whether or not the First Tier Subcontractor or Material Supplier is a DVBE.

   3 = Third Tier Subcontractor or Material Supplier under a direct contract with a Second Tier Subcontractor or Material Supplier, regardless of whether or not the Second Tier Subcontractor or Material Supplier is a DVBE.
6. Claimed Value. Set forth the total dollar value of the Work to be provided or performed by the proposed DVBE. The dollar value set forth in the responses to Attachments C must conform to the applicable provisions of the District's DVBE Participation Program Goal Policy.
7. Certification. For each DVBE identified in Attachment C, the Bidder shall indicate in this column whether such DVBE is self-certified or certified by a public agency as a DVBE. The Bidder's completion of this portion of Attachment C with respect to each DVBE identified therein is in addition to and not in lieu of the Bidder's submittal of duly completed and executed forms of DVBE Certification (Attachment D) from each proposed DVBE identified in Attachment C.

[CONTINUED NEXT PAGE]

DVBE PARTICIPATION WORKSHEETS
ATTACHMENT C
DVBE PARTICIPATION SUMMARY

Bidder Name:_____

Project Name: STUDENT HOUSING

Firm Name	Item or Description of Work	Contracting with	Tier	Claimed Value	Certification

DVBE PARTICIPATION WORKSHEETS
INSTRUCTIONS FOR COMPLETION OF ATTACHMENT D
DVBE CERTIFICATION

1. DVBEs Completion of Attachment D. Bidders shall make available to each DVBE identified by the Bidder in its responses to Attachment C a copy of the DVBE Certification (Attachment D) for completion and execution by each such DVBE.
2. Bidder Submittal of Completed Attachment D. Bidders shall submit duly completed and executed forms of the DVBE Certification for each DVBE identified in the Bidder's responses to Attachment C. The failure or refusal, for any reason, of the Bidder to submit such completed and executed DVBE Certification(s) of each DVBE identified in the Bidder's responses to Attachment C may result in the District rejecting the Bid Proposal of such Bidder as being non-responsive.
3. Complete and Accurate Attachment D. Each DVBE identified in the Bidder's responses to Attachment C shall complete and execute, under penalty of perjury, a DVBE Certification. Each such DVBE and the Bidder acknowledge that if the District reasonably determines that any response in the DVBE Certification(s) submitted to the District which are incomplete, false or misleading or which omit facts rendering responses therein to be false or misleading, the District may reject the Bid Proposal of such Bidder as being non-responsive.

DVBE PARTICIPATION WORKSHEETS
ATTACHMENT D
DVBE CERTIFICATION

1. DVBE Information.

DVBE Firm Name	
DVBE Address	
DVBE Firm Contact Name	
DVBE Firm Contact Phone, Fax and Email	
Services or Goods Generally Provided by DVBE	
Services or Goods to be Provided by DVBE to Bidder	

2. Certification of DVBE Status. The above-identified DVBE is certified as such by California Department of General Services Office of Small Business and Disabled Veteran Business Enterprise Services and a true and correct copy of such certification is attached hereto. The Bidder and the above-identified DVBE acknowledge that if the certification of the above-identified DVBE's status is not attached, the above-identified DVBE will not be counted or considered for purposes of the Bidder's achievement of the Participation Goal.

3. Authority to Execute. The undersigned individual executing this DVBE Certification warrants and represents to the District that she/he has made diligent inquiry to ascertain that all of the information provided herein is true, correct and complete, that there are no omissions of fact in any of the responses herein which would render such responses false or misleading and that she/he is duly authorized to execute this DVBE Certification on behalf of the above-identified DVBE.

Executed this ____day of _____, 20____at_____
(City and State)

I declare under penalty of perjury under the laws of the state of California that the foregoing is true and correct.

_____
(Signature)

_____
(Name of Individual Executing DVBE Certification)
[Printed or Typed]

DVBE PARTICIPATION WORKSHEETS
ATTACHMENT E
DVBES CONTACTED

For each Subcontractible Item of the Work identified in the Bidder's response to Attachment B (Subcontractible Items of the Work), provide the following:

1. List all the DVBEs you solicited sub-bids from and how you obtained each firm's name.
2. Indicate method and date of solicitation (all written solicitations must conform to Public Contract Code § 4108 with respect to bonding requirements, if any).
3. List the method and date of follow-up and the person you contacted.
4. USE ONE SHEET FOR EACH SUBCONTRACTIBLE ITEM OF WORK IDENTIFIED IN ATTACHMENT B. (Photocopy as many sheets of this Attachment E as necessary.)

Bidder Name: _____
Project Name: STUDENT HOUSING

DVBE Solicited & Source of the Firm's Name	Method & Date of Solicitation	Follow-up Method, Date & Person Contacted

DVBE PARTICIPATION WORKSHEETS
ATTACHMENT F
DVBE SUB-BIDS NOT ACCEPTED BY BIDDER

List all DVBEs who submitted bids or quotations to the Bidder which were not accepted. Indicate if the sub-Bidder is a DVBE, identify the item of Work or materials, list the Subcontractor/Material Supplier the Bidder intends to use in lieu of the DVBE submitting a sub-bid for the identified portion of the Work, and the amount of such other sub-Bidder's bid. Give the reason the Bidder did not use the DVBE firm. **(Photocopy if additional sheets are needed.)**

Bidder Name: _____
Project Name: **STUDENT HOUSING**

DVBEs Who Submitted Bids	Item of Work or Materials	Subcontractor/ Material Supplier to be Used	Reason DVBE Bid Not Accepted

DVBE PARTICIPATION WORKSHEETS
ATTACHMENT G
VERIFICATION OF DVBE SOLICITATIONS

Bidder Name: _____

Project Name: STUDENT HOUSING

Identify ALL DVBE firms contacted by the Bidder for purposes of meeting the DVBE Participation Goal. If a DVBE was solicited in writing, the Bidder shall attach hereto a true and correct copy of such written solicitation; failure of the Bidder to do so may result in the District's rejection of the Bidder's Bid Proposal as being non-responsive.

Name of DVBE Firm Solicited	Manner of Solicitation, i.e., written, personal, telephonic, etc.	Date of Solicitation	General Description of DVBE Response to Solicitation

DVBE PARTICIPATION WORKSHEETS
ATTACHMENT H
AGENCY CONTACTS

Bidder Name: _____

Project Name: STUDENT HOUSING

Identify all local, state or federal public agencies and DVBE organizations contacted by the Bidder for the purpose of identifying potential DVBEs to meet the Participation Goal. If the Bidder received any list or other writing identifying potential DVBEs from any agency or organization set forth in this Attachment H, the Bidder shall attach hereto a true and correct copy of each such list or other writing; failure of the Bidder to so attach such list(s) or other writing(s) may result in the District rejecting the Bid Proposal of such Bidder as being non-responsive. (Photocopy if additional sheets are necessary.)

LOCAL, STATE OR FEDERAL AGENCIES.

Agency Name & Address	Date of Bidder's Contact with Agency	Name & Telephone Number of Individual Contacted	DVBE List Received by Bidder (Indicate Yes or No & if Yes, the date of Bidder's receipt of list)

DVBE ORGANIZATIONS CONTACTED.

Organization Name & Address	Date of Bidder's Contact with Organization	Name & Telephone Number of Individual Contacted	DVBE List Received by Bidder (Indicate Yes or No & if Yes, the date of Bidder's receipt of list)

AGREEMENT

THIS AGREEMENT is entered into as of Click here to enter a date. in the City of Compton, County of Los Angeles, State of California, by and between COMPTON COMMUNITY COLLEGE DISTRICT, a California Community College District hereinafter "District" and _____ ("Contractor").

WITNESSETH, that the District and the Contractor in consideration of the mutual covenants contained herein agree as follows:

1. **The Work**. Within the Contract Time and for the Contract Price, subject to adjustments thereto pursuant to the Contract Documents, the Contractor shall perform and provide all necessary labor, materials, tools, equipment, utilities, services and transportation to complete in a workmanlike manner all of the Work required in connection with the work of improvement commonly referred to as Site Concrete Work. The Contractor shall complete all Work covered by the Contract Documents, including without limitation, the Drawings and Specifications prepared by the Architect and other Contract Documents enumerated in Paragraph 5 of this Agreement, along with all modifications and addenda thereto issued in accordance with the Contract Documents. The Architect for the Work is _____.

2. **Contract Time**. The Work shall be commenced on the date stated in the District's Notice to Proceed. The Contractor shall achieve Substantial Completion of the Work within the Contract Time set forth in the Special Conditions.

3. **Contract Price**. The District shall pay the Contractor as full consideration for the Contractor's full, complete and faithful performance of the Contractor's obligations under the Contract Documents, subject to adjustments of the Contract Price in accordance with the Contract Documents, the Contract Price of _____ Dollars ($_____). The Contract Price is based upon the Contractor's Base Bid Proposal for the Work and the following Alternate Bid Items, if any: _____. The District's Progress Payments of the Contract Price shall be subject to retention withholdings equal to five percent (5%) of each Progress Payment ("Retention"). Retention withheld by the District shall be disbursed to the Contractor as part of the Final Payment due the Contractor.

4. **Liquidated Damages**. The Contractor shall be subject to assessment of Liquidated Damages if the Contractor: (i) fails to achieve Substantial Completion of the Work within the Contract Time, including adjustments thereto authorized by the Contract Documents; (ii) fails to submit Submittals in accordance with the Submittal Schedule; or (iii) fails to complete Punchlist items noted upon Substantial Completion within the time established to complete the Punchlist items. The per diem rate of Liquidated Damages assessed for each of the foregoing events is set forth in the Special Conditions.

5. **Limitation on Damages**. If the District breaches or defaults in its performance of its obligations under the Contract Documents, the damages, if any, recoverable by the Contractor shall be limited to general damages which are directly and proximately caused by said breach or default of the District and shall exclude any and all special or consequential damages. By executing this Agreement, the Contractor expressly acknowledges the foregoing limitation to the recovery only of general damages from the District if the District is in breach or default of its obligations under the Contract Documents. The Contractor expressly waives any right to and foregoes the recovery of any special or consequential damages from the District including, without limitation, damages for: (i) lost or impaired bonding capacity; and/or, (ii) lost profits arising out of or in connection with any past, present, or future work of improvement, except for the Project which is the subject of the Contract Documents.

6. **The Contract Documents.** The documents forming a part of the Contract Documents consist of the following, all of which are component parts of the Contract Documents:

00 01 10 Table of Contents
00 21 13 Instructions for Bidders
00 11 13 Notice Calling for Bids, including Bid Addenda Nos. _____
00 41 00 Bid Proposal
00 42 13 Alternate Bid Items Proposal Form
00 43 24 Pre-Bid Inquiry Form
00 43 36 Subcontractors List
00 45 13 Statement of Qualifications
00 45 19 Non-Collusion Affidavit
00 45 26 Certificate of Workers Compensation Insurance
00 45 27 Drug-Free Workplace Certification
00 52 00 Agreement
00 61 10 Bid Bond
00 61 13 Performance Bond
00 61 14 Labor and Material Payment Bond
00 62 17 OCIP SEWUP Forms & Manual
00 62 90 Verification of Certified Payroll Records Submittal to Labor Commission
00 65 36 Guarantee Form
00 65 37 Contractor Certification of Subcontractor Claim
00 72 00 General Conditions
00 73 00 Special Conditions
Attachment A: Community Benefits Agreement

7. **Notices**. Notices of the District and Contractor to the other shall be transmitted in accordance with the Contract Documents. The effective date of notices transmitted in accordance with the Contract Documents shall be as set forth in the Contract Documents. Notices under the Contract Documents shall be addressed as follows:

If to the District:
Abdul Nasser
Vice President, Administrative Services
Compton Community College District
1111 East Artesia Boulevard
Compton, CA 90221

If to the Contractor:
_____
_____
_____

8. **Authority to Execute**. The individual(s) executing this Agreement on behalf of the Contractor is/are duly and fully authorized to execute this Agreement on behalf of Contractor and to bind the Contractor to each and every term, condition and covenant of the Contract Documents.

CONTRACTORS ARE REQUIRED BY LAW TO BE LICENSED AND REGULATED BY THE CONTRACTORS' STATE LICENSE BOARD. ANY QUESTIONS CONCERNING A CONTRACTOR MAY BE REFERRED TO THE REGISTRAR, CONTRACTORS' STATE LICENSE BOARD, P.O. BOX 2600, SACRAMENTO, CALIFORNIA 95826

IN WITNESS WHEREOF, this Agreement has been duly executed by the District and the Contractor as of the date set forth above.

"DISTRICT"
Compton Community College District

By: _____

_____
(Name Printed or Typed)

Title: _____

"CONTRACTOR"

_____

By: _____

_____
(Name Printed or Typed)

Title: _____

BID BOND

KNOW ALL MEN BY THESE PRESENTS that we, _____, as Surety and _____, as Principal, are jointly and severally, along with their respective heirs, executors, administrators, successors and assigns, held and firmly bound unto COMPTON COMMUNITY COLLEGE DISTRICT ("the Obligee") for payment of the penal sum hereof in lawful money of the United States, as more particularly set forth herein.

THE CONDITION OF THIS OBLIGATION IS SUCH THAT:

WHEREAS, the Principal has submitted the accompanying Bid Proposal to the Obligee for the Work commonly described as **STUDENT HOUSING.**

WHEREAS, subject to the terms of this Bond, the Surety and the Principal are jointly and severally firmly bound unto the Obligee in the penal sum equal to Ten Percent (10%) of the maximum amount of the Bid Proposal submitted by the Principal to the Obligee, inclusive of amounts proposed for Alternate Bid Items, if any.

NOW THEREFORE, if the Principal shall not withdraw said Bid Proposal within the period specified therein after the opening of the same, or, if no period be specified, for sixty (60) days after opening of said Bid Proposal; and if the Principal is awarded the Contract, and shall within the period specified therefore, or if no period be specified, within five (5) days after the prescribed forms are presented to him for signature, enter into a written contract with the Obligee, in accordance with the Bid Proposal as accepted and give such bond(s) with good and sufficient surety or sureties, as may be required, for the faithful performance and proper fulfillment of such Contract and for the payment for labor and materials used for the performance of the Contract, or in the event of the withdrawal of said Bid Proposal within the period specified for the holding open of the Bid Proposal or the failure of the Principal to enter into such Contract and give such bonds within the time specified, if the Principal shall pay the Obligee the difference between the amount specified in said Bid Proposal and the amount for which the Obligee may procure the required Work and/or supplies, if the latter amount be in excess of the former, together with all costs incurred by the Obligee in again calling for Bids, then the above obligation shall be void and of no effect, otherwise to remain in full force and effect.

Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or the Call for Bids, the Work to be performed there under, the Drawings or the Specifications accompanying the same, or any other portion of the Contract Documents shall in no way affect its obligations under this Bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of said Contract, the Call for Bids, the Work, the Drawings or the Specifications, or any other portion of the Contract Documents.

In the event suit or other proceeding is brought upon this Bond by the Obligee, the Surety and Principal shall be jointly and severally liable for payment to the Obligee all costs, expenses and

[CONTINUED NEXT PAGE]

fees incurred by the Obligee in connection therewith, including without limitation, attorneys' fees.

IN WITNESS WHEREOF, the Principal and Surety have executed this instrument this _____ day of _____, 20___ by their duly authorized agents or representatives.

_____
(Bidder-Principal Name)

By: _____
(Signature)

_____
(Typed or Printed Name)

Title:

_____

(Attach Notary Public Acknowledgement of Principal's Signature)

_____
(Surety Name)

By: _____
(Signature of Attorney-In-Fact for Surety)

_____
(Typed or Printed Name of Attorney-In-Fact)

(Attach: (i) Attorney-In-Fact Certification; (ii) Notary Public Acknowledgment of Authorizing Signature on Attorney-Fact Certification; and (iii) Notary Public Acknowledgement of Attorney-In-Fact's Signature)

Contact name, address, telephone number and email address for notices to the Surety

_____
(Contact Name)

_____
(Street Address)

_____
(City, State & Zip Code)

(_____) _____ (_____) _____
Telephone Fax

_____
(Email address)

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS that we, _____, as Surety and _____, as Principal, are jointly and severally, along with their respective heirs, executors, administrators, successors and assigns, held and firmly bound unto COMPTON COMMUNITY COLLEGE DISTRICT ("the Obligee") for payment of the penal sum the penal sum of _____ Dollars ($_____) in lawful money of the United States, well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally.

THE CONDITION OF THIS OBLIGATION IS SUCH THAT:

WHEREAS, the Obligee, by resolution of its Board of Trustees has awarded to the Principal a Contract for the Work described as **STUDENT HOUSING.**

WHEREAS, the Principal, has entered into an agreement with the Obligee for performance of the Work; the Agreement and all other Contract Documents set forth therein are incorporated herein and made a part hereof by this reference.

WHEREAS, by the terms of the Contract Documents, the Principal is required to furnish a bond ensuring the Principal's prompt, full and faithful performance of the Work of the Contract Documents.

NOW THEREFORE, if the Principal shall promptly, fully and faithfully perform each and all of the obligations and things to be done and performed by the Principal in strict accordance with the terms of the Contract Documents as they may be modified or amended from time to time; and if the Principal shall indemnify and save harmless the Obligee and all of its officers, agents and employees from any and all losses, liability and damages, claims, judgments, liens, costs, and fees of every description, which may be incurred by the Obligee by reason of the failure or default on the part of the Principal in the performance of any or all of the terms or the obligations of the Contract Documents, including all modifications, and amendments, thereto, and any warranties or guarantees required thereunder; then this obligation shall be void; otherwise, it shall be, and remain, in full force and effect.

The Surety, for value received, hereby stipulates and agrees that no change, adjustment of the Contract Time, adjustment of the Contract Price, alterations, deletions, additions, or any other modifications to the terms of the Contract Documents, the Work to be performed thereunder, or to the Specifications or the Drawings shall limit, restrict or otherwise impair Surety's obligations or Obligee's rights hereunder; Surety hereby waives notice from the Obligee of any such changes, adjustments of Contract Time, adjustments of Contract Price, alterations, deletions, additions or other modifications to the Contract Documents, the Work to be performed under the Contract Documents, or the Drawings or the Specifications.

In the event of the Obligee's termination of the Contract due to the Principal's breach or default of the Principal's obligations thereunder, within twenty (20) days after written notice from the Obligee to the Surety of the Principal's breach or default of the Contract Documents and Obligee's termination of the Contract, the Surety shall notify Obligee in writing of Surety's assumption of obligations hereunder by its election to either remedy the default or breach of the Principal or to take charge of the Work of the Contract Documents and complete the Work at its own expense ("the Notice of Election"); provided, however, that the procedure by which the Surety undertakes to discharge its obligations under this Bond shall be subject to the advance written approval of the Obligee, which approval shall not be unreasonably withheld, limited or restricted. The insolvency of the Principal or the Principal's denial of a failure of performance or default under the Contract Documents shall not by itself, without the Surety's prompt, diligent inquiry and investigation of such denial, be justification for Surety's failure to give the Notice of Election or for its failure to promptly remedy the failure of performance or default of the Principal or to complete the Work.

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In the event the Surety fails to issue its Notice of Election to Obligee within the time provided for hereinabove, the Obligee may thereafter cause the cure or remedy of the Principal's failure of performance or default or to complete the Work. The Principal and the Surety shall be jointly and severally liable to the Obligee for all damages and costs sustained by the Obligee as a result of the Principal's failure of performance under the Contract Documents or default in its performance of obligations thereunder, including without limitation the costs of cure or completion of the Work exceeding the then remaining balance of the Contract Price; provided that the Surety's liability hereunder for the costs of performance, damages and other costs sustained by the Obligee upon the Principal's failure of performance or default under the Contract Documents shall be limited to the penal sum hereof, which shall be deemed to include the costs or value of any Changes to the Work which increases the Contract Price.

In the event suit or other proceeding is brought upon this Bond by the Obligee, the Surety and Principal shall be jointly and severally liable for payment to the Obligee of all costs, expenses and fees incurred by the Obligee therewith, including without limitation, attorneys' fees.

IN WITNESS WHEREOF, the Principal and Surety have executed this instrument this _____day of _____, 20__ by their duly authorized agent or representative

_____
(Bidder-Principal Name)

By: _____
(Signature)

_____
(Typed or Printed Name)

Title: _____

(Attach Notary Public Acknowledgement of Principal's Signature)

_____
(Surety Name)

By: _____
(Signature of Attorney-In-Fact for Surety)

_____
(Typed or Printed Name of Attorney-In-Fact)

(Attach: (i) Attorney-In-Fact Certification; (ii) Notary Public Acknowledgment of Authorizing Signature on Attorney-Fact Certification; and (iii) Notary Public Acknowledgement of Attorney-In-Fact's Signature)

Contact name, address, telephone number and email address for notices to the Surety

_____
(Contact Name)

_____
(Street Address)

_____
(City, State & Zip Code)

(_____) _____ (_____) _____
Telephone Fax

_____
(Email address)

LABOR AND MATERIAL PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS that we, _____, as Surety and _____, as Principal, are jointly and severally, along with their respective heirs, executors, administrators, successors and assigns, held and firmly bound unto COMPTON COMMUNITY COLLEGE DISTRICT ("the Obligee") for payment of the penal sum the penal sum of _____ Dollars ($_____) in lawful money of the United States, well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally.

THE CONDITION OF THIS OBLIGATION IS SUCH THAT:

WHEREAS, the Obligee, by resolution of its Board of Trustees has awarded to the Principal a Contract for the Work described as **STUDENT HOUSING.**

WHEREAS, the Principal, has entered into an Agreement with the Obligee for performance of the Work, the Agreement and all other Contract Documents set forth therein are incorporated herein by this reference and made a part hereof.

WHEREAS, by the terms of the Contract Documents, the Principal is required to furnish a bond for the prompt, full and faithful payment to any Claimant, as hereinafter defined, for all labor materials or services used, or reasonably required for use, in the performance of the Work.

NOW THEREFORE, if the Principal shall promptly, fully and faithfully make payment to any Claimant for all labor, materials or services used or reasonably required for use in the performance of the Work then this obligation shall be void; otherwise, it shall be, and remain, in full force and effect.

The term "Claimant" shall refer to any person, corporation, partnership, proprietorship or other entity including without limitation, all persons and entities described in California Civil Code §9100, providing or furnishing labor, materials or services used or reasonably required for use in the performance of the Work under the Contract Documents, without regard for whether such labor, materials or services were sold, leased or rented. This Bond shall inure to the benefit of all Claimants so as to give them, or their assigns and successors, a right of action upon this Bond.

In the event suit is brought on this Bond by any Claimant for amounts due such Claimant for labor, materials or services provided or furnished by such Claimant, the Surety shall pay for the same and reasonable attorneys' fees pursuant to California Civil Code §9554.

The Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration, deletion, addition, or any other modification to the terms of the Contract Documents, the Work to be performed thereunder, the Specifications or the Drawings, or any other portion of the Contract Documents, shall in any way limit, restrict or otherwise affect its obligations under this Bond; the Surety hereby waives notice from the Obligee of any such change, extension of time, alteration, deletion, addition or other modification to the Contract Documents, the Work to be performed under the Contract Documents, the Drawings or the Specifications of any other portion of the Contract Documents.

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IN WITNESS WHEREOF, the Principal and Surety have executed this instrument this _____ day of _____, 20__ by their duly authorized agent or representative.

_____
(Bidder-Principal Name)

By: _____
(Signature)

_____
(Typed or Printed Name)

Title:
_____

(Attach Notary Public Acknowledgement of Principal's Signature)

_____
(Surety Name)

By: _____
(Signature of Attorney-In-Fact for Surety)

_____
(Typed or Printed Name of Attorney-In-Fact)

(Attach: (i) Attorney-In-Fact Certification; (ii) Notary Public Acknowledgment of Authorizing Signature on Attorney-Fact Certification; and (iii) Notary Public Acknowledgement of Attorney-In-Fact's Signature)

Contact name, address, telephone number and email address for notices to the Surety

_____
(Contact Name)

_____
(Street Address)

_____
(City, State & Zip Code)

(_____) _____ (_____) _____
Telephone Fax

_____
(Email address)

OCIP SEWUP FORMS AND MANUAL

SEWUP
EDUCATION CONSTRUCTION INSURANCE

www.sewup.org

Statewide Educational Wrap Up Program (SEWUP) JPA

Owner Controlled Insurance Program (OCIP)

Project Insurance Manual

This manual is intended to provide only a general overview of the Owner Controlled Insurance Program and does not in any way alter or take precedence over the language in the actual insurance policies and contracts. It makes no promise to provide insurance to those not enrolled in the Owner Controlled Insurance Program

Program Administrator:

Keenan & Associates

2355 Crenshaw Blvd., Suite 200
Torrance, CA 90501
Phone: 800.654.8102
SEWUP Department
License # 0451271

IX (v.04-2022)

SEWUP
EDUCATION CONSTRUCTION INSURANCE

Table of Contents

SEWUP
EDUCATION CONSTRUCTION INSURANCE

Preface

About This Manual

- Identifies responsibilities of the various parties involved in the project
- Provides a basic description of the OCIP coverage and program structure
- Describes audit and administrative procedures
- Provides answers to basic questions about the OCIP
- Claim reporting procedures
- Will be updated as necessary

This Manual Does Not

- Provide OCIP coverage interpretations
- Provide complete information about OCIP coverages (Refer to OCIP policies)
- Provide answers to specific claims questions

1.0 Introduction

The Statewide Educational Wrap Up Program JPA (SEWUP), of which this school district is a member, is providing an Owner Controlled Insurance Program (OCIP) for work performed at specific project sites, on behalf of the district, who is the "Owner". The OCIP is an insurance program that insures eligible and enrolled subcontractors, for Work performed at the Job Site.

Certain subcontractors are excluded from this OCIP. These parties are identified in the Contract Documents and Section 3 (Definitions) of this manual.

The Owner / District will pay the insurance premiums for the OCIP coverage described in this manual. You should notify your insurer(s) to endorse your coverage to be excess and contingent over the insurance provided under this OCIP for on-site activities and the related costs. Each bidder, the Contractor and its subcontractors, are required to exclude from its bid price and requests for payment, the cost of insurance coverages that will be provided by the OCIP.

Note
The guidelines in this manual are to be used for informational purposes only. This manual does not constitute a contractual agreement. If conflicts exist between this manual and OCIP Insurance Policies, or this manual and the Contract between the District, Construction Manager, and Contractor (Enrolled Parties), OCIP Policies or Owner's Contract will govern.

Any questions regarding a Subcontractor's status as "Eligible" or "Ineligible" should be referred by written request to Contractor and Owner and approved by the Program Administrator.

1.1 Participation & Contractor Compliance

Participation in the OCIP is mandatory but not automatic. Enrollment eligibility will be determined upon completion of and online enrollment form which will include documentation of trade, scope of work, estimated value, estimated start and completion. All Contractors and subcontractors of all tiers must register via WrapPortal (www.keenanwrap.com) and adhere to all program requirements, as specified in Section 5.0.

The program Administrator will provide access to an online enrollment via Keenan Wrap, through its proprietary software referred to herein as WrapPortal; a User Name, Password and URL for website enrollment will be provided to each subcontractor upon entry of Subcontractor identifying information into WrapPortal by Contractor or Parent Subcontractor.

Enrollment of each Contractor's eligible Subcontractors is mandatory. Contractor shall notify Owner and the Program Administrator in writing of the identity of each Subcontractor regardless of enrollment eligibility and shall cause each Subcontractor to notify the Program Administrator in writing of the identity of each of its Sub-subcontractors, prior to such parties' commencement of their portion of the Work and prior to their entry onto the Project. Contractors and subcontractors of all tiers shall not be deemed enrolled until the Program Administrator and OCIP insurers receive and approve a completed Contract Enrollment Form, for each awarded contract. Enrollment is required prior to commencement of on-site activities but no contractor shall be enrolled sooner than 30 days prior to their start date. Each Contractor/Subcontractor shall be solely responsible for any and all losses, damages, claims, liabilities, and suits arising out of such Subcontractor's failure to enroll, or delay in enrolling, any of its Subcontractors.

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Enrollment (Definition): An Eligible Subcontractor is considered Enrolled once all required documents are received, reviewed and processed by the OCIP Program Administrator and Insurer.

1.2 Subcontractor Eligibility

A. Eligible

Includes all Subcontractors providing direct labor on the Project and excludes Ineligible contractors as defined below. Temporary labor services and leasing companies are to be treated as Eligible Contractors.

B. Ineligible Contractor (Excluded)

It is not the intent to insure (but is not limited to) consultants, suppliers, abatement and/or removal of hazardous materials, vendors, materials dealers, surveyors, guard services, non-construction janitorial services, and truckers, including trucking to the Project where delivery is the only scope of work performed. **Ineligible/excluded parties are required to ensure that any eligible subcontractors, who are hired for installation or to provide on-site labor, comply with the OCIP Enrollment and are provided with a copy of this OCIP Project Manual**. Ineligible contractors will be required to adhere to insurance certificate requirements as stated in section 4.0, under Contractor-Provided Insurance Coverage. In addition, any party deemed an Ineligible Contractor, but who has direct labor on the Project, will be required to participate in the Project Safety Program (see Section 6.0).

1.3 Project Site and Offsite Premises

Coverages provided by the OCIP are Project Site specific. The Project-Site must be designated by the Owner. The Project Site consists of any and all projects that are endorsed to this policy, which includes the:

- Ways and means adjoining the endorsed project site.
- Adjacent locations to the endorsed projects sites where incidental operations are being performed, excluding permanent locations.

With the exception of 1 and 2 mentioned above, off-site locations, labor and operations are not covered by the OCIP. It will be the responsibility of each contractor to maintain off-site insurance, as identified in Section 4.3, which specifies coverage types and minimum limits. Contractor will promptly furnish to the Owner, or their designated representative, Certificates of Insurance evidencing that all required insurance is in force.

2.0 Information Directory

2.1 Program Administrator

Keenan & Associates - SEWUP Department
2355 Crenshaw Blvd., Suite 200
Torrance, CA 90501
Phone: 800.654.8102

Questions Regarding OCIP
Refer questions concerning the OCIP and its administration or coverage's to the Program Administrator. Answers to questions may also be found in Section 9.0 - Frequency Asked Questions.

2.2 Insurance Companies

Workers' Compensation	Liberty Mutual Insurance
General Liability	Lloyds of London
Excess Liability	Lloyds of London
	Associated Industries Insurance Company
	Endurance American Specialty Insurance Company
	Liberty Surplus Insurance Corp
	Great American Assurance Co
	Texas Insurance Co
	Westchester Surplus Lines
	Crum & Forester Specialty Insurance
	Great Lakes Insurance SE
Builder's Risk	Ace American Insurance Company
Contractor's Pollution Liability	Berkeley Assurance Insurance Company

See Section 6 For Claims Reporting Instructions and Procedures.

3.0 OCIP Coverages

Description of Owner Controlled Insurance Program (OCIP) Coverages

The OCIP is for the benefit of the Owner and all Enrolled Contractor/Subcontractors who have on-site employees. OCIP coverage applies only to Work performed under the contract at the Project Site specified by the Owner. All Contractors must provide their own insurance for Automobile Liability and off-site locations, labor, and operations. The following coverages are provided by the OCIP:

Workers' Compensation and Employers Liability

Commercial General & Excess Liability

Builder's Risk

Contractor's Pollution Liability

A Certificate of Insurance evidencing workers' compensation & employer's liability, general and excess liability and pollution liability insurance will be issued to each Enrolled Party via WrapPortal. Other documentation including forms, posting notices, etc., will be provided to each Enrolled Party.

OCIP Disclaimer
The OCIP is intended to provide broad coverages and high limits, to all Enrolled Contractors/Subcontractors. The Owner does not warrant or represent that the OCIP coverages constitute an insurance program that completely addresses the risks of the Contractors/Subcontractors. Prior to contract award, it is the responsibility of all Contractors/Subcontractors to ensure that the OCIP coverages provided sufficiently address their insurance needs. Upon request, OCIP policies are available for review.

3.1 Workers' Compensation and Employer's Liability Insurance

Workers' Compensation and Employer's Liability Insurance will be provided in accordance with applicable state laws, to all Enrolled Contractors/Subcontractors, each as named insured, and issued an individual policy reflecting the following Limits of Liability:

Coverage A – Workers' Compensation

Liability imposed by the Workers' Compensation and/or Occupational Disease statute of the State of California or governmental authority having jurisdiction related to the work performed on the Project.

Coverage B – Employers Liability

$1,000,000 Bodily Injury each Accident
$1,000,000 Bodily Injury by Disease – Policy Limit
$1,000,000 Bodily Injury by Disease – Each Employee

Contractor Deductible: None

Exclusions: The known exclusions for this coverage are listed in Section 10.0 – Known Policy Exclusions. This is a summary and may not be exhaustive. The policy language may contain additional exclusionary language, limitations or carve-backs that may not be identified in the list. It is the responsibility of the Contractor/Subcontractor to review the policy for the complete details of all exclusions.

Policy Term: The master policy effective date is October 1, 2021. The policy term is three years, with automatic one-year renewals until the Project is completed. The policy is intended to remain in effect for duration of the contractor's contractual work. Warranty work and post contract repair work is excluded. The policy is intended to remain in effect for the length of the Project or the policy end date, whichever comes first.

3.2 Commercial General Liability & Excess Liability Insurance

All Enrolled Contractors/Subcontractors are considered Named Insured under SEWUP's Master General & Excess Liability policies. The Master Policies are available for review by Contractors/Subcontractors, upon request to the Owner or the Program Administrator.

Primary Coverage: Total Limits for Bodily Injury and Property Damage

$125,000,000 Each Occurrence
$195,000,000 General Annual Aggregate – per Policy
$125,000,000 Products and Completed Operations Aggregate

- Ten (10) year Products and Completed Operations Extension after Notice of Completion is filed by the Owner, or date Occupancy is taken with a single non-reinstated aggregate limit.

Policy Forms: "Occurrence" Form

Contractor Deductible: None

Exclusions: This insurance does not provide coverage for products liability of any enrolled party for any product manufactured, assembled or otherwise worked upon away from the Project Site.

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The known exclusions for this coverage are listed in Section 10.0 – Known Policy Exclusions. This is a summary and may not be exhaustive. The policy language may contain additional exclusionary language, limitations or carve-backs that may not be identified in the list. It is the responsibility of the Contractor/Subcontractor to review the policy for the complete details of all exclusions.

Policy Term: The master policy effective date is October 1, 2021. The policy is intended to remain in effect for the length of the Project or through October 1, 2026 at 12:01am, whichever comes first.

3.3 Builder's Risk Insurance

The Builders Risk Master Policy names the Owner as named insured and enrolled Contractors/Subcontractors as additional insured's. This Master policy is available for review by Contractors/Subcontractors, upon request to the Owner or the Program Administrator.

Primary Coverage: Builders Risk coverage will be in place during the Course of Construction at the Project. Such insurance shall be written on a repair or replacement cost basis, subject to exclusions, sub limits, property limitations and conditions. The policy covers materials, supplies, equipment, fixtures, or machinery, which will become a permanent part of the building, or structure at the Project site specified, limited to policy form, policy limit, and exclusions.

Deductible: A deductible, which shall be determined by the type of construction, will apply to each occurrence. The deductible schedule is as follows:

New Construction & Renovation

- $10,000 - $50,000 deductible (depending on type of structure) for Wood Frame, Masonry Non-Combustible or Joisted Masonry, and Fire Resistive / Non-Combustible.
- Up to $100,000 deductible for Water Damage to All Construction Classifications.

Contractor Deductible: Contractor/Subcontractors shall be responsible for the applicable deductible. The deductible shall apply to each occurrence and must be satisfied prior to payment of the loss. **The deductible shall not be reimbursed by the OCIP Insurance Program or the District.**

Exclusions: The known exclusions for this coverage are listed in Section 10.0 – Known Policy Exclusions. This is a summary and may not be exhaustive. The policy language may contain additional exclusionary language, limitations or carve-backs that may not be identified in the list. It is the responsibility of the Contractor/Subcontractor to review the policy for the complete details of all exclusions.

Policy Term: The policy term is the term of the project.

Note:
All Contractors'/Subcontractors' shall be responsible for any loss or damage to their personal property. This would include, but is not limited to, tools, equipment, mobile construction equipment, or materials NOT intended to be a permanent part of the building, whether owned, borrowed, used, leased, or rented by any Contractor/Subcontractor. Any insurance purchased by the Contractors/Subcontractors, or self-insurance, shall be the Contractors'/Subcontractors' sole source of recovery in the event of a loss.

3.4 Contractor's Pollution Liability Insurance

Contractor's Pollution Liability is written on an "Occurrence" form under a master liability policy. This Master policy is available for review by Contractors/Subcontractors, upon request to the Owner

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or the Program Administrator. Certificates of Insurance will be provided to all enrolled Contractors/Subcontractors, as named insured.

Primary Coverage: Bodily Injury or Property Damage from a pollution event as defined within the policy form resulting from covered operations or completed operations.

Limits:

$15,000,000 Per Occurrence /$25,000,000 Policy Aggregate

Defense costs included within limits

Deductible: $10,000 Per Occurrence

Contractor/Subcontractor shall be liable, at its expense; to the extent claims payable are attributable to their acts or omissions and/or the acts or omissions of its Subcontractors of any tier or any other entity or person for whom it may be responsible. The deductible amount shall not be reimbursed by the OCIP Insurance Program or the District.

Exclusions: The known exclusions for this coverage are listed in Section 10.0 – Known Policy Exclusions. This is a summary and may not be exhaustive. The policy language may contain additional exclusionary language, limitations or carve-backs that may not be identified in the list. It is the responsibility of the Contractor/Subcontractor to review the policy for the complete details of all exclusions.

Policy Term: The master policy effective date is October 1, 2019. The policy is intended to remain in effect for the length of the Project or through October 1, 2025 at 12:01am, whichever comes first.

3.5 OCIP Certificates

All Enrolled Contractors/Subcontractors will receive their own Workers' Compensation policy. Certificates of Insurance will be furnished for the General Liability, Excess Liability, Contractor's Pollution Liability, and Builder's Risk coverages. These policies are available for review by the Contractor/Subcontractor, upon request to the Owner or the Program Administrator. Such policies or programs may be amended from time to time and the terms of such policies or programs are incorporated herein by reference. Contractors/Subcontractors hereby agree to be bound by the terms of coverage, as contained in such insurance policies and/or self-insurance programs.

4.0 Contractor Required Insurance

For any work under this contract, and until completion and final acceptance of the work by the Owner, the Contractors/Subcontractors shall, at their own expense, promptly furnish Certificates of Insurance and an Additional Insured Endorsement acceptable to the Owner and Program Administrator. Copies should be provided to the Program Administrator via WrapPortal, for both Project Site and Off-Site operations, within ten (10) days after award of the contract to all Contractors/Subcontractors and prior to commencement of on-site activities.

All required insurance shall be maintained, without interruption, from the date of commencement of on-site activities, until the date of the final payment or expiration of any extended period. Certificates and additional insured endorsements shall provide not less than thirty (30) days prior written notice to the Program Administrator, of any material change in the insurance, cancellation or non- renewal.

The OCIP places contractors and subcontractors into one of two main categories: Enrolled Contractors or Ineligible (Excluded) Contractors.

4.1 Verification of Required Insurance Coverages

A. Enrolled Contractor/Subcontractors:

- **Certificates of Insurance** must be provided, evidencing Workers' Compensation & Employer's Liability, and General Liability, Excess/Umbrella Liability insurance for off-site activities, and Automobile Liability insurance for on and off-site activities as per the insurance specifications in the Contract.
- **Additional Insured Endorsements** for Auto Liability. These endorsements must name **the District** specifically as additional insured. If the insured's policy has a 'Blanket' Additional Insured Endorsement and cannot name any entity, provide a copy of the endorsement for our review.

B. Ineligible (Excluded) Contractors/Subcontractors:

- **Certificates of Insurance** must be provided, evidencing Workers' Compensation & Employer's Liability, General Liability, Excess/Umbrella Liability and Automobile Liability insurance for all activities including both on-site and off-site activities as per the insurance specifications in the Contract.
- **Additional Insured Endorsements** for General Liability and Auto Liability. These endorsements must name **the District** specifically as additional insured. If the insured's policy has a 'Blanket' Additional Insured Endorsement and cannot name any entity, provide a copy of the endorsement for our review.
- **Waiver of Subrogation** for Workers Compensation and General Liability in favor of the owner.

4.2 Contractor Maintained Insurance Coverage

***Indicates off-site required coverage / **Indicates off-site & on-site required coverage**

A. Workers' Compensation and Employer's Liability Insurance*

- Enrolled & Ineligible/Excluded Contractors
- Required limits on Certificate of insurance are as follows:

Subcontractors	
Part 1: Workers Compensation	California Statutory Benefits
Part 2: Employer's Liability	
$1,000,000	Bodily Injury each Accident
$1,000,000	Bodily Injury by Disease – Policy Limit
$1,000,000	Bodily Injury by Disease – Each Employee

- Ineligible/Excluded Subcontractors must also provide **Waiver of Subrogation** for Workers Compensation in favor of the owner.

B. General Liability Insurance*

- Enrolled & Ineligible/Excluded Subcontractors
- Minimum Required limits of insurance are as follows:

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General/Prime Contractor	Subcontractor	
$2,000,000	$1,000,000	Bodily Injury and Property Damage
$2,000,000	$1,000,000	Per Occurrence
$2,000,000	$1,000,000	General Aggregate
$2,000,000	$1,000,000	Products/Completed Operations Aggregate
$2,000,000	$1,000,000	Personal/Adv. Injury Aggregate

- It is recommended that the Designated Operations Covered by a Consolidated (Wrap-Up) Insurance Program (CG 21 31 05 09) endorsement be added to your primary general liability policy. This will ensure appropriate coverage for any off-site exposures associated with this OCIP project.

C. Automobile Liability Insurance**

- Enrolled & Ineligible/Excluded Subcontractors
- Must cover all vehicles owned by, hired by, or used on behalf of the Contractors/Subcontractors for both Project Site and off-site operations with the following minimum limits of liability:

General/Prime Contractor	Subcontractor	
$2,000,000	$1,000,000	Bodily Injury and Property Damage

D. Professional Liability Insurance**

- Enrolled & Ineligible/Excluded Subcontractors
- If Subcontractor's work requires design and/or design-assist services, or Subcontractor performs professional services of any kind, Subcontractor shall purchase and maintain, at its sole cost and expense, Professional Liability (Errors and Omissions) insurance for all professional services provided.
- Shall include full prior acts coverage sufficient to cover the services under this agreement, with the following minimum limits of liability:
  $2,000,000 per Claim/Annual Aggregate
- Deductible or self-insured retention amount must not be greater than $100,000 per claim, including coverage of contractual liability.
- Must be maintained during the term of the contract and for so long as the insurance is reasonably available as provided herein, for a period of ten (10) years after completion of the services.

E. Environmental and Asbestos Abatement Coverages**

- Ineligible Subcontractors
- If Subcontractor's scope of work involves the removal of asbestos, the removal/replacement of underground tanks, or the removal of toxic chemicals and substances, the Contractor/Subcontractor will be required to provide the following minimum limits of liability, for such exposures subject to requirements and approval of the Owner:

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$2,000,000 per Claim/Aggregate

F. Aircraft or Watercraft Liability Insurance**

- If any Subcontractor requires the use of Aircraft or Watercraft at the Project Site, the Subcontractor shall purchase and maintain, or cause the operator of the Aircraft or Watercraft to purchase and maintain, Aircraft or Watercraft liability insurance.
- Must insure passengers and the General Public against personal injury, bodily injury or property damage arising out of the ownership, maintenance, use or entrustment to others.
- Includes Aircraft or Watercraft owned or operated by or rented or loaned to any insured.
- Use includes operation and "loading or unloading". Contractor/Subcontractor will be required to provide the following minimum limits of liability, for such exposures subject to requirements and approval of the Owner:

  $5,000,000 per Claim/Aggregate

  Please note, Drones are considered aircraft and coverage is expressly excluded from the OCIP policies.

4.3 Certificates of Insurance

The Project must be identified on the Certificate of Insurance in the "Description of Operations/Locations/Vehicles/Special Items" section. The Certificates of Insurance should name District, as the Certificate Holder, as specified below:

Certificate Holder:

Insert District Name
c/o Statewide Educational Wrap Up Program (SEWUP)
2355 Crenshaw Blvd., Suite 200
Torrance, CA 90501

4.4 Additional Insured Endorsements

The Owner must be specifically named on the Schedule of an Additional Insured Endorsement, under the section titled, "Name of Person or Organization", as specified below:

- **The District, CM, Architect, Inspector, the State of California, their officers, employees, agents, volunteers and independent contractors as additional insureds.**
- All Contractors must provide an additional insured endorsement for automobile liability.
- Ineligible/Excluded Contractors must provide an additional insured endorsement on both the Automobile Liability and General Liability policies and a waiver of subrogation on workers' compensation.

Insert District Name
c/o Statewide Educational Wrap Up Program (SEWUP)
2355 Crenshaw Blvd., Suite 200
Torrance, CA 90501

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5.0 Contractor Responsibilities / Requirements

Throughout the course of the Project, Subcontractors will be responsible for reporting and maintaining certain records as outlined in this section.

All Subcontractors shall cooperate with, and require their tier Subcontractors to cooperate with, the Owner and the Program Administrator, regarding administration and operation of the OCIP. **Each Subcontractor must include this document with their bid specifications to any and all Subcontractors**.

Responsibilities of Subcontractors:

- Enrolling in the OCIP and assuring all eligible tier subcontractors promptly enroll in the OCIP, via WrapPortal, prior to the start of any work
- Complying with the provisions of the OCIP Manual and cooperating in the administration and operation of the OCIP
- Including OCIP Provisions in all subcontracts, as appropriate
- Identifying and removing from bid the cost of OCIP-provided insurance (by all eligible contractors / subcontractors)
- Providing each Subcontractor with a copy of the OCIP manual
- Providing timely evidence of insurance to the SEWUP Department via WrapPortal
- Notifying the SEWUP Department of all awarded subcontracts via WrapPortal
- Maintaining and reporting monthly payroll records (by all eligible subcontractors) via WrapPortal
- Complying with the OCIP Administrator's requests for information
- Complying with insurance, claim and safety procedures
- Notifying OCIP Administrator immediately of any insurance cancellation or non renewal of Contractor required insurance
- Complying with the OCIP insurance policy requirements, including but not limited to, physical audit of payroll records by the insurance company or its representatives.

5.1 Contractor Bids & Change Orders - Removing Insurance Costs

The Owner / School District provides insurance for all eligible, Enrolled Contractors/Subcontractors for work performed at the project site(s). The Owner pay's the insurance premiums for the OCIP coverage's described in this manual.

Contractors/Subcontractors who are eligible for enrollment in the OCIP are required to **exclude the cost of insurance that is provided by the OCIP, from its bid price** for the proposed scope of work at the project site(s).

Change orders should be priced by the Contractor / Subcontractor to exclude any costs of insurance for coverage's that are provided by the OCIP. It is the responsibility of the contractor to ensure that their subcontractors of all tiers also exclude the cost of insurance

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5.2 Program Compliance

A. **Participation in the OCIP is mandatory but not automatic. An Eligible contractor is not enrolled until the Program Administrator receives and approves the following items:**

- Completed Contract Enrollment, for each awarded contract, within ten (10) days of Contract Award and prior to commencement of On-site activities. Enrollments can be completed and submitted electronically visiting www.keenanwrap.com
- Certificates of Insurance, evidencing Insurance for Workers' Compensation & General Liability coverages for **Off-Site** locations, labor, and operations
- Certificate of Insurance, including an Additional Insured Endorsement, naming the Owner as an Additional Named Insured, for Automobile Liability for both Project Site and Off-Site operations
- Policy Declarations pages, including proof of rates from your current policies

B. All Contractors/Subcontractors of all tiers shall cooperate with, and require their Subcontractors to cooperate with, the Owner and the Program Administrator, in regard to the administration and operation of the OCIP.

C. All Contractors/Subcontractors further acknowledge and agree to comply fully and promptly with such safety, loss control, and quality control rules, requirements, and directives as may from time to time be promulgated by Owner, the Program Administrator and/or the OCIP insurers or any of its or their respective consultants, agents, or representatives. Nothing in this document or any other contract document or in the Project Insurance Manual, shall be deemed to render Owner or any of its affiliates of any tier an employer of Contractor/Subcontractor or any of its Subcontractors or any of its or their personnel or employees. **Failure to comply will be considered non-performance under the contract.**

OCIP Enrollment completed through WrapPortal by the following deadline:

- Subcontractors (All Tiers): Within ten (10) days of Contract Award and prior to commencement of On-site activities

All questions regarding enrollment compliance should be directed to the assigned OCIP Administrator.

Any Subcontractor who enrolls in the OCIP after their start date will have to provide a No-Known-Loss Letter to the Program Administrator, along with enrollment documentation.

For any work under this contract, and until completion and final acceptance of the work by the Owner, the Subcontractors shall, at their own expense, promptly furnish Certificates of Insurance to the Program Administrator before commencing work on the Project Site. Automobile Liability Insurance must be maintained for both Project Site and off-site operations.

5.3 Confirmation of Enrollment & Evidence of OCIP Coverages

Upon review of completed enrollment, OCIP Administrator will acknowledge acceptance of the Eligible Subcontractor into the Owner's OCIP, by issuing the following to each Enrolled Party:

- Confirmation Letter

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- OCIP Certificates of Insurance
- Claims Kit, including DWC1 and MPN Notices

These documents, as issued by the OCIP Administrator, will clearly identify the effective dates of the OCIP coverages for the Contract. A separate Workers' Compensation policy will be issued and sent to each Enrolled Party.

Should an Enrolled Party perform work on several contracts/projects, an Enrollment Form must be completed for each contract. The OCIP Administrator will issue confirmation letters and certificates of insurance to each Enrolled Party for each separate contract. However, only one individual Workers' Compensation policy (that will apply to all contracts/projects) will be issued to each Enrolled Party.

Note:
Verify that the Workers' Compensation effective date, listed on your OCIP Certificate of Insurance, reflect the same date as your start date.

5.4 Payroll Reporting Compliance

Project Site Monthly Payroll Report Requirements

- Project Site Monthly Payroll must be submitted to the Program Administrator by the 10th of each month via WrapPortal until the completion of the contract and in no event shall be later than the 15th of each month. Payroll shall be reported only for labor performed at the project jobsite.
- Monthly Payroll Reporting is to begin from the enrollment effective date until the completion of the contract or the policy end date.
- Should no work be performed on the Project Site during a given month, each Enrolled Party is required to submit a form stating that "Non-Performance."
- Payroll reporting must summarize the unburdened payroll by Workers' Compensation Class Code. Certified payroll is not a requirement of the OCIP and cannot be accepted.
- If Monthly Payroll Report is not submitted to Program Administrator on a monthly basis, the Construction Manager and/or Owner can withhold payment until the report is received.
- For those Enrolled Parties performing Work under multiple contracts, for each contract, a Monthly Payroll Report is required each month until contract is finalized.
- All reported project site monthly payroll reported from October through the end of September is submitted by Program Administrator to the OCIP Insurance Carrier for auditing.
- Subcontractor shall to keep and maintain accurate and classified records of their payroll for operations at the Project Site.
- A carrier audit may be performed using the reported payroll and other supporting documents. Contractor / Subcontractor agrees to cooperate with the OCIP insurance carrier(s) or their 3 party auditors by responding to and providing documents as requested in a timely manner.

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Workers' Compensation Insurance Rating Bureau Requirements

- **Payroll Reporting for Each Workers' Compensation Policy Issued -** Once an Eligible Contractor/Subcontractor is enrolled into the OCIP, the Program Administrator will issue a separate Workers' Compensation Policy. All Enrolled Subcontractors will need to comply with the rules and regulations of the California Workers Compensation Insurance Rating Bureau (WCIRB). This requires each Enrolled Party to maintain payroll records for each Contract under the policy issued. Such records will allocate the payroll by Workers' Compensation classification(s) and exclude the excess or premium paid for overtime (i.e., only the straight-time rate will apply to overtime hours worked).
- **Insurance Company Payroll Audit -** Each Enrolled Party must properly classify payrolls, as these are reported to the rating bureau for calculation of future Experience Modifiers for the Enrolled Party's firm. All Enrolled Parties shall make available for inspection and copying their respective company books, vouchers, contracts, documents, and records, of any and all types, for physical inspection by the auditors of the OCIP insurance carrier(s) or Owner's representatives. Availability of records must be for a reasonable time during the policy period, any extension, or during a final audit period, as required by the OCIP Insurance Policies.

5.5 Contract Completion / Closeout Compliance

A. Contractor's Completion Notice

- Contractor's Completion Notice must be submitted to the Program Administrator via WrapPortal, (www.keenanwrap.com) upon completion of contract work at the Project Site, which includes punch list items, but not warranty or service contract work.
- This form evidences all enrolled Contractors'/Subcontractors' actual start and completion dates, per each contract.
- Completion Notice information is reported to OCIP Insurance carrier to confirm coverage and payroll reporting requirements has ended for the contract.

6.0 Safety

It is the responsibility of each Subcontractor to maintain an environment free of recognized hazards. All Subcontractors shall exercise reasonable care to prevent work-related injuries; property and equipment damage at the Project, as well as minimize risk to the public and third-party property.

In the event of an accident, it shall be the responsibility of the employing and/or responsible Subcontractor to see that injured workers or members of the public are provided immediate medical treatment. All appropriate medical and claim forms must be filed in accordance with the claim procedures developed for this Project by Keenan & Associates, hereinafter called "Program Administrator." This includes notification to the appropriate state authorities, if necessary.

The Program Administrator shall conduct periodic loss control surveys on behalf of the District. These surveys will focus on evaluating the Subcontractors' efforts to minimize loss, assist in identifying loss exposures, and to recommend appropriate corrective measures. The Program Administrator is a resource to supplement the safety and loss prevention activity of Subcontractors. Its loss control survey activities or other activities of the Program Administrator and/or OCIP insurers do not in any way relieve the Contractors/Subcontractors of their responsibilities for Project safety.

6.1 Occupational Safety and Health Compliance

All Subcontractors are expected to comply with all applicable local, state, and federal occupational safety and health. If additional safety and health requirements are set forth in the contract specifications, all contractors shall comply with these requirements

In addition local, state, and federal occupational safety and health laws, the following standards apply to all OCIP Enrolled and Non-Enrolled Contractors/Subcontractors.

6.2 Safety Orientation

a. Subcontractor employees shall be provided with a project specific safety orientation prior the start of the project. At a minimum, the orientation will address the following items:

   i. The District's site safety requirements.
   ii. Site specific safety hazards and protective measures for these hazards.
   iii. Emergency telephone numbers and procedures.
   iv. Local medical clinic/hospital information within the Medical Provider Network (MPN).

6.3 Program Management

a. Each Subcontractors shall have the following safety programs:

   i. Injury and Illness Prevention Plans
   ii. Hazard Communication Programs
   iii. Heat Illness Prevention Plans

b. Each Contractor/Subcontractor shall have an onsite competent person responsible for occupational safety and health.

6.4 Site Safety

According to industry practices, it is the responsibility of contractors of all tiers to exercise reasonable care to prevent work-related injuries; property and equipment damage at the project site, as well as minimize risk to the third-party persons and property. Subcontractors of all tiers shall be expected to comply with the following safety and loss control requirements:

a. All Subcontractors shall identify their contact person(s) to the General or Prime Contractor.

b. All Contractors/Subcontractors shall follow District procedures for dealing with the media.

c. At all times, hard hats shall be worn in the construction environment. Hard hats shall meet the requirements of ANSI Z89.1. No modification to the shell or suspension is allowed except when such changes are approved by the manufacturer.

d. 100% protective eyewear with side shield protection is required while in the construction environment, shop, or anytime eye hazards exist. Protective eyewear shall bear a legible and permanent "Z87" logo to indicate compliance with applicable ANSI/ASSE Standard.

e. All construction employees shall wear clothing suitable for the weather and work conditions. At a minimum, this shall be short sleeved shirts, long pants, and leather or other protective work shoes or boots.

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f. Alcohol is prohibited on District property at all times.

g. Contractors/Subcontractors will be required to respond to all District complaints about objectionable levels of dust or noise and will be required to provide prompt and appropriate abatement.

h. Construction personnel cannot enter District grounds other than the construction site unless accompanied by District personnel and are allowed only "incidental" contact with students. Violations of these requirements by any construction employee will result in a mandatory background check of that employee – including fingerprinting – as required by state law.

i. All prime contractors must attend the site-specific pre-construction meeting.

j. No sexual reference or preference shall be permitted on any piece of clothing or the hardhat. Any employee observed disregarding this policy shall be removed from the job site until further notice.

k. Contractors and subcontractors at all times shall keep premises free from debris such as waste, rubbish, and excess materials and equipment caused by contract work. Contractors and subcontractors shall not leave debris under, in, or about the premises. Upon completion of the contract work, contractors and subcontractors shall clean the interior and exterior of the building or improvement including fixtures, equipment, walls, floors, ceilings, roofs, window sills and ledges, horizontal projections, and any areas where debris has collected so surfaces are free from foreign material or discoloration. Contractors and subcontractors shall clean and polish all glass, plumbing fixtures, and finish hardware and similar finish surfaces and equipment and contractor shall also remove temporary fencing, barricades, planking and construction toilet and similar temporary facilities from the site. No glass containers are permitted on the site.

l. Theft or willful damage to any property of the District, student, or other contractors will be prosecuted fully.

m. All Contractors/Subcontractors will advise non-English speaking employees in their native language either in a written format or via an interpreter of these policies.

6.5 Mandatory 6' Fall Protection

a. Contractor/Subcontractor employees shall be protected from fall exposures of 6 feet or greater. Activities include but are not limited to:
   i. Steel erection
   ii. Decking
   iii. Roofing
   iv. Framing
   v. Scaffold work
   vi. Work performed from ladders

b. The following exceptions apply only to framers and wood frame activities:
   i. When installing or "rolling" the joists, Cal/OSHA fall protection requirements shall govern.
   ii. When framers are walking/working on securely braced joists, rafters, or roof trusses on center spacing not exceeding 24 inches, and more than 6' from an unprotected side or edge, they shall be considered protected from falls between the joists, rafters, or roof trusses

c. A safety monitor as means of fall protection is prohibited.

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d. Ladder jacks, lean-to, and prop-scaffolds are prohibited.

e. Contractor/Subcontractors are required to provide training to their employees who might be exposed to a fall hazard prior to the exposure or upon hiring. This training shall be documented and available for review.

f. Methods of fall protection include but are not limited to the following:

   i. Railings
   ii. Covers for Floor, Roof, and Wall Openings
   iii. Personal Fall Arrest Systems, Personal Fall Restraint Systems, and Positioning Devices
   iv. Controlled Access Zones

g. The design and construction of railings shall conform to the Cal/OSHA Construction Safety Orders.

h. The use of wire ropes as top rails and intermediate rails of guardrail systems used for perimeter protection, or at interior openings such as stairways and elevator shafts, shall be installed in accordance with Cal/OSHA requirements. Additionally, wire ropes shall be secured to each support and taut at all times. The maximum deflection of the top rail when a load of 200 pounds is applied in any direction at any point of the top rail shall not exceed 3 inches in one direction which includes the free hanging sag in the wire rope.

i. The minimum parapet height allowed for fall protection is 42 inches or greater.

j. Covers used to cover floor, roof, and wall openings shall be secured in place to prevent accidental removal or displacement and shall be marked in accordance in accordance with Cal/OSHA Construction Safety Orders.

k. Covers used to cover floor and roof openings shall be capable of safely supporting the greater of 400 pounds or twice the weight of the employees, equipment and materials that may be imposed on any one square foot area of the cover at any time.

l. Controlled access zones shall be defined by a control line or other means that restricts access. Each line shall have a minimum breaking strength of 200 pounds. Signs shall be posted to warn unauthorized employees to stay out of the controlled access zone.

m. Control lines shall consist of ropes, wires, tapes, or equivalent materials. Control lines shall be erected and supported in accordance with Cal/OSHA Construction Safety Orders.

n. Scaffold Access/Egress. An internal ladder system with hatches and drop-down ladders or temporary stairs shall be provided for safe access/egress on all scaffolds 20 feet or greater in height. External straight ladders are prohibited on all scaffolds if it exposes a user to a fall of 20 feet or greater in height.

6.6 Crane Safety

a. In accordance with Title 8, California Code of Regulations, section 5006.1, employers shall only permit operators who have a valid certificate (license) of competency to operate cranes. The operator shall have his license on his person, readily available for review.

b. All cranes used in lifting service, exceeding 3 tons rated capacity, and their accessory gear shall not be used until the employer has ascertained that such equipment has been certificated in accordance with Cal/OSHA as evidenced by current and valid documents.

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Certificates (annual and quadrennial) attesting to current compliance with testing and examination standards shall be maintained, readily available for each crane.

c. The contractor shall provide an erection plan and procedure for erection of trusses and beams over 25 feet long. The erection plan and procedure shall be prepared by a civil engineer currently registered in California. This plan and procedure shall be followed and kept available on the job site.

6.7 Fire Prevention During Welding, Cutting, and Other Hot Work

a. Contractors engaged in welding and allied processes, heat treating, grinding, cutting, thawing pipe, powder-driven fasteners, hot riveting, torch-applied roofing in conjunction with the requirements of NFPA 241, and similar applications producing or using a spark, flame, or heat shall adhere to National Fire Protection Association Standard 51B entitled "Standard for Fire Prevention During Welding, Cutting, and Other Hot Work."

6.8 Incident Investigation Requirements

a. The contractor shall perform thorough, in-depth investigations and evaluations of all incidents. A formal incident investigation shall be conducted whenever any incident occurs, including, without limitation, both non-injury incidents and incidents involving first aid. Additionally, near miss accidents and/or incidents must be reported and undergo the same in-depth investigation, root cause analysis and lessons learned process. The incident investigation report shall be e-mailed to Keenan and Associates within 5 working days.
b. Recommendations and lessons learned to prevent recurrence of incidents shall be documented and communicated to all employees of contractor and subcontractors through safety meetings

6.9 Return to Work:

The District and OCIP Carrier are committed to working with all Enrolled Contractors and Subcontractors to promote the successful & timely return to work of injured employees following a work-related injury. The purpose of this policy is to ensure that Enrolled Contractor/Subcontractor employees who temporarily cannot return to their normal duties due to job-related injury or illness but can safely perform transitional duties while recovering is offered appropriate transitional duties for a limited time only.

a. An employee who has experienced a job-related injury requiring medical treatment must provide a proper medical release prior to returning to work.
b. An employee who has been removed from the jobsite ambulatory must provide a proper medical release prior to returning to work.
c. Each Enrolled Contractor/Subcontractor will cooperate with the OCIP Carrier to facilitate the return to work of any injured employee capable of safely performing transitional duties.
d. When the employee is released to transitional duties, it is the Enrolled Contractor/Subcontractor's responsibility to facilitate the injured employee's return to work.

e. The Enrolled Contractor/Subcontractor is fully expected to accommodate the injured employee and facilitate the return to work.

f. It will be the responsibility of the Insurance Carrier's Adjuster to maintain communication with the treating physician and the Enrolled Contractor/Subcontractor to facilitate the prompt return of an employee to full work status.

6.10 Conflicting Safety Requirements:

The District and SEWUP OCIP program place a very high value on project safety. Each may have their own safety requirements that are very similar in nature. However, in the event the requirements are in conflict or one is silent on a particular matter, then the requirement affording the greatest of amount protection will control. For example, if the District's Safety Program Requirements do not mandate 6' Fall Protection, then Section "6.5 Mandatory 6' Fall Protection" contained in the SEWUP Project Insurance Manual will control.

6.11 Noncompliance and Unsafe Practices

Owner or their representative shall have the authority to immediately cease any and all operation (s) on the jobsite that is deemed by Owner or their representative to be unsafe to property or has the potential to cause Bodily Injury, pursuant to Title VIII California Code of Regulation, Section 1511. Any such cession of work shall not constitute recoverable delay or other contractual remedies for liquidated damages and may expose the offending contractor to any such losses to the District or other trades.

7.0 Claims Reporting

Accident/Claims Reporting Procedures - Overview

This section describes the basic procedures for reporting SEWUP claims: Workers' Compensation, General Liability, Pollution Liability, and Damage to the Project (Builders Risk).

The OCIP Administrator provides an Accident Claims Reporting Guide to Enrolled Contractors and Subcontractors. The Accident Claims Reporting Guide provides instructions and necessary information for reporting a claim, including policy numbers and site location codes. **This manual includes the required claim forms and postings**. Additional claim forms can be obtained from the OCIP Administrator upon request.

7.1 Workers' Compensation Claim Reporting & Procedures

If the injury requires a doctor (or medical office) visit or involves lost time, please follow the procedures listed below.

Contractors'/Subcontractors' on-site personnel must follow these procedures if any employee is involved in an accident or occurrence resulting in bodily injury or death:

The main responsibility for any Contractor and Subcontractor is first to see that the injured worker receives immediate medical care. Immediately contact 911 for any serious, traumatic, and life-threatening injuries.

If an employee reports a work injury or illness that is minor and does not require a doctor visit or time off from work, the supervisor should refer the employee to the nearest **First Aid Treatment** available at the jobsite.

Call Liberty Mutual Insurance Company at **1-800-362-0000 or email them at** **CLclaimsreports@libertymutual.com** to report the injury. Access the Workers' Compensation Claim Kit, sent to you by the Program Administrator, which contains forms to be completed by employee and employer, as well as accident reporting guidelines. Have the following items ready when reporting the claim:

- SEWUP **Workers' Compensation Policy Number (Provided at time of enrollment)**
- SEWUP **Site Location Code**

Medical Provider Network (MPN)

Liberty Mutual Insurance, the Statewide Educational Wrap Up Program's insurance carrier, has implemented the following Medical Provider Network (MPN):

Liberty Mutual Insurance MPN

The above MPN is to be utilized for the medical treatment of injured employees, unless the employee has pre-designated their medical provider prior to the date of loss. In emergency situations, it is always recommended that the injured worker be treated at an emergency medical facility first, and then sent to a physician in the Medical Provider Network (MPN).

MPN Regulations & Guidelines:

- California MPN rules and regulations require that the injured worker must receive the Full Written MPN Notification when an injury is reported, or at the time of injury. The English version is given to English speaking employees and the Spanish version is given to Spanish speaking employees. The Full Written MPN Notification must also be given to the injured worker when changing to and transferring open claims to the Gallagher Bassett Platinum MPN.
- The MPN regulations are silent about Employee Acknowledgement Letters. As an employer, you have the right to use acknowledgement letters for your employees to sign when you give your employee the Full Written MPN Notification.
- An MPN Panel Card shall be posted at SEWUP Project Jobsite, Displaying the Name, Address and a Map of Designated Medical Clinic close to the jobsite.
- **For locating participating medical providers** within the Liberty Mutual Insurance MPN, use your Internet Browser to access the below website, which will provide links for locating a medical provider within the network by specialty and by location,

  https://lmi.co/LMnetworks

State Required Workers' Compensation Forms

The Labor Code requires that an employee report any injury immediately to the employer. There are essential requirements for both the employer and employee to perform, once the injury has actually been reported.

The Labor Code provides for possible penalties to be assessed if the following time lines are not met:

- Provision of the Employee Claim Form, DWC-1; report within one (1) working day of the employer's knowledge of a disability or injury beyond first aid. Each employer is responsible for

providing this form to an injured employee. Should the employee not be available for hand delivery, mail the DWC-1 to the employee at their home address.

- Provision of the Employer's Report of Injury, Form 5020; report, within five (5) days of knowledge, every occupational injury or illness which results in lost time beyond the date of the incident, or requires medical treatment at a medical facility. In addition, every serious illness/injury or death must be reported immediately by telephone or fax to the nearest office of the California Division of Occupational Safety and Health.

7.2 General Liability Claim Reporting

Contractors/Subcontractor must immediately report all known or suspected First Party, Third Party or Pollution Liability incidents occurring at the Project Site involving bodily injury, death, or any damage to property to the following:

- Keenan & Associates - **1-310-212-0363 x.2011**. Have the following information ready when reporting claim
    - SEWUP **General Liability Policy Number**
    - SEWUP **Site Location Code**
- Program Administrator (SEWUP) – Email: SEWUP@keenan.com, Phone: (800) 654-8102. Notice of Occurrence - Accident/Incident Report may be email or faxed.

Note:
Always take appropriate emergency measures to prevent additional injury or damage, including contacting police and fire authorities as required by law.

7.3 Builder's Risk Claim Reporting

Contractors/Subcontractors must immediately report all property damage to your work or work of any other Contractor/Subcontractor at the Project Site, to the following:

- Keenan & Associates - **1-310-212-0363 x.2011**Ace USA Property Claims – Email: Propertyfirstnotices@acegroup.com, Phone: (800) 433-0385, or Fax: (302) 467-7855
- Program Administrator (SEWUP) – Email: SEWUP@keenan.com, Phone: (800) 654-8102.

Note:
Always take appropriate emergency measures to prevent additional injury or damage, including contacting police and fire authorities as required by law.

7.4 Contractor's Pollution Liability Claim Reporting

Contractors/Subcontractors must immediately report all third party accidents related to a known or suspected pollution incident at the Project Site involving bodily injury, death, or any damage to property to the following:

- Keenan & Associates - **1-310-212-0363 x.2011**. Arch Specialty Insurance - Telephonic Reporting - **1-877-265-5186**
- Program Administrator (SEWUP) – Email: SEWUP@keenan.com, Phone: (800) 654-8102.

7.5 Automobile Claim Reporting

NO coverage is provided for automobile accidents under the OCIP. It is the sole responsibility of each Contractor and Subcontractor to report claims involving their automobiles to their own insurance carrier.

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7.6 Instructions and Procedures – Litigation Papers, Legal Documents, etc.

If your firm is served with a lawsuit arising out of your involvement with the Owner's Project, or if receipt of litigation papers or legal documents is your first notice of a claim, forward to the following:

- Program Administrator (SEWUP) – Email: SEWUP@keenan.com, Phone: (800) 654-8102

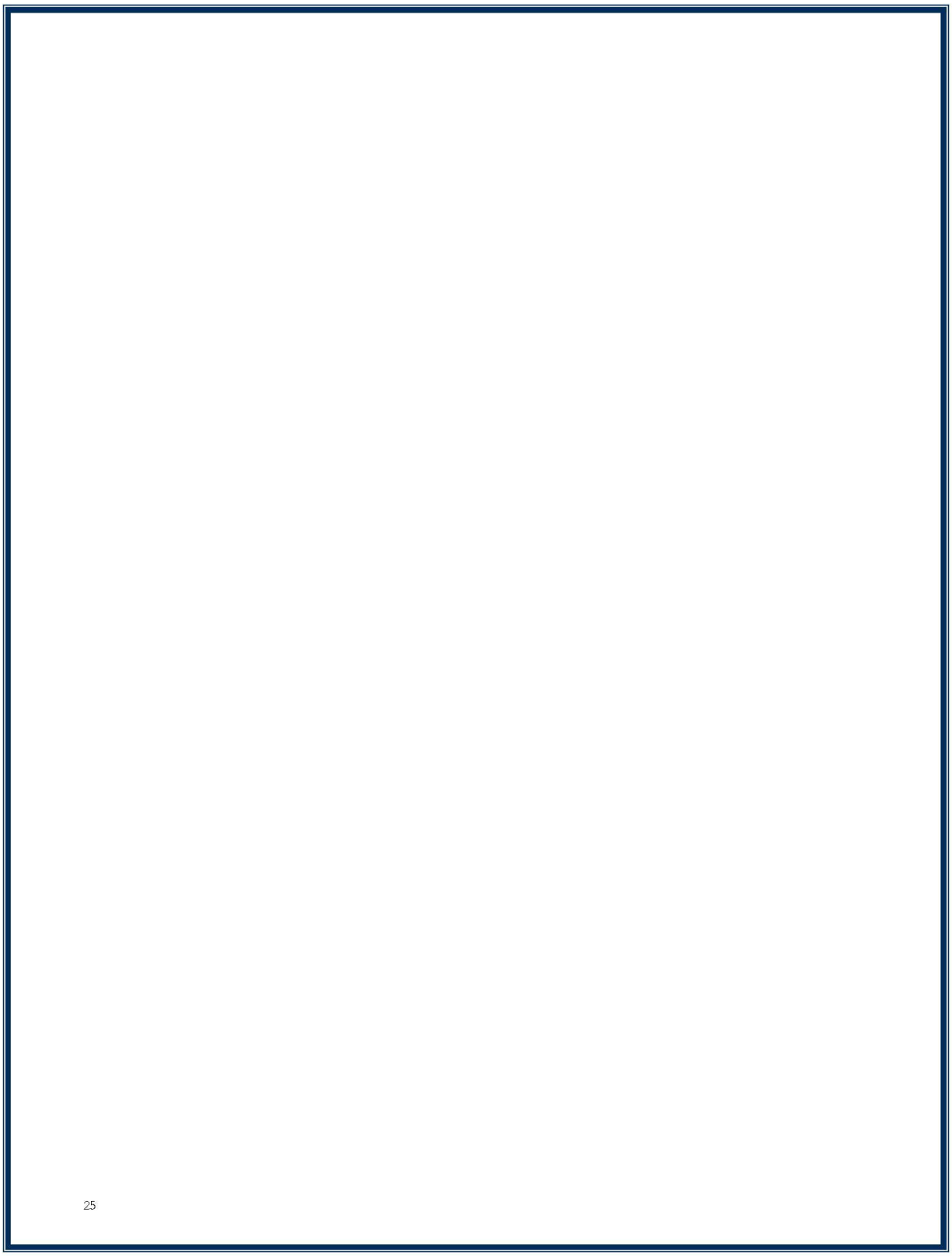
7.7 Investigation Assistance/Confirmation of Claim Receipt

All Contractors/Subcontractors will assist in the investigation of any accident or occurrence involving injury to persons or property. All Contractors/Subcontractors must cooperate with the companies involved in adjusting any claim by securing and giving evidence and obtaining the participation and attendance of witnesses required for the investigation and defense of any claim or suit.

Upon receipt of the claim or incident from the Contractor, the respective OCIP insurance carrier will send a claims acknowledgment letter with the assigned claims file number. Always cooperate with the Owner or the OCIP insurer representatives in the accident investigation.

8.0 Required Project Forms

- **8.1 First Report of Injury (5020)**
- **8.2 Workers' Compensation Claim Form (DWC-1)**
- **8.3 Notice of Occurrence - Accident/Incident Report – General Liability, Pollution, Builders Risk**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8.1 First Report of Injury (5020)

District Name: _____

Project Name: _____

State of California **EMPLOYER'S REPORT OF OCCUPATIONAL INJURY OR ILLNESS**	PLEASE COMPLETE (TYPE, IF POSSIBLE). MAIL TWO COPIES TO:	**OSHA CASE NO.** ☐ FATALITY

Any person who makes or causes to be made any knowingly false or fraudulent material statement or material representation for the purpose of obtaining or denying workers compensation benefits or payments of guilty of a felony.

NOTICE: California law requires employers to report within five days of knowledge every occupational injury or illness which results in lost time beyond the date of the incident OR requires medical treatment beyond first aid. If an employee subsequently dies as a result of a previously reported injury or illness, the employer must file within five days of knowledge an amended report indicating death. In addition, every serious illness/injury or death must be reported immediately by telephone or telegraph to the nearest office of the California Division of Occupational Safety and Health

EMPLOYER

1. FIRM NAME	1A. POLICY NUMBER	DO NOT USE THIS COLUMN
2. MAILING ADDRESS (Number and Street, City, ZIP)	2A. PHONE NUMBER	Case No.
3. LOCATION, IF DIFFERENT FROM MAILING ADDRESS (Number and Street, City, ZIP)	3A. LOCATION CODE	Ownership
4. NATURE OF BUSINESS, e.g., painting contractor, wholesale grocer, sawmill, hotel, etc.	5. STATE UNEMPLOYMENT INSURANCE ACCT NUMBER	Industry
6. TYPE OF EMPLOYER ☐ PRIVATE ☐ STATE ☐ CITY ☐ COUNTY ☐ SCHOOL DIST. ☐ OTHER GOV. – SPECIFY _____		Occupation

EMPLOYEE

7. EMPLOYEE NAME	8. SOCIAL SECURITY NUMBER	9. DATE OF BIRTH (mm dd yy)	Sex
10 HOME ADDRESS (Number and Street, City, ZIP)		10A PHONE NUMBER	Age
11. SEX ☐ MALE ☐ FEMALE	12. OCCUPATION (Regular job title – NO initials, abbreviations or numbers)	13 DATE OF HIRE (mm dd yy)	Daily Hours
14 EMPLOYEE USUALLY WORKS hours ____ per day days ____ per week total ____ wkly. hrs	14A EMPLOYMENT STATUS (check applicable status at time of injury) regular part ___full-time ___time temp. ___seasonal	14B Under what class code of your policy were wages assigned	Days/week
15 GROSS WAGES/SALARY $_____ PER _____	16 OTHER PAYMENTS NOT REPORTED AS WAGES/Salary (e.g., tips, meals, lodging, overtime, bonuses, etc.)? ☐ YES $_____ PER_____ ☐ NO		Weekly Hours

INJURY OR ILLNESS

17. DATE OF INJURY OR ONSET OF ILLNESS (mm dd yy)	18 TIME INJURY ILLNESS OCCURRED A.M. P.M.	19 TIME EMPLOYEE BEGAN WORK A.M. P.M.	20. IF EMPLOYEE DIED, DATE OF DEATH (mm dd yy)	Weekly Wage
21 UNABLE TO WORK FOR AT LEAST ONE FULL DAY AFTER DATE OF INJURY ☐ YES ☐ NO	22. DATE LAST WORKED (mm dd yy)	23. DATE RETRUNED TO WORK (mm dd yy)	24. IF STILL OFF WORK CHECK THIS BOX ☐	County
25. PAID FULL WAGES FOR DAY OF INJURY OR LAST DAY WORKED ☐ YES ☐ NO	26. SALARY BEING CONT'D? ☐ YES ☐ NO	27. DATE OF EMPLOYER'S KNOWLEDGE NOTICE OF INJURY/ILLNESS (mm dd yy)	28.DATE EMPLOYEE WAS PROVIDED EMPLOYEE CLAIM FORM (mm dd yy)	Nature of Injury
29. SPECIFIC INJURY/ILLNESS AND PART OF BODY AFFECTED, MEDICAL DIAGNOSIS, if available , e.g., second degree burns on right arm, tendonitis of left elbow, lead poisoning				Part of Body
30. LOCATION WHERE EVENT OR EXPOSURE OCCURRED (Number and Street, City)		30A COUNTY	30B. ON EMPLOYER'S PREMISES ☐ YES ☐ NO	Source
31 DEPARTMENT WHERE EVENT OR EXPOSURE OCCURRED, e.g. shipping department, machine shop.		32. OTHER WORKERS INJURED/ ILL IN THIS EVENT? ☐ YES ☐ NO		Event
33. EQUIPMENT, MATERIALS AND CHEMICALS THE EMPLOYEE WAS USING WHEN EVENT OR EXPOSURE OCCURRED, e.g., acetylene, welding torch, farm tractor, scaffold				Sec. Source
34. SPECIFIC ACTIVITY THE EMPLOYEE WAS PERFORMING WHEN EVENT OR EXPOSURE OCCURRED, e.g., welding seams of metal forms, loading boxes into truck				Extent of Injury
35 HOW INJURY/ILLNESS OCCURRED. DESCRIBE SEQUENCE OF EVENTS SPECIFY OBJECT OR EXPOSURE WHICH DIRECTLY PRODUCED THE INJURY/ILLNESS (e.g., worker stepped back to inspect work and slipped on scrap material. As he fell, he brushed against fresh weld and burned right hand). USE SEPARATE SHEET IF NECESSARY				
36. NAME AND ADDRESS OF PHYSICIAN (Number and Street, City, ZIP)			36A. PHONE NUMBER	
37 IF HOSPITALIZED AS AN INPATIENT, NAME AND ADDRESS OF HOSPITAL (Number and Street, City, ZIP)			37A. PHONE NUMBER	

COMPLETED BY (type or print)	SIGNATURE	TITLE	DATE

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8.2 Workers' Compensation Claim Form (DWC-1)

Formulario de Reclamo de Compensación para Trabajadores (DWC 1) y Notificación de Posible Elegibilidad

If you are injured or become ill, either physically or mentally, because of your job, including injuries resulting from a workplace crime, you may be entitled to workers' compensation benefits. Attached is the form for filing a workers' compensation claim with your employer. **You should read all of the information below.** Keep this sheet and all other papers for your records. You may be eligible for some or all of the benefits listed depending on the nature of your claim. If required you will be notified by the claims administrator, who is responsible for handling your claim, about your eligibility for benefits.

To file a claim, complete the "Employee" section of the form, keep one copy and give the rest to your employer. Your employer will then complete the "Employer" section, give you a dated copy, keep one copy and send one to the claims administrator. Benefits can't start until the claims administrator knows of the injury, so complete the form as soon as possible.

Medical Care: Your claims administrator will pay all reasonable and necessary medical care for your work injury or illness. Medical benefits may include treatment by a doctor, hospital services, physical therapy, lab tests, x-rays, and medicines. Your claims administrator will pay the costs directly so you should never see a bill. For injuries occurring on or after 1/1/04, there is a limit on some medical services.

The Primary Treating Physician (PTP) is the doctor with the overall responsibility for treatment of your injury or illness. Generally your employer selects the PTP you will see for the first 30 days, however, in specified conditions, you may be treated by your predesignated doctor. If a doctor says you still need treatment after 30 days, you may be able to switch to the doctor of your choice. Special rules apply if your employer offers a Health Care Organization (HCO) or after 1/1/05, has a medical provider network. Contact your employer for more information. If your employer has not put up a poster describing your rights to workers' compensation, you may choose your own doctor immediately.

Within one working day after an employee files a claim form, the employer shall authorize the provision of all treatment, consistent with the applicable treating guidelines, for the alleged injury and shall continue to provide treatment until the date that liability for the claim is accepted or rejected. Until the date the claim is accepted or rejected, liability for medical treatment shall be limited to ten thousand dollars ($10,000).

Disclosure of Medical Records: After you make a claim for workers' compensation benefits, your medical records will not have the same privacy that you usually expect. If you don't agree to voluntarily release medical records, a workers' compensation judge may decide what records will be released. If you request privacy, the judge may "seal" (keep private) certain medical records.

Payment for Temporary Disability (Lost Wages): If you can't work while you are recovering from a job injury or illness, you will receive temporary disability payments. These payments may change or stop when your doctor says you are able to return to work. These benefits are tax-free. Temporary disability payments are two-thirds of your average weekly pay, within minimums and maximums set by state law. Payments are not made for the first three days you are off the job unless you are hospitalized overnight or cannot work for more than 14 days.

Si Ud. se lesiona o se enferma, ya sea física o mentalmente, debido a su trabajo, incluyendo lesiones que resulten de un crimen en el lugar de trabajo, es posible que Ud. tenga derecho a beneficios de compensación para trabajadores. Se adjunta el formulario para presentar un reclamo de compensación para trabajadores con su empleador. **Ud. debe leer toda la información a continuación.** Guarde esta hoja y todos los demás documentos para sus archivos. Es posible que usted reúna los requisitos para todos los beneficios, o parte de éstos, que se enumeran, dependiendo de la índole de su reclamo. Si se requiere, el/la administrador(a) de reclamos, quien es responsable del manejo de su reclamo, le notificará a usted, lo referente a su elegibilidad para beneficios.

Para presentar un reclamo, complete la sección del formulario designada para el "Empleado", guarde una copia, y déle el resto a su empleador. Entonces, su empleador completará la sección designada para el "Empleador", le dará a Ud. una copia fechada, guardará una copia, y enviará una al/a la administrador(a) de reclamos. Los beneficios no pueden comenzar hasta, que el/la administrador(a) de reclamos se entere de la lesión, así que complete el formulario lo antes posible.

Atención Médica: Su administrador(a) de reclamos pagará toda la atención médica razonable y necesaria, para su lesión o enfermedad relacionada con el trabajo. Es posible que los beneficios médicos incluyan el tratamiento por parte de un médico, los servicios de hospital, la terapia física, los análisis de laboratorio y las medicinas. Su administrador(a) de reclamos pagará directamente los costos, de manera que usted nunca verá un cobro. Para lesiones que ocurren en o después de 1/1/04, hay un límite de visitas para ciertos servicios médicos.

El Médico Primario que le Atiende-*Primary Treating Physician PTP* es el médico con toda la responsabilidad para dar el tratamiento para su lesion o enfermedad. Generalmente, su empleador selecciona al *PTP* que Ud. Verá durante los primeros 30 días. Sin embargo, en condiciones específicas, es posible que usted pueda ser tratado por su médico pre-designado. Si el doctor dice que usted aún necesita tratamiento después de 30 días, es possible que Ud. pueda cambiar al médico de su preferencia. Hay reglas especiales que son aplicables cuando su empleador ofrece una Organización del Cuidado Médico (HCO) o depués de 1/1/05 tiene un Sistema de Proveedores de Atención Médica. Hable con su empleador para más información. Si su empleador no ha colocado un poster describiendo sus derechos para la compensación para trabajadores, Ud. puede seleccionar a su propio medico inmediatamente.

El empleador autorizará todo tratamiento médico consistente con las directivas de tratamiento applicables a la lesión o enfermedad, durante el primer día laboral después que el empleado efectúa un reclamo para beneficios de compensación, y continuará proveyendo este tratamiento hasta la fecha en que el reclamo sea aceptado o rechazado. Hasta la fecha en que el reclamo sea aceptado o rechazado, el tratamiento médico será limitado a diez mil dólares ($10,000).

Divulgación de Expedientes Médicos: Después de que Ud. presente un reclamo para beneficios de compensación para los trabajadores, sus expedientes médicos no tendrán la misma privacidad que usted normalmente espera. Si Ud. no está de acuerdo en divulgar voluntariamente los expedientes médicos, un(a) juez de compensación para trabajadores posiblemente decida qué expedientes se revelarán. Si Ud. Solicita privacidad, es posible que el/la juez "selle" (mantenga privados) ciertos expedientes médicos.

Pago por Incapacidad Temporal (Sueldos Perdidos): Si Ud. no puede trabajar, mientras se está recuperando de una lesión o enfermedad relacionada con el trabajo, Ud. recibirá pagos por incapacidad temporal. Es posible que estos pagos cambien o paren, cuando su médico diga que Ud. está en condiciones de regresar a trabajar. Estos beneficios son libres de impuestos. Los pagos por incapacidad temporal son dos tercios de su pago semanal promedio, con cantidades mínimas y máximas establecidas por las leyes estatales. Los pagos no se hacen durante los primeros tres

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Return to Work: *To help you to return to work as soon as pos*s you should actively communicate with your treating dc claims administrator, and employer about the kinds of work you can do while recovering. They may coordinate efforts to return you to modified duty or other work that is medically appropriate. This modified or other duty may be temporary or may be extended depending on the nature of your injury or illness.

Payment for Permanent Disability: If a doctor says your injury or illness results in a permanent disability, you may receive additional payments. The amount will depend on the type of injury, your age, occupation, and date of injury.

Vocational Rehabilitation (VR): If a doctor says your injury or illness prevents you from returning to the same type of job and your employer doesn't offer modified or alternative work, you may qualify for VR. If you qualify, your claims administrator will pay the costs, up to a maximum set by state law. VR is a benefit for injuries that occurred prior to 2004.

Supplemental Job Displacement Benefit (SJDB): If you do not return to work within 60 days after your temporary disability ends, and your employer does not offer modified or alternative work, you may qualify for a nontransferable voucher payable to a school for retraining and/or skill enhancement. If you qualify, the claims administrator will pay the costs up to the maximum set by state law based on your percentage of permanent disability. SJDB is a benefit for injuries occurring on or after 1/1/04.

Death Benefits: If the injury or illness causes death, payments may be made to relatives or household members who were financially dependent on the deceased worker.

It is illegal for your employer to punish or fire you for having a job injury or illness, for filing a claim, or testifying in another person's workers' compensation case (Labor Code 132a). If proven, you may receive lost wages, job reinstatement, increased benefits, and costs and expenses up to limits set by the state.

You have the right to disagree with decisions affecting your claim. If you have a disagreement, contact your claims administrator first to see if you can resolve it. If you are not receiving benefits, you may be able to get State Disability Insurance (SDI) benefits. Call State Employment Development Department at (800) 480-3287.

You can obtain free information from an information and assistance officer of the State Division of Workers' Compensation, or you can hear recorded information and a list of local offices by calling **(800) 736-7401**. You may also go to the DWC web site at **www.dir.ca.gov**. Link to Workers' Compensation.

You can consult with an attorney. Most attorneys offer one free consultation. If you decide to hire an attorney, his or her fee will be taken out of some of your benefits. For names of workers' compensation attorneys, call the State Bar of California at (415) 538-2120 or go to their web site at **www.californiaspecialist.org**.

ıs en que Ud. no trabaje, a menos que Ud. sea hospitalizado(a) de ıche, o no pueda trabajar durante más de 14 días.

Regreso al Trabajo: Para ayudarle a regresar a trabajar lo antes posible, Ud. debe comunicarse de manera activa con el médico que le atienda, el/la administrador(a) de reclamos y el empleador, con respecto a las clases de trabajo que Ud. puede hacer mientras se recupera. Es posible que ellos coordinen esfuerzos para regresarle a un trabajo modificado, o a otro trabajo, que sea apropiado desde el punto de vista médico. Este trabajo modificado, u otro trabajo, podría extenderse o no temporalmente, dependiendo de la índole de su lesión o enfermedad.

Pago por Incapacidad Permanente: Si el doctor dice que su lesión o enfermedad resulta en una incapacidad permanente, es posible que Ud. reciba pagos adicionales. La cantidad dependerá de la clase de lesión, su edad, su ocupación y la fecha de la lesión.

Rehabilitación Vocacional: Si el doctor dice que su lesión o enfermedad no le permite regresar a la misma clase de trabajo, y su empleador no le ofrece trabajo modificado o alterno, es posible que usted reúna los requisitos para rehabilitación vocacional. Si Ud. reúne los requisitos, su administrador(a) de reclamos pagará los costos, hasta un máximo establecido por las leyes estatales. Este es un beneficio para lesiones que ocurrieron antes de 2004.

Beneficio Suplementario por Desplazamiento de Trabajo: Si Ud. No vuelve al trabajo en un plazo de 60 días después que los pagos por incapcidad temporal terminan, y su empleador no ofrece un trabajo modificado o alterno, es posible que usted reúne los requisitos para recibir un vale no-transferible pagadero a una escuela para recibir un Nuevo entrenamiento y/o mejorar su habilidad. Si Ud. reúne los requisitios, el administrador(a) de reclamos pagará los costos hasta un máximo establecido por las leyes estatales basado en su porcentaje del incapicidad permanente. Este es un beneficio para lesiones que ocurren en o después de 1/1/04.

Beneficios por Muerte: Si la lesión o enfermedad causa la muerte, es posible que los pagos se hagan a los parientes o a las personas que vivan en el hogar, que dependían económicamente del/de la trabajador(a) difunto(a).

Es ilegal que su empleador le castigue o despida, por sufrir una lesión o enfermedad en el trabajo, por presentar un reclamo o por atestiguar en el caso de compensación para trabajadores de otra persona. (El Codigo Laboral sección 132a). Si es probado, puede ser que usted reciba pagos por perdida de sueldos, reposición del trabajo, aumento de beneficios, y gastos hasta un límite establecido por el estado. Ud. tiene derecho a estar en desacuerdo con las decisiones que afecten su reclamo. Si Ud. tiene un desacuerdo, primero comuníquese con su administrador(a) de reclamos, para ver si usted puede resolverlo. Si usted no está recibiendo beneficios, es posible que Ud. pueda obtener beneficios de Seguro Estatal de Incapacidad (SDI). Llame al Departamento Estatal del Desarrollo del Empleo (EDD) al (800) 480-3287.

Ud. puede obtener información gratis, de un oficial de información y asistencia, de la División estatal de Compensación al Trabajador *(Division of Workers' Compensation – DWC)*, o puede escuchar información grabada, así como una lista de oficinas locales, llamando al **(800) 736-7401**. Ud. también puede ir al sitio electrónico en el Internet de la DWC en **www.dir.ca.gov.** Enlácese a la sección de Compensación para Trabajadores.

Ud. puede consultar con un(a) abogado(a). La mayoría de los abogados ofrecen una consulta gratis. Si Ud. decide contratar a un(a) abogado(a), sus honorarios se tomarán de sus beneficios. Para obtener nombres de abogados de compensación para trabajadores, llame a la Asociación Estatal de Abogados de California *(State Bar)* al (415) 538-2120, ó vaya a su sitio electrónico en el Internet en **www.californiaspecialist.org**.

State of California

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Department of Industrial Relations

DIVISION OF WORKERS' COMPENSATION

WORKERS COMPENSATION CLAIM FORM (DWC 1)

Employee: Complete the **"Employee"** section and give the form to your employer. Keep a copy and mark it **"Employee's Temporary Receipt"** until you receive the signed and dated copy from your employer. You may call the Division of Workers' Compensation and hear recorded information at **(800) 736-7401**. An explanation of workers' compensation benefits is included as the cover sheet of this form.

You should also have received a pamphlet from your employer describing workers' compensation benefits and the procedures to obtain them.

Any person who makes or causes to be made any knowingly false or fraudulent material statement or material representation for the purpose of obtaining or denying workers' compensation benefits or payments is guilty of a felony.

Estado de California
Departamento de Relaciones Industriales
DIVISION DE COMPENSACIÓN AL TRABAJADOR
PETITION DEL EMPLEADO PARA DE COMPENSACIÓN DEL TRABAJADOR (DWC 1)

Empleado: *Complete la sección* ***"Empleado"*** *y entregue la forma a su empleador. Quédese con la copia designada* ***"Recibo Temporal del Empleado"*** *hasta que Ud. reciba la copia firmada y fechada de su empleador. Ud. puede llamar a la Division de Compensación al Trabajador al* ***(800) 736-7401*** *para oir información gravada. En la hoja cubierta de esta forma esta la explicatión de los beneficios de compensación al trabjador.*

Ud. también debería haber recibido de su empleador un folleto describiendo lo s benficios de compensación al trabajador lesionado y los procedimientos para obtenerlos.

Toda aquella persona que a propósito haga o cause que se produzca cualquier declaración o representación material falsa o fraudulenta con el fin de obtener o negar beneficios o pagos de compensación a trabajadores lesionados es culpable de un crimen mayor "felonia".

Employee—complete this section and see note above. ***Empleado—complete esta sección y note la notación arriba.***

1. Name. *Nombre.* _____ Today's Date. *Fecha de Hoy.* _____
2. Home Address. *Dirección Residencial.* _____
3. City. *Ciudad.* _____ State. *Estado.* _____ Zip. *Código Postal.* _____
4. Date of Injury. *Fecha de la lesión (accidente).* _____ Time of Injury. *Hora en que ocurrió.* _____ a.m. _____ p.m.
5. Address and description of where injury happened. *Dirección/lugar dónde ocurió el accidente.* _____
6. Describe injury and part of body affected. *Describa la lesión y parte del cuerpo afectada.* _____
7. Social Security Number. *Número de Seguro Social del Empleado.* _____
8. Signature of employee. *Firma del empleado.* _____

Employer—complete this section and see note below. ***Empleador—complete esta sección y note la notación abajo.***

9. Name of employer. *Nombre del empleador.* _____
10. Address. *Dirección.* _____
11. Date employer first knew of injury. *Fecha en que el empleador supo por primera vez de la lesión o accidente.* _____
12. Date claim form was provided to employee. *Fecha en que se le entregó al empleado la petición.* _____
13. Date employer received claim form. *Fecha en que el empleado devolvió la petición al empleador.* _____
14. Name and address of insurance carrier or adjusting agency. *Nombre y dirección de la compañía de seguros o agencia adminstradora de seguros.* _____
15. Insurance Policy Number. *El número de la póliza de Seguro.* _____
16. Signature of employer representative. *Firma del representante del empleador.* _____
17. Title. *Título.* _____ 18. Telephone. *Teléfono.* _____

Employer: You are required to date this form and provide copies to your insurer or claims administrator and to the employee, dependent or representative who filed the claim within **one working day** of receipt of the form from the employee.

SIGNING THIS FORM IS NOT AN ADMISSION OF LIABILITY

Empleador: *Se requiere que Ud. feche esta forma y que provéa copias a su compañía de seguros, administrador de reclamos, o dependiente/representante de reclamos y al empleado que hayan presentado esta petición dentro del plazo de* ***un día hábil*** *desde el momento de haber sido recibida la forma del empleado.*

EL FIRMAR ESTA FORMA NO SIGNIFICA ADMISION DE RESPONSABILIDAD

❑ Employer copy
Copia del Empleador

❑ Employee copy
Copia del Empleado

❑ Claims Administrator
Administrador de Reclamos

❑ Temporary Receipt/
Recibo del Empleado

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8.3 Notice of Occurrence - Accident/Incident Report – General Liability, Pollution, Builders Risk

SEWUP

Notice of Occurrence
ACCIDENT / INCIDENT REPORT – GENERAL LIABILITY/POLLUTION/BUILDERS RISK

Keenan & Associates 2355
Crenshaw Blvd. Torrance, CA 90501
www.SEWUP.ORG
Licence No. 0451271

		Date:	
Contact:	Project Location Code:	Date of Loss & Time:	☐ AM ☐ PM
Phone:			
Cell:	Carrier:		NAIC Code:
Fax:	Policy No.:	Client ID No.:	
Email:			

School District

Name of Insured:		Insureds Mailing Address:	
Contact Name:	Title:		
Primary Phone: ☐ Bus ☐ Cell	Secondary Phone: ☐ Bus ☐ Cell	Primary Email:	Secondary Email:

Contractor

Name of Insured:		Insureds Mailing Address:	
Contact Name:	Title:		
Primary Phone: ☐ Bus ☐ Cell	Secondary Phone: ☐ Bus ☐ Cell	Primary E-mail:	Secondary E-mail:

Occurrence

Location of Occurrence / Address (Describe Location if No Specific Address):	Police or Fire Dept. Contacted?
	Report No.:
Description of Occurrence:	

Property

Premises: Claimant (1) is: ☐ Owner ☐ Tenant ☐ Insured Party	Premises: Claimant (2) is: ☐ Owner ☐ Tenant ☐ Insured Party
Type of Damage:	Type of Damage:
Damaged Party (1) Name & Address (If not insured):	Damaged Party (2) Name & Address (If not insured):
Primary Phone: ☐ Home ☐ Bus. ☐ Cell	Primary Phone: ☐ Home ☐ Bus. ☐ Cell
Secondary Phone: ☐ Home ☐ Bus. ☐ Cell	Secondary Phone: ☐ Home ☐ Bus. ☐ Cell
Primary Email:	Primary Email:
Secondary Email:	Secondary Email:
Location of Property for Inspection:	Location of Property for Inspection:

SEWUP - Notice of Occurrence Page 1 of 2

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Injured Party

Damaged Party (1) Name & Address (If not insured):		Damaged Party (2) Name & Address (If not insured):	
Primary Phone:	☐Home ☐Bus ☐Cell	Primary Phone:	☐Home ☐Bus ☐Cell
Secondary Phone:	☐Home ☐Bus ☐Cell	Secondary Phone:	☐Home ☐Bus ☐Cell
Primary E-mail:		Primary E-mail:	
Secondary E-mail:		Secondary E-mail:	
Age: Sex: Occupation:		Age: Sex: Occupation:	
Where Taken:		Where Taken:	
Describe Injury:		Describe Injury:	
What Was Injured Doing:		What Was Injured Doing:	

Witnesses

Damaged Party (1) Name & Address (If not insured):		Damaged Party (2) Name & Address (If not insured):	
Primary Phone:	☐Home ☐Bus ☐Cell	Primary Phone:	☐Home ☐Bus ☐Cell
Secondary Phone:	☐Home ☐Bus ☐Cell	Secondary Phone:	☐Home ☐Bus ☐Cell
Primary E-mail:		Primary E-mail:	
Secondary E-mail:		Secondary E-mail:	

Remarks

Reported By:	Reported To:

SEWUP - Notice of Occurrence Page 2 of 2

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SEWUP
EDUCATION CONSTRUCTION INSURANCE

9.0 Frequency Asked Questions (FAQs)

An Owner Controlled Insurance Program (OCIP) Through The Statewide Educational Wrap Up Program (SEWUP)

1. **Who is insured under an Owner Controlled Insurance Program?**

   The Owner and all enrolled Contractors and their enrolled Subcontractors of any tier who perform operations at the Project Site described in the Contract Documents are insured under the OCIP.

2. **Who is managing the Owner Controlled Insurance Program?**

   Keenan & Associates is the Program Administrator for this Owner Controlled Insurance Program, otherwise known as Statewide Educational Wrap Up Program (SEWUP).

3. **Is Project Site Defined?**

   Yes. Project Site is on file with the insurance company, as described in the applicable Contract Documents.

4. **What insurance is provided to Contractors/Subcontractors under the Owner Controlled Insurance Program (OCIP)?**

   The Owner has agreed to procure the following insurance:

   a. Workers' Compensation and Employer's Liability
   b. General Liability Insurance for Personal Injury, Bodily Injury and Property Damage Liability
   c. Builder's Risk
   d. Contractor's Pollution Liability (course of construction only)

5. **Does the OCIP cover any contractor's equipment?**

   No. Contractors and Subcontractors must maintain this coverage.

6. **Are there other types of insurance normally purchased by Contractors, which are not included?**

   Yes. Examples are:

   a. Bonds, if required by contract
   b. Contractor's Automobile Liability and Physical Damage Insurance
   c. Contractor's Equipment Floater

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SEWUP
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7. Does the Contractor/Subcontractor insured under the OCIP have to provide evidence of insurance?

Yes. The contract requires that, prior to commencement of on-site activities; each Contractor/Subcontractor shall furnish a Certificates of Insurance evidencing coverage for:

a. Workers' Compensation
b. General Liability

Certificates of Insurance and Additional Named Insured Endorsements, specifically naming the Owner, are also required for:

a. Automobile Liability
b. Any other required coverages outlined in the Contract and the Project Insurance Manual.

8. How is the Contractor/Subcontractor's bid to be submitted?

The Contractor/Subcontractor needs to submit their bid excluding certain insurance costs, as outlined in the Contract. Change Orders also need to be submitted without insurance costs.

9. When will the Contractor/Subcontractor receive a Certificate of Insurance insuring them under the OCIP?

Eligible Contractors/Subcontractors awarded a contract will be furnished a Certificate of Insurance upon Program Administrator's review and acceptance of the Contract Enrollment via WrapPortal.

10. Will all Contractors/Subcontractors receive information concerning their loss experience?

This information is available, upon request, from the Program Administrator.

11. How long are the policies kept in-force for the Contractor/Subcontractor?

The policy periods commence on the date of "Award" and terminate as defined in the Contract Documents. The only extension is for General Liability "Completed Operations" which is for ten (10) years after Notice of Completion filed by the District.

12. Does the OCIP provide coverage for truckers, vendors and suppliers?

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No. Contractors/Subcontractors, whose sole duties are as truckers, vendors, or suppliers are not included in the program. If contracted with an on-site installer, vendors and/or suppliers should be enrolled in the OCIP for General Liability only, as it pertains to the contractual relationship of the installer's on-site work.

13. Are all Contractors/Subcontractors, of any tier, required to complete their own OCIP enrollment, before they will be allowed to begin job site activity?

All Contractors/Subcontractors, regardless of tier, must complete a Contract Enrollment via WrapPortal, prior to commencement of on-site activities. Upon acceptance by the OCIP Administrator, each Contractor/Subcontractor will receive an enrollment confirmation packet, which includes a Certificate of Insurance evidencing the OCIP coverages.

14. What document do I use to show my Agent/Broker and Insurer that I'm covered under the OCIP?

All contractors enrolled under the OCIP program receive individual workers' compensation policies and Certificates of Insurance evidencing coverage under the OCIP program.

Workers' Compensation and Employers' Liability Insurance Questions

1. What insurance company writes the Workers' Compensation and Employer's Liability coverage?

Liberty Mutual Insurance Company.

2. What is the coverage term?

The coverage term for each Contractor/Subcontractor will coincide with the Start Date provided at OCIP enrollment. OCIP Workers' Compensation policies are renewed each year until receipt of OCIP Contractor's Completion Notice.

3. How will the Contractor/Subcontractor's payroll be classified?

Insurance Company will classify payrolls in accordance with California law under the Workers' Compensation Insurance Rating Bureau regulations, classifications, rates and rating plans. The Monthly Project Site Payroll Form will be used for Contractors/Subcontractors' monthly payroll submissions.

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4. Will Program Administrator inspect the job and make recommendations regarding loss control and safety?

Yes. The Program Administrator will conduct periodic loss control surveys on behalf of the Owner. These surveys will focus on evaluating the contractors' efforts to control Workers' Compensation, General Liability, and Builders Risk exposures. These surveys are intended to assist contractors in identifying these exposures and take the appropriate actions to minimize the likelihood of loss.

5. Will there be other people who will make job site inspections?

Yes. The insurance company's Risk Engineer may conduct periodic site inspections to verify compliance with State requirements. State, City and Federal inspectors may also make inspections.

General Liability Insurance for Personal Injury, Bodily Injury and Property Damage Liability Questions

What insurance company writes the Personal Injury, Bodily Injury, and Property Damage Liability coverage? Lloyds of London.

Is Completed Operations coverage provided beyond acceptance of the work performed under the Contract?

Yes. The extension for General Liability "completed operations" is for ten (10) years after Notice of Completion is filed by the Owner, or date Occupancy is taken.

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10.0 Known Policy Exclusions

Workers Compensation

Bodily Injury Outside US or Canada
Bodily Injury To Any Member of Flying Crew
Bodily Injury To Person Subject To Federal Workers' Compensation
Bodily Injury To Person Subject To Occupational Disease Laws
Contractual Liability
Employees Knowingly Employed Illegally
Employment Related Practices
Intentional or Aggravated Bodily Injury
Obligations Imposed By Disability Benefits or Any Similar Law
Obligations Imposed By Occupational Disease Laws
Obligations Imposed By Unemployment Compensation Laws
Obligations Imposed By Workers' Compensation Laws
State or Federal Law Violation Fines, Penalties

General Liability

Aircraft, Auto or Watercraft
Asbestos
Certain Exclusions To Medical Payments Coverage
Certain Exclusions To Personal and Advertising Injury Liability
Certified Acts of Terrorism
Contractual Liability (Limited Coverage Provided)
Employers Liability
Employment Related Practices
Expected or Intended Injury
Exterior Insulation and Finish Systems (EIFS) "Subject to Installation Requirements"
Fungi Or Bacteria
Lead
Mobile Equipment
Nuclear
Personal and Advertising Bodily Injury
Pollution
Prior Continuous, or Progressively Deteriorating Injury or Damage
Professional Liability

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Recall of Products, Work Or Impaired Property
Silica or Silica Mixed Dust
Subsidence- Conditional Warranty- So long as Contractor follows specifications of geotechnical/environmental reports then the exclusion will be waived; if not, exclusion will be fully implemented
Violation of Statutes Governing Collecting, Transmitting Information
Violation of Statutes Governing Email, Fax, Phone Calls
War
Workers Compensation and Similar Laws

Builders Risk

Asbestos
Certain Offsite Property
Certain Release, Discharge, Escape, or Dispersal Of Contaminants
Certified Acts of Terrorism (Can be added)
Cessation of Work
Communicable Diseases
Contractor's Tools, Machinery, Plans, Equipment
Cost of Making Good
Damage To Existing Property (Can be added)
Damage While Testing Prototype or Used Machinery/Equipment
Damages, Fines, Penalties At Government Agency or Court Order
Disappearance or When Revealed By Inventory Shortage Alone
Earth Movement (Optional; can be added)
Electrical, Magnetic, or Errors Related To Electronic Records
Financial Accounts, Instruments, Stamps, Deeds, Precious Material
Flood (Optional; can be added)
Foreign Terrorism
Infidelity, Dishonesty, Fraudulent Activity Of Insured
Land, Values of Land, Cut, & Fill etc. Prior to Project Commencement
Loss Under Any Manufacturer or Supplier Guarantee/Warranty
Normal Subsidence
Nuclear
Offshore Or Barrier Island Property
Property That Stores, Processes, or Handles Radioactive Materials
Rolling Stock, Aircraft, Watercraft
Software Loss, unless results from an Open Peril
Standing Timber, Growing Crops, Animals
Vehicles or Equipment Licensed For Highway Use

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War and Military Action

Contractors Pollution Liability
Auto, Aircraft, Vessel Or Rolling Stock
Claims Between Certain Insured's
Contractual Liability
Damage To Property
Disposal Sites
Employment Related Practices
Fines, Penalties, and Treble Damages
Hazardous Materials Facility
Intentional Acts
Nuclear
Other Entities
Pre-Existing Conditions
Products
Related Entities and Individuals
Transportation Of Pollutants
War
Workers Compensation and Similar Laws

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CERTIFICATION OF CERTIFIED PAYROLL RECORDS SUBMITTAL TO LABOR COMMISSION

I am the _____ for _____ in connection with
(Superintendent/Project Manager) (Contractor)
_____. This Certification is submitted to Compton
(Project Name)
Community College District concurrently with the Contractor's submittal of an Application for Progress Payment to the District, identified as Application For Progress Payment No. _____ ("the Pay Application").

1. The Pay Application requests the District's disbursement of a Progress Payment covering Work performed for the period between _____, 20___ and _____, 20___.
2. The Contractor has submitted Certified Payroll Records ("CPR") to the Labor Commissioner for all employees of the Contractor engaged in performance of Work subject to prevailing wage rate requirements for the period of time covered by the Pay Application.
3. All Subcontractors who are entitled to any portion of payment to be disbursed pursuant to the Pay Application have submitted their CPRs to the Labor Commissioner for all of their employees performing Work subject to prevailing wage rate requirements for the period of time covered by the Pay Application.
4. I have reviewed the Contractor's CPRs submitted to the Labor Commissioner; the CPRs submitted to the Labor Commissioner by the Contractor are complete and accurate for the period of time covered by the Pay Application.
5. I have reviewed the Subcontractors' CPRs submitted to the Labor Commissioner; the CPRs submitted to the Labor Commissioner by the Subcontractors are complete and accurate for the period of time covered by the Pay Application.

I declare under penalty of perjury under California law that the foregoing is true and correct. I executed this Certification on the ____ day of _____, 20___ at
_____.
(City and State)

By: _____

_____
(Typed or Printed Name)

GUARANTEE

Project: STUDENT HOUSING

The Contractor hereby warrants and guarantees to the District that all work, materials, equipment and workmanship provided, furnished or installed by or on behalf of Contractor in connection with the above referenced Project (the "Work") have been provided, furnished and installed in strict conformity with the Contract Documents for the Work, including without limitation, the Drawings and the Specifications. Contractor further warrants and guarantees that all work, materials, equipment and workmanship as provided, furnished and/or installed are fit for use as specified and fulfill all applicable requirements of the Contract Documents including without limitation, the Drawings and the Specifications. Contractor shall, at its sole cost and expense, repair, correct and/or replace any or all of the work, materials, equipment and/or workmanship of the Work, together with any other items which may be affected by any such repairs, corrections or replacement, that may be unfit for use as specified or defective within a period of one (1) years from the date of the District's Final Acceptance of the Work, ordinary wear and tear and unusual abuse or neglect excepted.

In the event of the Contractor's failure and/or refusal to comply with the provisions of this Guarantee, within the period of time set forth in the Contract Documents after the District's issuance of the Notice to the Contractor of any defect(s) in the Work, materials, equipment or workmanship, Contractor authorizes the District, without further notice to Contractor, to repair, correct and/or replace any such defective item at the expense of the Contractor. The Contractor shall reimburse the District for all costs, expenses or fees incurred by the District in providing or performing such repairs, corrections or replacements within ten (10) days of the District's presentation of a demand to the Contractor for the same.

The provisions of this Guarantee and the provisions of the Contract Documents for the Work relating to the Contractor's Guarantee(s) and warranty(ies) relating to the Work shall be binding upon the Contractor's Performance Bond Surety and all successors or assigns of Contractor and/or Contractor's Performance Bond Surety.

The provisions of this Guarantee are in addition to, and not in lieu of, any provisions of the Contract Documents for the Work relating to the Contractor's guarantee(s) and warranty(ies) or any guarantee(s) or warranty(ies) provided by any material supplier or manufacturer of any equipment, materials or other items forming a part of, or incorporated into the Work, or any other guarantee or warranty obligation of the Contractor, prescribed, implied or imposed by law.

The undersigned individual executing this Guarantee on behalf of Contractor warrants and represents that he/she is duly authorized to execute this Guarantee on behalf of Contractor and to bind Contractor to each and every provision hereof.

Contractor

_____
(Contractor Name)

_____
(Signature of Contractor's Authorized Employee, Officer
Or Representative)

_____
(Printed Name and Title)

_____
(Date)

CONTRACTOR CERTIFICATION OF SUBCONTRACTOR CLAIM

STUDENT HOUSING

Pursuant to Article 16.10.8.2 of the General Conditions, I certify as follows:

1. The portion of the Claim made on behalf of the Subcontractor to which this Certification is attached is made in good faith.
2. I have reviewed the attached Subcontractor Claim and certify that: (i) the Subcontractor Claim incorporate substantiating data which establish District responsibility for Subcontractor Claim; (ii) if any portion of the Subcontractor Claim does not incorporate substantiating data which establish District responsibility, I have removed such portion of the Subcontractor Claim before submitting the Subcontractor Claim to the District; (iii) I have reviewed and confirmed that the amounts asserted in the Subcontractor Claim for costs, expenses and damages as the responsibility of the District are supported by substantiating data that is complete and accurate; and (iii) there are no other costs, expenses or damages that are the responsibility of the District which arise out of or relate to any matter asserted in the Subcontractor Claim, except as asserted in the Subcontractor Claim.
3. The amount requested in the Subcontractor Claim is the responsibility of the District (or an agent/representative of the District) and not any other party.
4. The Subcontractor Claim does not incorporate any request constituting a False Claim under applicable law, including the California False Claim Act (Government Code §12650 et seq).
5. I am duly authorized to certify the Subcontractor Claim on behalf of the Contractor.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Executed at _____, on _____, 20___.
(City and State)

_____
(Signature)

_____
(Print Name)

_____
(Title)

_____
(Name of Contractor)

GENERAL CONDITIONS
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[END OF SECTION]

GENERAL CONDITIONS

1. Definitions

1.1. The Work. The "Work" is the construction and services required by the Contract Documents, and includes all labor, materials, equipment or services to fulfill the Contractor's obligations under the Contract Documents.

1.2. Surety. The Surety is the person or entity that executes, as surety, the Contractor's Labor and Material Payment Bond and/or Performance Bond.

1.3. Subcontractors. A Subcontractor is a person or entity who has a direct contract with the Contractor for a portion of the Work; Subcontractors include lower tier subcontractors, who are in direct privity of contract with a Subcontractor.

1.4. Material Supplier. A Material Supplier only furnishes materials, equipment or supplies for the Work without fabricating, installing or consuming them in the Work.

1.5. Drawings and Specifications. The Drawings are the graphic and pictorial portions of the Contract Documents, showing generally, the design, location and dimensions of the Work and may include plans, elevations, sections, details, schedules or diagrams. The Specifications are the written requirements for materials, equipment, construction systems, standards, criteria and workmanship.

1.6. Intent and Correlation of Contract Documents. The Contract Documents are complementary and what is required by one portion shall be by all; performance by the Contractor is required to the extent consistent with the Contract Documents and reasonably inferable therefrom as being necessary to produce the intended results. If a portion of the Contract Documents is silent and information appears elsewhere in the Contract Documents, such other portions of the Contract Documents shall control. Words or terms with well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings. Conflicts, inconsistencies or ambiguities in the Contract Documents shall be resolved by the Architect based on the following standards: the Drawings are intended to describe matters relating to placement, type, quantity and the like; the Specifications are intended to describe matters relating to quality, materials, compositions, manufacturers and the like. If conflicts exist between parts of the Contract Documents regarding the quality of any product, equipment or materials, the Contractor shall provide the product, equipment or material of the highest or more stringent quality.

1.7. Shop Drawings; Samples; Product Data ("Submittals"). Shop Drawings are diagrams, schedules and other data specially prepared for the Work to illustrate the installation, assembly or similar matters for a portion of the Work. Samples are physical examples of materials, equipment or workmanship to be incorporated into the Work. Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information to illustrate materials or equipment for a portion of the Work. Shop Drawings, Samples and Product Data prepared by the Contractor or any Subcontractors/Material Suppliers are collectively referred to as "Submittals."

1.8. Division of State Architect ("DSA"). DSA is the California Division of the State Architect; references to "DSA" include its offices, employees and agents. The authority of the DSA over the Work and the performance thereof shall be as set forth in the Contract Documents and the Laws.

1.9. Project Inspector. The Project Inspector is employed by the District in accordance with the requirements of Title 24 of the California Code of Regulations. The Project Inspector is authorized to act on behalf of the District as provided for in the Contract Documents and in Title 24 of the California Code of Regulations.

1.10. Contract Document Terms. The term "provide" means "provide complete in place" or to "furnish and install" such item. Unless otherwise provided in the Contract Documents, the terms "approved;" "directed;" "satisfactory;" "accepted;" "acceptable;" "proper;" "required;" "necessary" and "equal" means as approved, directed, satisfactory, accepted, acceptable, proper, required, necessary and equal, in the opinion of the Architect. The term "typical" as used in the Drawings shall require the installation or furnishing of such item(s) of the Work designated as "typical" in all other areas similarly marked as "typical"; Work in such other areas shall conform to that shown as "typical" or as reasonably inferable therefrom.

1.11. Record Drawings. The Record Drawings are the Drawings marked by the Contractor during the Work to indicate completely and accurately actual as-built conditions of the Work.

1.12. Construction Manager. The Construction Manager, if any, is designated in the Special Conditions and is authorized to act on behalf of the District in accordance with the Contract Documents. If a Construction Manager is not designated in the Special Conditions, the District may designate a Construction Manager during performance of the Work without adjustment of the Contract Price or the Contract Time or otherwise affect, limit or restrict Contractor's obligations hereunder.

1.13. Construction Equipment. "Construction Equipment" is equipment utilized for the performance of any portion of the Work, but which is not incorporated into the Work.

1.14. Site. The Site is the physical area designated in the Contract Documents for Contractor's performance, construction and installation of the Work.

1.15. Field Clarifications. A written or graphic document consisting of supplementary details, instructions or information issued on behalf of the District which clarifies or supplements the Contract Documents and which becomes a part of the Contract Documents upon issuance. Field Clarifications do not constitute Changes, unless a Change Order relating to a Field Clarification is authorized and issued.

1.16. Defective or Non-Conforming Work. Defective or Non-Conforming Work is any Work which is unsatisfactory, faulty or deficient by: (i) not conforming to the requirements of the Contract Documents; (ii) not conforming to the standards of workmanship of the applicable trade; (iii) not in compliance with the requirements of any inspection, reference, standard, test, or approval required by the Contract Documents; or (iv) damage occurring prior to Final Acceptance.

1.17. Notice to Proceed. The Notice to Proceed is the written notice issued by or on behalf of the District to the Contractor authorizing the Contractor to proceed with commencement of the Work and which establishes the date for commencement of the Contract Time.

1.18. Progress Reports; Verified Reports. Progress Reports are written reports prepared by the Contractor and its Subcontractors on a daily basis. Progress Reports must include: (i) the number of labor and supervising personnel at the Site; (ii) the labor/work classification of each laborer; (iii) a detailed description of the Work in progress and completed; (iv) weather/environmental conditions; and (v) problems encountered with a potential impact to the Contract Time or the Contract Price. Verified Reports are periodic written reports prepared by the Contractor and submitted to the DSA; Verified Reports shall be in such form and content as required by Title 24 of the California Code of Regulations.

1.19. Laws. "Laws" refer to all laws, ordinances, codes, rules and/or regulations promulgated by any governmental or quasi-governmental agency with jurisdiction over any portion of the Work and which apply to any portion of the Work, including those in effect as of the execution of the Agreement, amendments thereto and subsequently enacted Laws that take effect during the performance of the Work. No adjustment of the Contract Time or the Contract Price shall be

allowed for the Contractor's compliance with the Laws.

1.20. Construction Change Directive. A Construction Change Directive is a written instrument issued by or on behalf of the District to the Contractor directing a Change to the Work prior to the Contractor and District reaching full agreement on an adjustment of the Contract Time and/or Contract Price on account of such Change. A material obligation of the Contractor is timely performance of Work noted in a Construction Change Directive.

2. District

2.1. Information Required of District.

2.1.1. Surveys; Site Information. Information, if any, concerning physical characteristics of the Site, including without limitation, surveys, soils reports, and utility locations is set forth in the Contract Documents. Information not provided by the District but required to complete the Work shall be obtained by Contractor without adjustment to the Contract Price or the Contract Time. The Contractor shall verify all information provided by the District. Variations between conditions or existing improvements depicted in the Contract Documents and those actually encountered in the performance of the Work shall not result in any District liability therefor, nor shall any such variations result in an adjustment of the Contract Time or the Contract Price.

2.1.2. Permits; Fees. Except as otherwise provided in the Contract Documents, the District shall secure and pay for necessary approvals, easements, assessments and charges required for construction of the Work.

2.1.3. Drawings and Specifications. The District shall furnish the Contractor, without cost to the Contractor, the number of copies of the Drawings and the Specifications as set forth in the Special Conditions. All of the Drawings and the Specifications provided by the District to the Contractor remain the property of the District; the Contractor shall not use the Drawings or the Specifications other than the Work of the Project.

2.2. District's Right to Stop the Work. The District may, by written order, direct the Contractor to stop any portion of the Work if the Contractor: (i) fails to correct Defective or Non-Conforming Work; or (ii) fails to carry out the Work in conformity to the Contract Documents. The right of the District to stop the Work hereunder shall not: (i) be deemed a duty of the District to exercise such right for the benefit of the Contractor; (ii) waive or limit the exercise of any other right or remedy of the District under the Contract Documents or the Laws; or (iii) result in adjustment of the Contract Time or the Contract Price.

2.3. Partial Occupancy or Use. The District may occupy or use any completed or partially completed portion of the Work. Immediately prior to such partial occupancy or use of the Work, the District, Project Inspector, Contractor, Construction Manager and Architect shall jointly inspect the portion of Work to be used or occupied by the District to record the condition of the Work. Corrective action noted in such inspection shall be promptly performed and completed by the Contractor so the Work conforms to requirements of the Contract Documents and the District's occupancy or use thereof is not impaired. The District's use or occupancy of the Work or portions thereof is not "completion" of the Work pursuant to Public Contract Code §7107 nor constitute the District's acceptance Defective or Non-Conforming Work.

2.4. The Project Inspector.

2.4.1. Authority. All Work shall be performed under the observation of the Project Inspector, whose authority is established by the Laws and the Contract Documents. Duties of the Project Inspector shall not relieve or limit the Contractor's performance of its obligations under the Contract Documents. The Project Inspector does not

have authority: (i) to interpret the Contract Documents or to modify the Work depicted in the Contract Documents; or (ii) relating to the Contractor's safety plan. Upon the Project Inspector's issuance of a report or other similar statement identifying Defective or Non-Conforming Work, the Contractor shall promptly repair, replace or correct the same so that it conforms to requirements of the Contract Documents. If the Contractor fails or refuses to promptly remedy Defective or Non-Conforming Work, the District may remedy such Defective or Non-Conforming Work at the expense of the Contractor.

2.4.2. Facilities and Information for the Project Inspector. The Contractor shall provide to the Project Inspector all information, data and similar materials as necessary or appropriate for the Project Inspector's purposes of fulfilling the Project Inspector's obligations relating to observations and inspections of the Work. The Contractor shall provide, without adjustment of the Contract Price, for use by the Project Inspector, the District and Construction Manager the facilities, equipment, furnishings and services set forth in the Special Conditions. If the Contractor does not provide the facilities, furnishings, equipment and services set forth in the Special Conditions, or fails to pay timely any charges or fees arising out of the use of the same, the District may, as applicable, procure facilities, furnishings, equipment and services required by the Contract Documents or pay outstanding charges, at the expense of the Contractor.

2.5. Communications Software. The District reserves the right to implement electronic data and/or communications software (such as Primavera Expedition®) for data and communications relating to the Work ("Communications Software"). The Contractor's use of Communications Software will be as directed by the District without charge or expense to the Contractor and without adjustment of the Contract Price or the Contract Time.

3. Architect; Construction Manager

3.1. Administration of the Contract. The Architect and Construction Manager will provide administration of the Contract and are District representatives during construction until the time that Final Payment is due the Contractor under the Contract Documents. The Architect and Construction Manager will advise and consult with the District and the Project Inspector with respect to the administration of the Contract and the Work. The Architect and the Construction Manager are authorized to act on behalf of the District to the extent provided for in the Contract Documents; and shall have the responsibilities and powers established by the Laws, including Title 24 of the California Code of Regulations.

3.2. Architect Periodic Site Inspections. The Architect will visit the Site at intervals appropriate to the stage of construction to: (i) become generally familiar with the progress and quality of the completed Work; and (ii) determine if the Work is being performed so that when completed will be in accordance with the Contract Documents. On the basis of Site observations as an architect, the Architect will keep the District informed of the progress of the Work, and endeavor to guard the District against defects and deficiencies in the Work. The Architect is authorized to reject Defective or Non-Conforming Work. The Architect may require additional inspections or tests, whether or not the Work is fabricated, installed or completed.

3.3. Submittals. The Architect will review and accept or take other appropriate action relating to Submittals for the limited purpose of checking for general conformance with information given and the design concept expressed in the Contract Documents. The Architect's review of Submittals shall not: (i) relieve the Contractor of its obligations under the Contract Documents; (ii) constitute approval of safety measures, programs or precautions; or (iii) constitute the direction of construction means, methods, techniques, sequences or procedures. The Architect's review and return of reviewed Submittals will conform to the time limits set forth in

the Specifications, the Construction Schedule or other provisions of the Contract Documents. If no time limits are established in the foregoing, the Architect shall have fourteen (14) days for review and return of Submittals.

3.4. Changes; Change Orders. The Architect will prepare Change Orders, and may authorize minor Changes in the Work which do not result in adjustment of the Contract Time or the Contract Price. The Architect may issue Field Clarifications and Construction Change Directives.

3.5. Interpretation of Contract Documents. The Architect will interpret and decide matters concerning the requirements of the Contract Documents on written request of either the District or the Contractor. The Architect's response to such requests will be made promptly and within the time limits agreed upon; if agreement establishing the time for the Architect's review and response to requests is not reached, the Architect shall have fifteen (15) days after receipt of such request to respond thereto. Interpretations and decisions of the Architect will be consistent with the intent of and reasonably inferable from the Contract Documents and will be in writing or in the form of drawings. The Architect's decisions on matters relating to aesthetic effect are final if consistent with the intent expressed in the Contract Documents.

3.6. Review of Applications for Payment. The Architect, Project Inspector and Construction Manager will each review the Contractor's Applications for Progress Payments and for Final Payment, evaluate the extent of Work performed and certify to the District the amount properly due the Contractor on such Application for Payment.

3.7. Rejection of Work. The Architect and/or Construction Manager are authorized to reject Work which is defective or does not conform to the requirements of the Contract Documents. Whenever the Architect, Project Inspector or the Construction Manager consider it necessary or advisable, for implementation of the intent of the Contract Documents, they shall have authority to require additional inspections or testing of the Work, whether or not such Work is fabricated, installed or completed. The authority of the Architect, Project Inspector or the Construction Manager or a decision made in good faith by the Architect, Project Inspector or Construction Manager to exercise or not to exercise such authority shall not give rise to a duty or responsibility to the Contractor, Subcontractors, Material Suppliers, their agents or employees, or other persons performing portions of the Work.

3.8. Completion. The Architect, Project Inspector and the Construction Manager will conduct observations to determine the date(s) of Substantial Completion and the date(s) of Final Completion. The Construction Manager will receive from the Contractor and forward to the District, for the District's review and records, written warranties and related documents or other items required by the Contract Documents upon close-out of the Work which are assembled by the Contractor. If a Construction Manager is not retained for the Work, the Contractor shall submit such items to the Architect for forwarding to the District. The Architect, Project Inspector and Construction Manager will verify that the Contractor has complied with all requirements of the Contract Documents and is entitled to receipt of Final Payment.

3.9. Interpretation of Contract Documents; Architect as Initial Arbiter of Disputes. The Architect will interpret and decide matters concerning the requirements of the Contract Documents on written request of either the District or the Contractor. The Architect's response to such requests will be made with reasonable promptness and within the time limits agreed upon, if any. If no agreement is reached establishing the time for the Architect's review and response to requests, the Architect shall be afforded a ten (10) calendar day period after receipt of such request to review and respond thereto. Interpretations and decisions of the Architect will be consistent with the intent of and reasonably inferable from the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both the District and the Contractor,

will not show partiality to either and will not be liable for results of interpretations or decisions so rendered in good faith. The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents. If there is any disagreement, dispute or other matter in controversy between the District and the Contractor, in addition to other requirements established by the Contract Documents or by law, the submission of the same to the Architect for its decision shall be a condition precedent to initiation of dispute resolution procedures.

3.10. Contractor Request for Information. If the Contractor encounters any condition which the Contractor believes, in good faith and with reasonable basis, is the result of an ambiguity, conflict, error or omission in the Contract Documents (collectively "the Conditions"), the Contractor must request information from the Architect necessary to address and resolve any such Conditions before proceeding with any portion of the Work affected or which may be affected by such Conditions. If the Architect reasonably determines that any of Contractor's request(s) for information: (i) does not reflect adequate or competent supervision or coordination by the Contractor or any Subcontractor; or (ii) does not reflect the Contractor's adequate or competent knowledge of the requirements of the Work or the Contract Documents; or (iii) is not justified for any other reason, Contractor shall be liable to the District for all costs incurred by the District to process, review, evaluate and respond to such request for information, including without limitation, fees of the Architect.

3.11. Contractor Responsibility for Construction Means, Methods and Sequences. Neither the District, Project Inspector, Architect or the Construction Manager will have control over or charge of and be responsible for construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the Work, these being solely the Contractor's responsibility. The District, Architect, Project Inspector or Construction Manager have no control over or charge of and are not responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or of any other persons performing portions of the Work.

3.12. Communications. All communications regarding the Work, the performance thereof or the Contract Documents shall be in writing; verbal communications shall be reduced to writing. Communications between the Contractor and the District or the Architect shall be through the Construction Manager, if one is retained for the Work. Communications between the Contractor and the District's separate contractors, if any, shall be through the District. All written communications between the Contractor and any Subcontractor, Material Supplier or others directly or indirectly engaged by the Contractor to perform or provide any portion of the Work shall be available to the District, the Construction Manager and the Architect for review, inspection and reproduction as may be requested from time to time. Failure or refusal of the Contractor to permit the District, the Construction Manager or Architect to review, inspect or reproduce such written communications may be deemed a default of Contractor hereunder.

4. The Contractor

4.1. Contractor Review of Contract Documents.

4.1.1. Examination of Contract Documents. The Contractor shall carefully study Contract Documents and information furnished by the District and shall immediately notify the Architect in writing of errors, inconsistencies or omissions discovered. If the Contractor performs any Work knowing, or with reasonable diligence should have known that, it involves an error, inconsistency or omission in the Contract Documents without prior notice to the Architect, the Contractor shall bear the costs for correction of the same.

4.1.2. Measurements, Layouts and Field Engineering. The Contractor shall take field measurements and verify field conditions at the Site. All field engineering required

for laying out the Work and establishing grades for earthwork operations shall be by an engineer registered under the Laws and without adjustment of the Contract Price. The Contractor shall complete all surveys necessary for performance of the Work and for establishment, location, maintenance and preservation of benchmarks, reference points and stakes for the Work.

4.1.3. Drawings; Dimensions. Unless otherwise expressly provided, dimensions indicated in the Drawings are: (i) intended for reference only; and (ii) diagrammatic and schematic in nature. The Contractor is solely responsible for dimensioning and coordinating the Work of the Contract Documents. No Contract Price adjustment will be allowed on account of differences between actual dimensions and the dimensions indicated on the Drawings.

4.1.4. Work in Accordance With Contract Documents. The Contractor shall perform all of the Work in strict conformity with the Contract Documents and the Laws.

4.2. Site Investigation; Subsurface Conditions.

4.2.1. Subsurface Data. By executing the Agreement, the Contractor acknowledges that it has examined the boring data and other available subsurface data and has satisfied itself as to the character, quality and quantity of surface and subsurface materials, including without limitation, obstacles which may be encountered in performance of the Work. Subsurface data or other soils investigation report provided by the District hereunder are not a part of the Contract Documents. Information contained in such data or report regarding subsurface conditions, elevations of existing grades, or below grade elevations are approximate only and is neither guaranteed or warranted by the District to be complete and accurate. The District assumes no responsibility for any conclusions or interpretations of the Contractor on the basis of available subsurface data or other information furnished by District under the Contract Documents.

4.2.2. Subsurface Conditions. If the Work involves digging trenches or other excavations that extend deeper than four (4) feet below the surface, the Contractor shall promptly and before the following conditions are disturbed, notify the Project Inspector, in writing, of any: (i) material that the Contractor believes may be material that is hazardous waste, as defined in California Health and Safety Code §25117, that is required to be removed to a Class I or Class II or Class III disposal site in accordance with provisions of existing law; (ii) subsurface or latent physical conditions at the site differing from those indicated; or (iii) unknown physical conditions at the site of any unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in the Work or the character provided for in the Contract Documents. If the District determines that the conditions so materially differ or involve such hazardous materials requiring an adjustment to the Contract Price or the Contract Time, the District shall issue a Change Order in accordance with Article 9 hereof. Pursuant to California Public Contract Code §7104, disputes between the Contractor and the District as to any of the conditions listed in (i), (ii) or (iii) above, shall not excuse the Contractor from the completion of the Work within the Contract Time and the Contractor shall proceed with all Work to be performed under the Contract Documents.

4.3. Supervision and Construction Procedures.

4.3.1. Supervision of the Work. The Contractor shall supervise and direct performance of the Work, using the Contractor's best skill and attention. The Contractor is responsible to the District for acts and omissions of the employees, agents and

representatives of the Contractor and Subcontractors.

4.3.2. Noise and Dust Control. The Contractor shall implement all measures necessary for noise and dust control during Work at the Site, including specific care to avoid deposits of airborne dust or airborne elements.

4.3.3. Clean-Up. The Contractor shall at all times keep the Site and all adjoining areas free from the accumulation of any waste material or rubbish. The Contractor shall maintain the Site in a "rake-clean" standard on a daily basis. The Project Inspector or Construction Manager may direct the Contractor's clean-up obligations hereunder. If the Contractor fails to clean up as provided for in the Contract Documents, the District may do so at the Contractor's expense.

4.3.4. Cutting and Patching. The Contractor is responsible for cutting, fitting or patching required to complete the Work or to make the component parts thereof fit together properly. The Contractor shall not damage or endanger any portion of the Work, or the fully or partially completed construction of the District or separate contractors by cutting, patching, excavation or other alteration.

4.3.5. Construction Utilities. The District will furnish and pay the costs of utility services for the Work as set forth in the Special Conditions; all other utilities necessary to complete the Work shall be obtained by the Contractor without adjustment of the Contract Price. The Contractor shall furnish and install temporary distributions of utilities at the Site as necessary for the Work, including utilities furnished by the District. All temporary distributions shall be removed by the Contractor upon completion of the Work. The costs of utility services obtained by the Contractor and the installation and removal of temporary distributions thereof are included in the Contract Price.

4.3.6. Existing Utilities; Removal, Relocation and Protection. Pursuant to California Government Code §4215, the District assumes responsibility for timely removal, relocation, or protection of existing main or trunkline utility facilities located on the Site which are not identified in the Contract Documents. The Contractor shall be compensated for the costs of locating, repairing damage not due to the Contractor's failure to exercise reasonable care, and removing or relocating such utility facilities not indicated in the Contract Documents with reasonable accuracy and for Construction Equipment on the Site necessarily idled during such work. The Contractor shall not be assessed Liquidated Damages for delay in completion of the Work when such delay is caused by the failure of the District or the utility owner to provide for removal or relocation of such utility facilities. The District is not required to indicate existing service laterals or appurtenances if presence of such utilities on the Site can be inferred from the presence of other visible facilities, such as buildings, meters and junction boxes, on or adjacent to the Site. If the Contractor encounters utility facilities not identified in the Contract Documents, the Contractor shall immediately notify, in writing, the District, Project Inspector, Architect, Construction Manager and the utility owner. If such utility facilities are owned by a public utility, the public utility shall have the sole discretion to perform repairs or relocation work or permit the Contractor to do such repairs or relocation work at a reasonable price.

4.4. Conferences and Meetings. A material obligation of the Contractor is the attendance by the Contractor's supervisory and/or management personnel (who shall be authorized to act on behalf of the Contractor) at meetings relating to the Work, including weekly progress meetings. The Contractor is responsible for arranging for attendance by Subcontractors, Material Suppliers at meetings and conferences relating to the Work as necessary, appropriate or as requested by the District. All costs, expenses, charges or fees incurred by the Contractor in

connection with attendance and participation meetings relating to the Work shall be without adjustment of the Contract Time or the Contract Price. The Architect or Construction Manager will prepare and distribute minutes reflecting the items addressed and actions taken at a meeting or conference. The Contractor shall have five (5) days after the date of distribution of minutes to notify the Construction Manager and Architect in writing of objections to such minutes. Failure of the Contractor to interpose objections within said five (5) days will result the minutes as distributed constituting the official record of the meeting or conference. Objections of Subcontractors or Material Suppliers to minutes shall be submitted to the Architect or Construction Manager through the Contractor. If the Contractor timely interposes objections or notes corrections, the resolution of such matters shall be addressed at the next scheduled meeting.

4.5. Labor and Materials.

4.5.1. Payment for Labor, Materials and Services. The Contractor shall provide and pay for labor, materials, equipment, tools, Construction Equipment and machinery, water, heat, utilities, transportation, and other facilities and/or services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated in the Work.

4.5.2. Employee Discipline and Competency. The Contractor shall enforce strict discipline and good order among employees of the Contractor, Subcontractors and all other persons performing any part of the Work at the Site. The Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them. The Contractor shall dismiss from its employ and direct any Subcontractor to dismiss from their employment any person deemed by the District to be unfit or incompetent to perform Work.

4.5.3. Contractor's Superintendent. The Contractor's superintendent shall at the Site at all times during the Work. The superintendent shall represent the Contractor and communications given to the superintendent shall be binding as if given to the Contractor. The Contractor shall submit to the District a written statement of the qualifications of the Contractor's proposed Superintendent. Acceptance of the Contractor's proposed Superintendent is subject to establishing the Superintendent's: (i) skills, experience and other capabilities of the proposed Superintendent to supervise, coordinate and manage the Work; (ii) fluent verbal and written English language capabilities; (iii) competency in reading, comprehending and understanding Drawings, Specifications and other technical construction-related materials; and (iv) recent experience in completing construction projects similar to the Work within the budget and time established for such other construction projects. Upon acceptance of the Contractor's Superintendent, the Contractor shall not be change the Superintendent without prior consent of the District, unless the Superintendent: (i) is unsatisfactory to the Contractor; or (ii) is determined by the District to be unfit, incompetent or incapable of performing functions and responsibilities assigned.

4.5.4. Prohibition on Harassment. Any person engaging in a prohibited form of harassment is subject to immediate removal and thereafter excluded from the Site. Upon the District's receipt of any notice or complaint that a person performing Work at the Site has engaged in a prohibited form of harassment ("Worker"), the District will promptly undertake an investigation of such notice or complaint. If the District, after such investigation, reasonably determines that a prohibited form of harassment has occurred, the District will notify the Contractor of the same and direct that the Worker be immediately removed from the Site. Unless the District's determination

is grossly negligent or without reasonable cause, District shall have no liability for directing the removal of any Worker determined to have engaged in a prohibited form of harassment nor shall the Contract Price or the Contract Time be adjusted on account thereof. The Contractor and the Surety shall defend, indemnify and hold harmless the Indemnified Parties from any and all claims, liabilities, judgments, awards, actions or causes of actions, including without limitation, attorneys' fees, which arise out of, or pertain in any manner to: (i) the assertion by any Worker that the direction of the District pursuant to the foregoing was improper; or (ii) the assertion by any person that a Worker has engaged in a prohibited form of harassment directed to or affecting such person.

4.5.5. Taxes. The Contractor shall pay, without adjustment of the Contract Price, all sales, consumer, use and other taxes for the Work or portions thereof provided by the Contractor under the Contract Documents.

4.6. Permits, Fees and Notices; Compliance With Laws**.**

4.6.1. Payment of Permits, Fees. Unless otherwise provided in the Contract Documents, the District shall secure and pay for the building permits, other permits, governmental fees, licenses and inspections necessary or required for the proper execution and completion of the Work. The foregoing notwithstanding: (i) the Contractor shall pay all fees, costs or other expenses associated with or arising in connection with Deferred Approval Items without adjustment of the Contract Price; and (ii) the Contractor shall obtain the following permits/approvals if applicable to the Work without adjustment of the Contract Price: (a) Temporary Fire Department plan check and permits for temporary material handling, storage and/or dispensing facilities for fuel, oil, liquid or gases; (b) industrial waste and AQMD permits relating to temporary facilities used in connection with any portion of the Work; (c) local business license; (d) traffic control, OSHA and offsite improvement permits; and (e) sewer, water, storm drain, gas tie plan check permits.

4.6.2. Compliance With Laws. The Contractor shall comply with and give notices required by the Laws and other orders of public authorities bearing on performance of the Work. All Work completed by the Contractor shall be in compliance with the Laws.

4.6.3. Notice of Variation From Laws. If the Contractor knows, or has reason to believe, that any portion of the Contract Documents are at variance with applicable Laws, the Contractor shall promptly notify the Architect, Construction Manager and the Project Inspector, in writing, of the same. If the Contractor performs Work knowing, or with reasonable diligence should have known, it to be contrary to the Laws without such notice to the Architect, Construction Manager and the Project Inspector, the Contractor shall assume full responsibility for such Work and shall bear the attributable costs arising or associated therefrom, including without limitation, the removal, replacement or correction of the same.

4.6.4. DIR Registration. At all times during the Work, the Contractor shall be a DIR registered contractor. Performance of any Work by the Contractor without the Contractor being a DIR registered contractor at the time Work is performed is the Contractor's default in performance of a material obligation of the Contractor under the Contract Documents.

4.7. Submittals. Submittals are not part of the Contract Documents. Submittals shall demonstrate, for those portions of the Work for which Submittals are required, the manner in which the Contractor proposes to furnish, install or incorporate such Work in conformity with the information given and the design concept expressed in the Contract Documents.

4.7.1. Contractor's Submittals.

4.7.1.1. Prompt Submittals. All Submittals required by the Contract Documents shall be prepared, assembled and submitted by the Contractor to the Architect in a timely manner or within the time indicated in the Submittal Schedule incorporated into the Accepted Construction Schedule.

4.7.1.2. Contractor Approval of Subcontractor Submittals. All Submittals prepared by Subcontractors or Material Suppliers shall bear the written approval of the Contractor prior to submission to the Architect for review, with the approval indicating that the Contractor has verified materials, field measurements, field construction criteria, catalog numbers and similar data related thereto and has verified that the information contained within such Submittals conform to the requirements the Contract Documents. Any Submittal submitted without the Contractor's written approval will be returned to the Contractor for re-submittal in conformity herewith, with the same being deemed to not have been submitted. Submittals shall be numbered consecutively and include the following: (i) date of submission; (ii) project name; (iii) name of submitting Subcontractor; and (iv) if applicable, the revision number. The foregoing information is in addition to, and not in lieu of, any other information required for the Architect's review of Submittals.

4.7.1.3. Contractor Responsibility for Deviations. The Contractor is not relieved of responsibility for correcting deviations from the Contract Documents by the Architect's review of Submittals unless the Contractor specifically informs the Architect in writing of such deviation at the time of submission of the Submittal and the Architect accepts the specific deviation.

4.7.1.4. No Performance of Work Without Architect Review. The Contractor shall perform no portion of the Work requiring the Architect's review of Submittals until the Architect has completed its review and accepted the Submittal. The Contractor shall not perform any portion of the Work affected by a related Submittal until the related Submittal is reviewed and accepted by the Architect.

4.7.2. Architect Review of Submittals. If the Architect returns a Submittal as rejected or requiring correction(s) with re-submission, the Contractor shall promptly resubmit a Submittal conforming to the requirements of the Contract Documents; the resubmitted Submittal shall indicate the portions thereof modified in accordance with the Architect's direction. When professional certification of performance criteria of materials, systems or equipment is required by the Contract Documents, the Architect may rely on the accuracy and completeness of such calculations and certifications accompanying Submittals. The following notations or notations of a similar nature noted on a reviewed Submittal will require the Contractor action noted below.

Submittal Notation	Required Contractor Action
No Exceptions Taken	No formal revision required
Make Corrections Noted	Make revision noted; re-submission of revised Submittal not required.
Revise and Re-Submit	Revise Submittal in accordance with notations and re-submit for review.
Rejected Re-Submit	Prepare new alternative Submittal and re-submit for review.

4.7.3. Deferred Approval Items. If any portion of the Work is designated in the Contract Documents as a "Deferred Approval" item, Contractor is responsible for preparing Submittals for Deferred Approval Items. Where required by the Laws or the nature of a Deferred Approval, the Deferred Approval Design shall be completed and stamped by a California licensed architect or California registered engineer. The Deferred Approval Design shall: (i) incorporate all requirements of the Deferred Approval as set forth in the Contract Documents; (ii) be coordinated with other portions of the Work; (iii) be completed in a timely manner so as not to delay, disrupt or interfere with completion of the Work within the Contract Time; and (iv) be completed in accordance with the applicable professional standard of care. The Contractor shall submit each completed Deferred Approval Design to the Architect for review and acceptance. Upon the Architect's acceptance of a Deferred Approval Design, the Contractor shall be responsible for: (i) submittal of the Deferred Approval Design to DSA for review and approval; (ii) modifications to the Deferred Approval Design as necessary to obtain DSA approval; and (iii) payment of fees or charges imposed by DSA for review and approval of a Deferred Approval Design without adjustment of the Contract Price. Notwithstanding review and acceptance of a Deferred Approval Design by the Architect or DSA issuance of approval to construct pursuant to the Contractor's Deferred Approval Design, the Contractor remains liable to the District for all losses, damages, costs, or other consequences of the failure of any Contractor's Deferred Approval Design to: (i) conform to the applicable design professional standard of care; (ii) conform to design intent and/or aesthetic requirements established in the Contract Documents; or (iii) perform and function in accordance with requirements established in the Contract Documents.

4.8. Materials and Equipment.

4.8.1. Approval of Substitutions or Alternatives. The Contractor may propose alternatives or substitutes for items specified in the Contract Documents ("Alternative Products"), provided that: (i) the Alternative Products comply with the requirements of the specified item; (ii) the Contractor certifies that the quality, performance capability and functionality (including aesthetics) of the Alternative Products meet or exceed the quality, performance capability and functionality of the specified item; and (iii) use of the Alternative Product will not delay completion of the Work or increase the Contract Price. The Contractor shall submit engineering, construction, dimension, visual, aesthetic and performance data ("Substantiating Data") to the Architect to permit evaluation of the Alternative Products. The Contractor shall not furnish or install any Alternative Products without the Architect's acceptance of the Alternative Products. The Architect's decision evaluating the Contractor's proposed Alternative Products shall be final. Neither the Contract Time nor the Contract Price shall be increased on account of any Alternative Products accepted by the Architect. The Contract Price shall be reduced by the actual cost savings realized by the Contractor's furnishing and/or installation of accepted Alternative Products. The Contractor is solely responsible for all costs and fees incurred by the District to review proposed Alternative Products, including without limitation fees of the Architect, design consultants to the Architect and/or governmental agencies to review and/or approve any proposed substitution or alternative. All requests for the Architect's review and approval of any Alternative Products and all Substantiating Data shall be submitted by Contractor not later than thirty-five (35) days following the date of the District's award of the Contract to Contractor; any request for approval of Alternative Products submitted thereafter may be rejected summarily. The foregoing process and time limits shall apply to any proposed Alternative Products regardless of whether the Alternative Products are furnished or installed

by the Contractor, a Subcontractor or Material Supplier.

4.8.2. District Standard Products; "Sole Source" Products. If any material, equipment, product or other item ("Product") is designated in the Contract Documents as a "District Standard" or by similar words/terms, the District is deemed to have made a finding that such Product is designated and specified to match other Products in use in a completed or to be completed work of improvement and not subject to Alternative Products.

4.8.3. Placement of Material and Equipment Orders. The Contractor and Subcontractors shall promptly place all orders for materials and/or equipment for completion of the Work so that delivery of the same shall be made without delay or interruption to the Work. When requested by or on behalf of the District, the Contractor shall furnish written evidence of the placement of orders for materials and/or equipment necessary for completion of the Work, including without limitation, orders for materials and/or equipment to be provided, furnished or installed by any Subcontractor.

4.8.4. District's Right to Place Orders for Materials and/or Equipment. If the District determines, in its sole discretion, that orders for materials and/or equipment have not been placed in a manner so Substantial Completion is achieved within the Contract Time, the District shall have the right, but not the obligation, to place such orders on behalf of the Contractor. The Contractor shall reimburse the District for all costs and fees incurred by the District in placing such orders.

4.9. Safety; Security.

4.9.1. Safety. The Contractor is solely responsible for initiating, maintaining and supervising all safety programs required by the Laws or by the type or nature of the Work and for initiating and maintaining reasonable safety precautions to prevent damage, injury or loss to: (i) employees on the Work and other persons who may be affected thereby; (ii) the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site or in transit; and (iii) other property or items at the Site, or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction. The foregoing includes, without limitation, posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent sites and utilities. The Contractor shall implement and enforce personal safety measures required by the Laws for personnel at the Site. The Contract Price and the Contract Time are not subject to adjustment for the Contractor's compliance with personal and site safety requirements required by the Laws, unless personal or site safety requirements are amended during performance of the Work. In such event, the Contract Price may be adjusted for actual direct costs of materials or equipment required to comply with such amended personal or site safety requirements; no adjustment of the Contract Price shall be allowed for any impacts or consequences of any such amended personal or site safety requirements, including without limitation loss of productivity, loss of efficiency, hindrances or delays in completing the Work. If amended personal or site safety requirements directly affect Work on the critical path of the Updated Construction Schedule as of the effective date of any amended personal or site safety requirements, the Contract Time shall be equitably adjusted, provided that any such adjustment of the Contract Time shall not result in adjustment of the Contract Price. Duties of the Contractor's Superintendent include prevention of accidents and the implementation of safety precautions and programs. In an

emergency, the Contractor shall take necessary action to prevent or mitigate threatened damage, injury or loss.

4.9.2. Security. The Contractor is responsible for securing the Site and Work in place or in progress (including materials/equipment/tools situated at the Site) to prevent theft, loss or damage. The District and employees, officers, agents or representatives of the District are not liable to the Contractor, Subcontractors or their respective personnel for the loss, theft, damage or destruction of materials, equipment, tools and other personal property items, whether or not such personal property is used to complete the Work or is incorporated into the Work. The risk of such loss, theft, damage or destruction is solely that of the Contractor or Subcontractors.

4.10. Hazardous Materials; Prohibition on Use of Asbestos Construction Building Materials ("ACBMs"). If the Contractor or any Subcontractor uses, at the Site, or incorporates into the Work, any material or substance deemed to be hazardous or toxic under the Laws (collectively "Hazardous Materials"), the Contractor shall comply with the Laws relating to the use, storage or disposal thereof. It is the intent of the District that ACBMs not be used or incorporated into any portion of the Work. If any product or material forming a part of the Work or incorporated into the Work if found to contain ACBMs, the Contractor shall at its sole cost and expense: (i) remove such product or material in accordance with the Laws; (ii) replace such product or material with non-ACBM products or materials; and (iii) return the affected portion(s) of the Work to the finish condition depicted in the Contract Documents relating to such portion(s) of the Work. The foregoing obligations shall survive the termination of the Contract, the warranty period provided under the Contract Documents, completion of the Work or the District's acceptance of the Work. If the Contractor fails or refuses, for any reason, to commence the removal and replacement of any material or product containing ACBMs forming a part of, or incorporated into the Work, within ten (10) days of the date of the District's written notice to the Contractor, the District may thereafter proceed to cause the removal and replacement of such materials or products; all costs, expenses and fees, including without limitation fees and costs of consultants and attorneys, shall be the joint and several responsibility of the Contractor and the Surety.

4.11. Maintenance of Record Drawings. During the Work, the Contractor shall continuously maintain Record Drawings consisting of a set of the Drawings marked to indicate all field changes to adapt the Work depicted in the Drawings to field conditions, Change Orders and all concealed or buried installations, including without limitation, piping, conduit and utility services. Record Drawings relating to the Structural, Mechanical, Electrical and Plumbing portions of the Work shall indicate without limitation, circuiting, wiring sizes, equipment/member sizing and shall depict the entirety of the as built conditions of such portions of the Work. If the District reasonably determines that the Contractor has not been, or is not, continuously maintaining the Record Drawings pursuant to the foregoing, the District may take appropriate action to cause the continuous maintenance of complete and accurate Record Drawings, at the Contractor's expense. Prior to receipt of the Final Payment, Contractor shall deliver the Record Drawings to the Architect.

4.12. Use of Site. The Contractor shall confine operations at the Site to areas permitted the Laws and the Contract Documents and shall not unreasonably encumber the Site or adjoining areas with materials or equipment. The Contractor is solely responsible for providing security at the Site with all such costs included in the Contract Price. Except in an emergency, no construction activities shall be permitted at or about the Site except during the hours and days set forth in the Special Conditions; Work performed at hours or on days not noted in the Special Conditions will not result in adjustment of the Contract Time or the Contract Price.

4.13. Access to the Work. The Contractor shall provide DSA, District, Construction Manager, the Project Inspector and Architect with access to the Work, whether in place, preparation and progress and wherever located.

4.14. Patents and Royalties. The Contractor and the Surety shall defend, indemnify and hold harmless the District and its agents, employees and officers from any claim, demand or legal proceeding arising out of or pertaining, in any manner, to any actual or claimed infringement of patent rights in connection with performance of the Work under the Contract Documents.

4.15. Wage Rates; Employment of Labor.

4.15.1. Payment of Prevailing Rates. There shall be paid each worker of the Contractor and Subcontractors engaged in the Work, not less than the general prevailing wage rate, regardless of any contractual relationship which may be alleged to exist between the Contractor or any Subcontractor and such worker. During the Work and pursuant to Labor Code §1771.4(a)(4), the Department of Industrial Relations will monitor and enforce the obligation of the Contractor and Subcontractors to pay laborers at least the Prevailing Wage Rate established for the classification of work/labor performed.

4.15.2. Prevailing Rate Penalty. If a worker of the Contractor or a Subcontractor is paid less than the prevailing wage rate for the work or craft provided by the worker, the Contractor and/or Subcontractor shall be subject all penalties and assessments established by the Laws.

4.15.3. Certified Payroll Records. The Contractor and all Subcontractors shall prepare and submit Certified Payroll Records to the Labor Commissioner in compliance with requirements established in Labor Code §1771.4. The form and content of Certified Payroll Records shall be as established by the Labor Commissioner and the frequency of Certified Payroll Records submittal to the Labor Commissioner shall be pursuant to Labor Code §1771.4. Pursuant to California Labor Code §1776, the Contractor and each Subcontractor shall keep accurate payroll records, showing the name, address, social security number, work classification, straight time and overtime hours worked each day and week, and the actual per diem wages paid to each person employed for the Work. The payroll records shall be certified and available for inspection at all reasonable hours at the principal office of the Contractor in accordance with the Laws. If the Contractor and/or Subcontractor fail or refuse to produce payroll records as required by the Laws, the Contractor and/or Subcontractor shall be subject to all penalties and assessments under the Laws as a result of such failure or refusal.

4.15.4. Hours of Work. The Contractor and Subcontractors shall limit the hours of work by their respective workers to those permitted by the Laws. Hours of work exceeding those permitted by the Laws shall be subject to additional premium wage payments as required by the Laws. Failure of the Contractor or Subcontractors to comply with the foregoing will subject the Contractor and/or Subcontractor to all penalties and assessments under the Laws.

4.16. Apprentices. Apprentices for the Work shall be in strict conformity with the Laws, including without limitation, Labor Code §§1777.5 through 1777.7, the provisions of which are incorporated herein by this reference. The responsibility for compliance with apprenticeship requirements is solely and exclusively that of the Contractor. If the Contractor willfully fails to comply with these provisions and California Labor Code §1777.5, pursuant to California Labor Code §1777.7, the Contractor shall be subject to all penalties and assessments established by the Laws.

4.17. Employment of Independent Contractors. Pursuant to California Labor Code §1021.5, Contractor shall not willingly and knowingly enter into any agreement with any person, as an independent contractor, to provide services for the Work where the services provided or to be provided requires the person to hold a valid California Contractors' license and such person does not meet the burden of proof of his/her independent contractor status pursuant to California Labor Code §2750.5. Employment of any person in violation of the foregoing, will subject the Contractor to the civil penalties under California Labor Code §1021.5 and any other penalty provided by the Laws. All Subcontractors shall comply with the foregoing.

4.18. Assignment of Antitrust Claims. The Contractor and all Subcontractors assign to the District all rights, title and interest in and to all causes of action they may have under Section 4 of the Clayton Act, (15 U.S.C. §15) or under the Cartwright Act (California Business and Professions Code §§16700 et seq.) pursuant to California Government Code §4551. This assignment shall be made and become effective at the time the District tenders Final Payment to the Contractor, without further acknowledgment by the parties.

4.19. DSA Construction Oversight. All of the Work is subject to DSA Construction Oversight processes and procedures; a material obligation of the Contractor hereunder is the Contractor's compliance with the processes and procedures established by DSA for the Work. As applicable, the foregoing shall include without limitation, the processes and procedures established under DSA PR 13-01 in effect at the time of performing the Work hereunder. The foregoing shall include:

4.19.1. DSA Approved Documents. The Contractor shall carefully study the DSA approved documents and shall plan a schedule of operations well ahead of time.

4.19.2. Correction of Non-Conforming Work. If at any time it is discovered that Work is not in accordance with the DSA approved construction documents, the Contractor shall correct the Work immediately.

4.19.3. Verification of DSA 152 Forms. The Contractor shall verify that DSA 152 forms were issued for prior to the commencement of construction.

4.19.4. Test/Inspection Communications. The Contractor shall meet with the Architect, Construction Manager, the Laboratory of Record retained by the District for special tests/inspections and the Project Inspector to mutually communicate and understand the testing and inspection program, and the methods of communication appropriate for the Work.

4.19.5. DSA Form 156 Notifications to Project Inspector. The Contractor shall notify the Project Inspector, in writing, of the commencement of construction of each and every aspect of the Work at least 48 hours in advance by submitting Commencement/Completion of Work Notification (form DSA 156), or other agreed upon written documents, to the Project Inspector. The Contractor shall notify the Project Inspector of the completion of construction of each and every aspect of the Work by submitting form DSA 156 (or other agreed upon written documents) to the Project Inspector.

4.19.6. Limitations on Contractor Work. Until the Project Inspector has signed off applicable blocks and sections of the form DSA 152, the Contractor may be prohibited from proceeding with subsequent construction activities that cover up the unapproved Work. Any subsequent construction activities, that cover up the unapproved Work, will be subject to a "Stop Work Order" from DSA or the District, and are subject to removal and remediation if found to be in non-compliance with the DSA approved construction documents.

4.19.7. Final Verified Report. The Contractor shall submit the final Contractor Verified Report. (form DSA 6-C) to DSA and the Project Inspector. The DSA 6-C reports are required to be submitted by the Contractor upon occurrence of any of the following events: (i) the Work is substantially complete (DSA considers the Work to be complete when the construction is sufficiently complete in accordance with the DSA approved construction documents so that the owner can occupy or utilize the Work); (ii) Work is suspended for a period of more than one (1) month; (iii) services of the Contractor are terminated for any reason prior to the completion of the Work; or (iv) DSA requests a verified report.

4.19.8. Failure to Submit Final Verified Report. Should Contractor fail or refuse to submit the final Contractor Verified Report (form DSA 6-C) to DSA and the Project Inspector, the Final Payment due the Contractor shall be reduced by Twenty-Five Thousand Dollars ($25,000.00) until such time as the Contractor submits the final Contractor Verified Report (form DSA 6-C) to DSA and the Project Inspector.

4.19.9. DSA Verified Reports.

4.19.9.1. Contractor Actions. The Contractor acknowledges and agrees that a material obligation of the Contractor under the Contract Documents is the completion by the Contractor of all actions and activities which by the Contract Documents or by the Laws are the responsibility of the Contractor relating to DSA reporting requirements pursuant to Education Code §81141 (including amendments thereto) and issuance of DSA's Certificate of Compliance for the Project pursuant to Education Code §81147 (including amendments thereto) upon completion of the Work. The foregoing shall include without limitation, the timely preparation, completion and filing of Verified Reports during Project construction and the filing of the Final Verified Report with DSA within thirty (30) days of the determination of Final Completion. The Contractor shall provide the District, the Project Inspector, Architect, Construction Manager with copies of all Verified Reports completed by the Contractor and submitted to DSA; such copies shall be provided to the Project Inspector, Architect, the Construction Manager and the District concurrently with the Contractor's submission thereof to DSA.

4.19.9.2. District Withholdings From Final Payment. Notwithstanding any provision of the Contract Documents to the contrary, the completion and filing of the Final Verified Report with DSA by the Contractor is an express condition precedent to the District's disbursement of the Final Payment. If the Contractor fails to prepare and file the Final Verified Report with DSA within thirty (30) days of the determination of Final Completion, the District may in the sole and exclusive discretion of the District retain and withhold ten percent (10%) of the Final Payment from disbursement to the Contractor as damages for the failure of the Contractor to have timely and completely discharged its obligations hereunder. The Contractor acknowledges and agrees that the foregoing withholdings by the District is a reasonable estimate of the damages and other losses the District will sustain due to the failure of the Contractor to have timely and fully discharged its obligations hereunder.

4.20. Community Benefits Agreement. The Work is subject to the Community Benefit Agreement ("CBA") between the District and the Los Angeles/Orange Counties Building and Trades Council. Labor utilized to complete the Work shall be subject to the requirements and processes set forth in the CBA. Jurisdictional disputes and other matters relating to the utilization of labor to complete the Work shall be handled and processed in accordance with applicable terms of the CBA. The CBA is incorporated into and made a part of the Contract

Documents.

5. Subcontractors.

5.1. Subcontracts. Work performed by Subcontractors shall be pursuant to a written agreement between the Contractor and each Subcontractor which specifically incorporates by reference the Contract Documents and which specifically binds the Subcontractor to the applicable terms and conditions of the Contract Documents, including without limitation, the policies of insurance required under Article 6 of these General Conditions and obligates the Subcontractor to assume toward the Contractor and Architect all the obligations and responsibilities of the Contractor which the Contractor assumes toward the District and the Architect. No contractual relationship shall exist, or deemed to exist, between any Subcontractor and the District, unless the Contract is terminated and District, in writing, elects to assume the Subcontract. Each Subcontract shall provide that such Subcontract may be assigned to the District if the Contract is terminated by the District pursuant to these General Conditions, subject to the prior rights, if any, of the Surety.

5.2. Subcontractor DIR Contractor Registration.

5.2.1. No Subcontractor Performance of Work Without DIR Registration. No portion of the Work is permitted to be performed by a Subcontractor unless the Subcontractor is a DIR Registered contractor. The foregoing DIR contractor registration requirement is applicable for all Subcontractors, including without limitation, lower tier Subcontractors and Subcontractors who are not identified in the Contractor's Subcontractors List.

5.2.2. Contractor Obligation to Verify Subcontractor DIR Registration Status. An affirmative and on-going obligation of the Contractor under the Contract Documents is the Contractor's verification that all Subcontractors are at all times during performance of the Work in full and strict compliance with DIR contractor registration requirements. The Contractor shall not permit or allow any Subcontractor to perform any Work without the Contractor's verification that the Subcontractor is in full and strict compliance with DIR contractor registration requirements.

5.2.3. Contractor Obligation to Request Substitution of Listed Subcontractor Who Is Not DIR Registered Contractor. If any Subcontractor identified in the Contractor's Subcontractors List submitted with the Contractor's proposal for the Work is not a DIR registered contractor at the time of opening of proposals for the Work or if a Subcontractor's DIR contractor registration lapses prior to or during a Subcontractor's performance of Work, the Contractor shall request the District's consent to substitute the Subcontractor who is not a DIR registered contractor pursuant to Labor Code §1771.1(c)(3) and/or Labor Code §1771.1(d).

5.3. Substitution of Listed Subcontractor.

5.3.1. Substitution Process. Any request of the Contractor to substitute a listed Subcontractor must be in strict conformity with this Article 5.2 and California Public Contract Code §4107. All costs, fees or expenses incurred by the District, including, those of the Project Inspector, Architect and/or Construction Manager or attorneys in review, evaluation or hearing relating to a request to substitute a listed Subcontractor shall be borne by the Contractor.

5.3.2. Responsibilities of Contractor Upon Substitution of Subcontractor. The District's consent to Contractor's substitution of a listed Subcontractor shall not result in any increase of the Contract Price or the Contract Time.

5.4. Subcontractors' Work. Whenever the Work of a Subcontractor is dependent upon the Work of the Contractor or another Subcontractor, the Contractor shall require the Subcontractor to: (i) coordinate its Work with the dependent Work; (ii) provide necessary dependent data and requirements; (iii) supply and/or install items to built into the dependent Work of others; (iv) make appropriate provisions for dependent Work of others; (v) carefully examine and understand the portions of the Contract Documents (including Drawings, Specifications and Field Clarifications) and Submittals relating to the dependent Work; and (vi) examine the existing dependent Work and verify that the dependent Work is in proper condition for the Subcontractor's Work.

5.5. Subcontractors' CBA Letter of Assent. All Subcontractors, of any tier, must execute and deliver to the District the Subcontractor's executed CBA Letter of Assent as a condition to and performing Work at the Site. No Subcontractor is permitted to Work until the Subcontractor has submitted its executed CBA. All Subcontractors are bound by the terms of the CBA, including amendments thereto.

6. Insurance; Indemnity; Bonds

6.1. Owner Controlled Insurance Program ("OCIP"). The District has elected, at its sole discretion, to implement an Owner Controlled Insurance Program ("OCIP") under the Statewide Educational Wrap Up Program ("SEWUP"). The SEWUP Joint Powers Authority ("JPA") will be providing the OCIP on behalf of the District. The requirements for enrollment in the OCIP, OCIP forms, OCIP coverages and other OCIP requirements are set forth in the OCIP Program description incorporated as Attachment G to the Special Conditions.

6.2. Contractor OCIP Obligations.

6.2.1. Compliance With OCIP Requirements. Contractor agrees to comply with any and all terms and conditions of the policies of insurance provided by the District and to comply with any and all claims handling procedures, loss prevention programs and other programs required by or related to the District's OCIP as set forth herein. Contractor shall require Subcontractors and Sub-Subcontractor and all others covered by the District's OCIP insurance policies to so comply.

6.2.2. Contractor Furnishing of Information. Contractor, its Subcontractor and Sub-Subcontractors shall furnish to the District, the Architect, the OCIP Administrator, its designees or the insurers under the OCIP policies, all information and documentation that such entity may require from time to time in connection with the issuance of policies under this Contract or the administration of the OCIP in such form and substance as such entity may prescribe and promptly comply with the recommendations of the OCIP insurers.

6.2.3. No Violation of OCIP Insurance Policy Conditions. Contractor shall not violate, or knowingly permit to be violated; any conditions of the policies of insurance provided by the District hereunder and shall at all times satisfy the requirements of the insurers issuing them. Contractor shall assure that all OCIP requirements imposed upon, assumed and performed by each Subcontractor and Sub-Subcontractor.

6.2.4. District Rights. If the Contractor, Subcontractors, Sub-Subcontractors, or Excluded Parties should fail to comply with the Non-OCIP Insurance requirements, the District may withhold payment due to the Contractor or suspend the Work at the Contractors' sole expense and without adjustment of the Contract Price or Contract Time until such time as the Contractor, its Subcontractor, Sub-Subcontractors, and/or Excluded Parties have performed such obligations to the reasonable satisfaction of the District.

6.2.5. Withholding of Progress Payments/Final Payment. In addition to the rights of the District to withhold all or portions of Progress Payments or the Final Payment set forth elsewhere in the Contract Documents, the District may withhold Progress Payments or the Final Payment for the failure or refusal of the Contractor to comply with OCIP requirements, including without limitation, the reporting requirements set forth in the OCIP Program description or the OCIP insurance policies. Amounts withheld by the District pursuant to the preceding will be released only after the Contractor and/or Subcontractors' compliance with OCIP requirements, less costs and expenses incurred by the District in securing such compliance.

6.3. Contractor/Subcontractor Provided Insurance Requirements. The Contractor and Subcontractors shall obtain and maintain for the duration of the Work each of the Contractor/Subcontractor Provided insurance policies as set forth in the OCIP Program description.

6.4. Payment Bond; Performance Bond. Prior to commencing the Work, the Contractor shall obtain and deliver to the District a Performance Bond and a Labor and Material Payment Bond each in a penal sum equal to one hundred percent (100%) of the Contract Price and in the form and content set forth in the Contract Documents. The Surety issuing bonds shall be an Admitted Surety Insurer as defined in California Code of Civil Procedure §995.120 and A.M. Best rated at least A-/VII. Obligations of the Surety under the Performance Bond include without limitation, the Contractor's post-construction obligations, including timely and complete performance of warranty/guarantee obligations.

6.5. Contractor Indemnity. To the maximum extent possible permitted by the Laws, Contractor shall indemnify, defend and hold harmless the Indemnified Parties who are: (i) the District, its Board of Trustees and each individual member thereof, and the officers, employees, agents and representatives of the District; (ii) the Architect and its consultants for the Work and their respective agents and employees; (iii) the Project Inspector; and (iv) the Construction Manager and its agents and employees. The Contractor shall indemnify, defend and hold harmless the Indemnified Parties from and against any and all damages, losses, claims, demands or liabilities whether for damages, losses or other relief, including, without limitation attorneys' fees and costs which arise, in whole or in part, from the Work, the Contract Documents or the acts, omissions or other conduct of the Contractor, Subcontractor or any person or entity engaged by them for the Work. The Contractor's obligations under the foregoing include without limitation: (i) injuries to or death of persons; (ii) damage to property; (iii) theft, loss or destruction of property; (iv) Stop Payment Notice claims asserted in connection with the Work; and (v) other losses, liabilities, damages or costs resulting from, in whole or part, the negligent, grossly negligent or willful acts, omissions or other conduct of Contractor, any Subcontractor, or any other person or entity employed directly or indirectly by Contractor or a Subcontractor in connection with the Work and their respective agents, representatives, officers or employees. If any action or proceeding is commenced on account of any claim, demand or liability subject to Contractor's obligations hereunder, and any of the Indemnified Parties are a party thereto, the Contractor shall, at its sole cost and expense, defend the Indemnified Parties in such action or proceeding with counsel reasonably satisfactory to the named Indemnified Parties. If there is any judgment, award, ruling, settlement, or other relief arising out of any such action or proceeding to which any of the Indemnified Parties are bound by, the Contractor shall pay, satisfy or otherwise discharge any such judgment, award, ruling, settlement or relief; Contractor shall indemnify and hold harmless the Indemnified Parties from any and all liability or responsibility arising out of any such judgment, award, ruling, settlement or relief. The Contractor's obligations hereunder are binding upon Contractor's Performance Bond Surety and these obligations shall survive notwithstanding Contractor's completion of the Work or the termination of the Contract, until barred by the applicable Statute of Limitations.

7. Contract Time

7.1. Substantial Completion of the Work Within Contract Time. The Contract Time is the period of time, including authorized adjustments thereto, for achieving Substantial Completion of the Work. The date for commencement of the Work is the date established in the Notice to Proceed issued by the District pursuant to the Agreement, which shall not be postponed by the failure to act of the Contractor or of persons or entities for which the Contractor is responsible. The date of Substantial Completion is the date certified by the Architect, Construction Manager and Project Inspector.

7.2. Progress and Completion of the Work.

7.2.1. Time of Essence. Time limits stated in the Contract Documents are of the essence. The Contractor shall employ and supply a sufficient force of workers, material and equipment, and prosecute the Work with diligence so as to maintain progress, to prevent Work stoppage and to achieve Substantial Completion of the Work within the Contract Time.

7.2.2. Substantial Completion. Substantial Completion is when the Work is complete in accordance with the Contract Documents so the District can occupy or use the Work for its intended purpose. Substantial Completion shall be determined by the Architect, Construction Manager and Project Inspector upon request by the Contractor. The good faith and reasonable determination of Substantial Completion by the Project Inspector, Construction Manager and the Architect shall be controlling and final.

7.2.3. Correction or Completion of the Work After Substantial Completion.

7.2.3.1. Punchlist. Upon achieving Substantial Completion of the Work, the District, The Project Inspector, Construction Manager, Architect and Contractor shall jointly inspect the Work and prepare a comprehensive list of items of the Work to be corrected or completed by the Contractor ("the Punchlist"). The exclusion of an item on the Punchlist shall not limit the Contractor's obligation to complete or correct any portion of the Work in accordance with the Contract Documents.

7.2.3.2. Time for Completing Punchlist Items. The Construction Manager, Contractor and Architect shall, establish a reasonable time for Contractor's completion of the Punchlist. If mutual agreement is not reached, the Architect shall determine such time, which is final and binding upon the District and Contractor so long as the Architect's determination is made in good faith. The Contractor shall promptly and diligently complete all Punchlist items within the time established. If the Contractor fails to complete the Punchlist within the time established, the Contractor shall be subject to assessment of Liquidated Damages and the District may in its sole and exclusive discretion, without further notice to Contractor, elect to cause the completion of all remaining Punchlist items provided, however, that such election by the District is in addition to and not in lieu of any other right or remedy of the District under the Contract Documents or the Laws, including assessment of Liquidated Damages. If the District elects to complete Punchlist items of the Work, pursuant to the foregoing, the Contractor shall be responsible for all costs incurred by the District in connection herewith. If these costs exceed the remaining Contract Price due to the Contractor, the Contractor and the Performance Bond Surety are jointly and severally liable to District for any such excess costs.

7.2.3.3. Final Completion. Final Completion is when all Work has been completed in accordance with the Contract Documents, including without limitation, completion of the Punchlist, the Contractor's close-out responsibilities under the Contract

Documents have been fully performed. Final Completion shall be determined by the Architect, Construction Manager and Project Inspector upon request of the Contractor. The good faith and reasonable determination of Final Completion by the Project Inspector, Construction Manager and Architect shall be controlling and final.

7.2.3.4. Contractor Responsibility for Multiple Inspections. If the Contractor requests determination of Substantial Completion or Final Completion and the Project Inspector, Construction Manager or Architect determine that the Work does not then justify certification of Substantial Completion or Final Completion and re-inspection is required at a subsequent time to make such determination, the Contractor shall be responsible for all costs of such re-inspection, including without limitation, the fees of the Architect, Construction Manager and Project Inspector.

7.2.4. Final Acceptance. Final Acceptance of the Work shall occur upon acceptance of the Work by the District's Board of Trustees; such acceptance shall be submitted for consideration at a regularly scheduled meeting of the District's Board of Trustees after the determination of Final Completion. The commencement of any warranty or guarantee period under the Contract Documents the date of Final Acceptance.

7.3. Construction Schedule.

7.3.1. Submittal of Preliminary Construction Schedule. Within five (5) days following execution of the Agreement, the Contractor shall prepare and submit to the District, Construction Manager and Architect a Preliminary Construction Schedule indicating, in graphic form, the estimated rate of progress and sequence of all Work required under the Contract Documents. As required by the District or Construction Manager, the Construction Schedules shall; (i) be prepared with a commercially available computer software program in a critical path format; (ii) indicate the date(s) for commencement and completion of various portions of the Work including without limitation, procurement, fabrication and delivery of major items, materials or equipment; (iii) identify each Submittal required by the Contract Documents, the date for the Contractor's submission of each Submittal and the date for the return of the reviewed Submittal to the Contractor. Any "float" time (the time between earliest finish date and the latest finish date of an activity shown on the Construction Schedule) incorporated into the Construction Schedules is jointly owned by the District and the Contractor.

7.3.2. Review of Preliminary Construction Schedule. The District and Construction Manager will review the Preliminary Construction Schedule for conformity with the requirements of the Contract Documents. Comments of the District will be returned to the Contractor with the reviewed Preliminary Construction Schedule.

7.3.3. Accepted Construction Schedule. Within ten (10) days of the District's return of the Preliminary Construction Schedule to the Contractor, the Contractor shall prepare and submit to the District and Construction Manger a revised Construction Schedule incorporating therein the comments to the Preliminary Construction Schedule and submit the same to the District and the Construction Manager for review and acceptance. The review and revision of the Preliminary Construction Schedule shall continue until the District has accepted the entirety of the Construction Schedule, referred to herein as the "Accepted Construction Schedule."

7.3.4. Revisions to Accepted Construction Schedule. If the progress of the Work or the sequencing of the activities of the Work materially differs from that indicated in the Accepted Construction Schedule, as determined by the District in its reasonable

discretion and judgment, the District may direct the Contractor to revise the Accepted Construction Schedule; within fifteen (15) days of the District's direction, the Contractor shall prepare and submit to the District and Construction Manager a revised Accepted Construction Schedule for review and acceptance by the District. If a Revised Accepted Construction Scheduled is accepted by the District, the Contractor's performance of Work shall conform to such Revised Accepted Construction Schedule.

7.3.5. Updates to Accepted Construction Schedule. The Contractor shall update the Accepted Construction Schedule on a monthly basis, or more frequently as required by the conditions or progress of the Work, or as requested by the District. On or before the fifth (5th) day of each month, the Contractor shall deliver to the District and Construction Manager an updated Accepted Construction Schedule indicating progress achieved and activities commenced or completed in the prior updated Accepted Construction Schedule. If requested by the District, the Contractor shall also submit, with its updated Accepted Construction Schedules a narrative statement describing current and anticipated problem areas of the Work, delaying factors and their impact, and an explanation of corrective action taken or proposed by the Contractor. If the progress of the Work is behind that indicated in the Accepted Construction Schedule, the Contractor's narrative statement shall indicate what measures will be taken to place the Work back on schedule. The Contractor's preparation and submittal of the narrative described above is a material obligation of the Contractor.

7.3.6. Contractor Responsibility for Construction Schedule. The Contractor is responsible for preparation, submittal and maintenance of the Construction Schedules required by the Contract Documents. Failure of the Contractor to do so is the Contractor's default in the performance of a material obligation of the Contractor under Contract Documents. All costs or expenses incurred relating to Construction Schedules shall be solely that of the Contractor without adjustment of the Contract Price.

7.4. Adjustment of Contract Time. If Substantial Completion is delayed, adjustment, if any, to the Contract Time on account of such delay shall be in accordance with this Article 7.4.

7.4.1. Force Majeure and Excusable Delays. Excusable Delays are delays caused by Force Majeure events which are unforeseeable and unavoidable casualties or other unforeseen causes, circumstances or events beyond the control, and without fault or neglect, of the Contractor or the District. Force Majeure events include without limitation, unanticipated and unusual and unanticipated transportation delays, unanticipated unusually severe weather conditions, acts of God, public health crisis (including without limitation, epidemics and pandemics), acts of a public enemy, war/insurrection, earthquakes and floods. Neither the financial resources of the Contractor or any person or entity directly or indirectly engaged by the Contractor in performance of any portion of the Work shall be deemed conditions beyond the control of the Contractor. If an Excusable Delay occurs, the Contract Time shall be subject to adjustment only if the Contractor notifies the District in writing within ten (10) days of an Excusable Delay event and the Contractor establishes that the event(s) forming the basis for Contractor's request to adjust the Contract Time are: (i) outside the reasonable control and without any fault or neglect of the Contractor or any person or entity directly or indirectly engaged by Contractor in performance of any portion of the Work; and (iii) that the event(s) directly and adversely impacted the completion of the Work. Excusable Delays shall not result in adjustment of the Contract Price; the sole and exclusive remedy for an Excusable Delay is adjustment of the Contract Time. If the Special Conditions set forth a number of "Rain Days" to

be anticipated during performance of the Work, the Contract Time shall not be adjusted for rain-related unusually severe weather conditions until the actual number of Rain Days during performance of the Work exceeds those noted in the Special Conditions and such additional Rain Days shall have directly and adversely impacted the progress of the Work on the critical path of the then current Accepted Construction Schedule relative to the date(s) of such additional Rain Days.

7.4.2. Compensable Delays. If Substantial Completion of the Work is delayed by the acts or omissions of the District, the Construction Manager, the Architect, or separate contractor employed by the District (collectively "Compensable Delays"), upon Contractor's request and notice, in strict conformity with Articles 7 and 9 of these General Conditions, the Contract Time will be adjusted for such reasonable period of time as determined by the Construction Manager and District. Pursuant to California Public Contract Code §7102, if the Contractor's progress is delayed by any of the events described in the preceding sentence, Contractor shall not be precluded from the recovery of damages directly and proximately resulting therefrom, provided that the District is liable for the delay, the delay is unreasonable under the circumstances involved and the delay was not within the reasonable contemplation of the District and the Contractor at the time of execution of the Agreement. In such event, Contractor's damages, if any, shall be limited to direct, actual and unavoidable additional costs of labor, materials, equipment or Construction Equipment directly resulting from such delay, and shall exclude indirect or other consequential damages. Except as expressly provided for herein, Contractor shall not have any other claim, demand or right to adjustment of the Contract Price arising out of delay, interruption, hindrance or disruption to the progress of the Work. Adjustments to the Contract Price and the Contract Time, if any, on account of Changes to the Work or Suspension of the Work shall be governed by the applicable provisions of the Contract Documents.

7.4.3. Inexcusable Delays. Inexcusable Delays refer to any delay to the progress of the Work caused by events or factors other than those specifically identified in Articles 7.4.1 and 7.4.2 above. Neither the Contract Price nor the Contract Time shall be adjusted on account of Inexcusable Delays.

7.5. Liquidated Damages. If the Contractor fails to: (i) submit Submittals in accordance with the Accepted Construction Schedule or in a timely manner; (ii) achieve Substantial Completion of the Work within the Contract Time, (subject to adjustments authorized under the Contract Documents); or (iii) complete Punchlist items within the time established, the Contractor shall be liable to the District for per diem Liquidated Damages set forth in the Special Conditions, not as a penalty but as Liquidated Damages which are agreed upon because of the difficulty of fixing the District's actual damages. The Contractor and the District agree that said amounts are reasonable estimates of the District's damages in such event, and that such amounts do not constitute a penalty. The Contractor and the Surety shall be jointly and severally liable to the District for any Liquidated Damages liability of the Contractor exceeding the Contract Price then held or retained by the District. The Contractor and the District acknowledge and agree that the provisions of this Article 7.5 are reasonable under the circumstances existing at the time of the Contractor's execution of the Agreement.

8. Contract Price

8.1. Cost Breakdown of Contract Price. Within fifteen (15) days of the execution of the Agreement by Contractor, Contractor shall furnish, on forms provided by the District, a detailed estimate and complete Cost Breakdown of the Contract Price. The Cost Breakdown shall be subject to the District's review and acceptance of the content thereof. If the District objects to any portion

of the Cost Breakdown, within five (5) days of the Contractor's receipt of the District's written objection(s), Contractor shall submit a revised Cost Breakdown to the District for review and acceptance. The foregoing procedure shall continue until the District has accepted of the entirety of the Cost Breakdown. The Cost Breakdown accepted by the District shall not be modified by the Contractor without the prior consent of the District, which may be granted, conditioned or denied in the sole discretion of the District.

8.2. Progress Payments.

8.2.1. Applications for Progress Payments ("Payment Applications"). During performance of the Work, the Contractor shall submit monthly Payment Applications, on the first (1st) working day of each month, to the Construction Manager, Project Inspector and Architect, on forms approved by the District, setting forth an itemized estimate of Work completed in the preceding month for the purpose of the District's making of Progress Payments thereon. Values utilized in Payment Applications shall be based upon the District accepted Cost Breakdown.

8.2.2. District's Review of Payment Applications. In accordance with Public Contract Code §20104.50, upon receipt of a Payment Application, the District shall cause the same to be reviewed by the Project Inspector, Construction Manager and Architect, as soon as is practicable, for the purpose of determining that the Payment Application is a proper Payment Application. A Payment Application is "proper" only if it is submitted on the form approved by the District, with all of the information completely and accurately provided and such completed Payment Application is accompanied by: (i) the form of Verification of Certified Payroll Records Submittal to Labor Commissioner, executed under penalty of perjury by the Contractor's Superintendent and/or the Contractor PM; which verifies that all Certified Payroll Records for the Contractor and all Subcontractors for the period of time covered by the Application for Progress Payment have been completed and submitted in strict conformity with Labor Code §1771.4; (ii) a breakdown identifying each Subcontractor/Material Supplier to be disbursed a portion of the requested Progress Payment and the amount of the Progress Payment to be disbursed to each Subcontractor/Material Supplier so identified; (iii) duly completed and executed forms of Conditional Waiver and Release of Rights Upon Progress Payment in accordance with California Civil Code §8132 of the Contractor, all Subcontractors and Material Suppliers covering the Progress Payment requested; (iv) duly completed and executed forms of Unconditional Waiver and Release of Rights upon Progress Payment in accordance with California Civil Code §8134 of the Contractor, Subcontractors and Material Suppliers covering the Progress Payment received by the Contractor under the prior Payment Application; and (v) a certification by the Contractor that it has continuously maintained the Record Drawings. Submittal of all of the foregoing is an express condition precedent to the District's obligation to disburse any Progress Payment. If a Payment Application is determined by the District not to be a "proper" Payment Application, the Payment Application will be returned by the District to the Contractor (along with a written document setting forth the reason(s) why the Payment Application is not proper) as soon as is practicable after receipt of the same from the Contractor, but in no event not more than seven (7) days after the District's receipt thereof.

8.2.3. Review of Payment Applications. Upon receipt of Payment Application, the Architect, Construction Manager and Project Inspector shall inspect and verify the Work to determine whether it has been performed in accordance with the terms of the Contract Documents and to determine the portion of the Payment Application which is properly due to the Contractor under the terms of the Contract Documents.

8.3. District's Disbursement of Progress Payments.

8.3.1. Timely Disbursement of Progress Payments. In accordance with Public Contract Code §20104.50, within thirty (30) days after the District's receipt of a proper Payment Application, the District will pay the Contractor ninety five percent (95%) of the value of the Work indicated in the Payment Application which is actually in place as of the date of the Payment Application and as verified and approved by the Project Inspector, Construction Manager and Architect, along with the pro rata portion of the Contractor's overhead, supervision and general conditions costs and profit for that month; provided, however, that the District's obligation to disburse any Progress Payment shall be subject to the Contractor's submission of a "proper" Payment Application as defined hereinabove. If a Payment Application is not "proper" due to the failure or refusal of the Contractor to comply with conditions precedent to the District's obligation to disburse a Progress Payment, or incompleteness or inaccuracies in any such documents submitted, the thirty (30) day period for the District's timely disbursement of a Progress Payment shall commence on the date that the District is actually in receipt of documents not submitted with the Payment Application, or corrections to documents with the Payment Application so as to render them complete and accurate.

8.3.2. Untimely Disbursement of Progress Payments. Pursuant to Public Contract Code §20104.50, if the District fails to make any Progress Payment within thirty (30) days after receipt of an undisputed and proper Payment Application, the District shall pay the Contractor interest on the undisputed amount of such Payment Application equal to the legal rate of interest set forth in California Code of Civil Procedure §685.010(a).

8.3.3. District's Right to Disburse Progress Payments by Joint Checks. The District may in its sole discretion issue joint checks to the Contractor and Subcontractors or Material Suppliers in satisfaction of its obligation to make Progress Payments or the Final Payment due hereunder. The Contractor shall cooperate with the District and subcontractors/Material Suppliers in the issuance or processing of joint checks.

8.3.4. No Waiver of Defective or Non-Conforming Work. The approval of any Payment Application or the disbursement of any Progress Payment to the Contractor shall not be deemed nor constitute acceptance of Defective or Non-Conforming Work.

8.3.5. Progress Payments for Changed Work. The Contractor's Payment Applications may include requests for payment for Changes which have been authorized and approved by the District, Construction Manager, Project Inspector, Architect and all other governmental agencies with jurisdiction over such Change. Except as provided for herein, no other payment shall be made by the District for Changes.

8.3.6. Materials or Equipment Not Incorporated Into the Work. No Progress Payments will be made for materials or equipment not incorporated into the Work at the time a Payment Application is submitted.

8.3.7. Title to Work. The Contractor warrants that title to all Work covered by a Payment Application will pass to the District no later than the time of payment.

8.4. Substitute Security for Retention. Eligible and equivalent securities may be substituted for Retention at the request and expense of the Contractor pursuant to California Public Contract Code §22300. The foregoing and the provisions of California Public Contract Code §22300 notwithstanding, failure of the Contractor to request substitution of eligible and equivalent securities for Retention prior to the Contractor's submission of the first Payment Application is the Contractor's waiver of rights under Public Contract Code §22300.

8.5. Final Payment.

8.5.1. Application for Final Payment. When the Contractor has achieved Final Completion of the Work and has otherwise fully performed its obligations under the Contract Documents, the Contractor shall submit an Application for Final Payment on such form as approved by the District. Thereupon, the Architect, Construction Manager and Project Inspector will promptly make a final inspection of the Work and when the Architect, Construction Manager and Project Inspector find the Work acceptable under the Contract Documents and that the Contractor has completed all other obligations of the Contractor, the Architect, Construction Manager and Project Inspector will approve the Application for Final Payment, stating that to the best their knowledge, information and belief, the Work has been completed in accordance with the Contract Documents and that the Contractor is entitled to receipt of Final Payment. The Final Payment shall include the remaining balance of the Contract Price and Retention previously withheld by the District, less offsets and deductions thereto.

8.5.2. Conditions Precedent to Disbursement of Final Payment. Submittal of the following are express conditions precedent to the District's obligation to disburse the Final Payment: (i) duly completed and executed forms of Conditional or Unconditional Waivers and Releases of rights upon Final Payment of the Contractor, Subcontractors of any tier and Material Suppliers in accordance with California Civil Code §§8136 or 8138, with each of the same stating that there are, or will be, no claims for additional compensation after disbursement of the Final Payment; (ii) Operations and Maintenance manuals and separate warranties provided by any manufacturer or distributor of any materials or equipment incorporated into the Work; (iii) the Record Drawings; (iv) the form of Guarantee included in the Contract Documents duly executed by an authorized representative of the Contractor; (v) all other items or documents required by the Contract Documents to be delivered to the District upon completion of the Work; and (vi) written evidence of the Contractor's filing of the DSA Final Verified Report.

8.5.3. Disbursement of Final Payment. Provided that the District is then in receipt of all materials set forth in Article 8.5.2 above as conditions precedent to the District's obligation to disburse Final Payment, not later than sixty (60) days following Final Acceptance, the District shall disburse the Final Payment to the Contractor. Pursuant to California Public Contract Code §7107, if there is any dispute between the District and the Contractor at the time that disbursement of the Final Payment is due, the District may withhold from disbursement of the Final Payment an amount not to exceed one hundred fifty percent (150%) of the amount in dispute. If the Contractor complies with all of the conditions precedent to the District's disbursement of the Final Payment, except for written evidence of the Contractor's filing of the DSA Final Verified Report, the District may withhold and retain ten percent (10%) of the Final Payment in accordance with Article 4.19.9.2 of these General Conditions. In such event, provided that the Contractor has fully complied with and satisfied all other conditions precedent set forth in Article 8.5.2, the District will disburse the remaining balance of the Final Payment to the Contractor; such disbursement shall constitute the District's full and complete performance of payment obligations to the Contractor hereunder.

8.5.4. Waiver of Claims. The Contractor's acceptance of the Final Payment is a waiver and release by the Contractor of any and all claims against the District for compensation or otherwise in connection with the Contractor's performance of the Contract.

8.5.5. Claims Asserted After Final Payment. Any stop payment notice or other claim filed or asserted after the Contractor's acceptance of the Final Payment by any Subcontractor, Material Supplier or others in connection with or for Work is the sole and exclusive responsibility of the Contractor who shall indemnify, defend and hold harmless the Indemnified Parties from and against any claims, demands or judgments arising or associated therewith, including without limitation attorneys' fees.

8.6. Withholding of Payments. The District may withhold and retain the Contract Price, in whole or in part, on account of: (i) uncorrected Defective or Non-Conforming Work; (ii) failure of the Contractor to make payments when due laborers, Subcontractors or Material Suppliers; (iii) claims filed or reasonable evidence of the probable filing of claims by Subcontractors, laborers, Material Suppliers, or others performing any portion of the Work under the Contract Documents for which the District may be liable or responsible including, without limitation, Stop Notice Claims; (iv) reasonable doubt that the Contract can be completed for the then unpaid balance of the Contract Price; (v) tax demands filed in accordance with California Government Code §12419.4; (vi) other claims, penalties and/or forfeitures for which the District is required or authorized to retain funds otherwise due the Contractor, including any amounts due from the Contractor to the District under the Contract Documents; or (vii) the Contractor's failure to perform any of its obligations under the Contract Documents, its default under the Contract Documents or its failure to maintain adequate progress of the Work. In addition to the foregoing, the District shall not be obligated to process any Application for Progress Payment or Final Payment, nor shall Contractor be entitled to any Progress Payment or Final Payment so long as any lawful or proper direction concerning the Work or the performance thereof or any portion thereof, given by the District, the Construction Manager, Project Inspector, Architect or any public authority having jurisdiction over the Work, or any portion thereof, shall not be fully and completely complied with by the Contractor. When the District is reasonably satisfied that the Contractor has remedied any such deficiency, payment shall be made of the amount withheld. The foregoing notwithstanding, if the District withholds: (i) ten percent (10%) of the Final Payment pursuant to Articles 4.19.9.2 and 8.5.3 of these General Conditions; or (ii) any amount incurred to complete an obligation of the Contractor hereunder, the Contractor shall not be entitled to receipt or payment of any portion of such withholdings.

8.7. Payments to Subcontractors. The Contractor shall pay all Subcontractors on account of Work performed by Subcontractors in accordance with the terms of their respective subcontracts and pursuant to Business & Professions Code §7108.5 and Public Contract Code §7201.

9. Changes

9.1. Changes to the Work. The District, at any time, by written order, may make Changes within the general scope of the Work or issue additional instructions, require additional Work or direct deletion of Work. The Contractor shall not proceed with any Change without prior written authorization from the District. The Contractor shall promptly commence and diligently complete any District authorized Change; the Contractor shall not be relieved or excused from its prompt commencement and diligent completion of any Change authorized by the District due to the inability of the Contractor and the District to agree upon the adjustment to the Contract Time or the Contract Price on account of such Change. The issuance of a Change Order in connection with any Change authorized by the District is not a condition precedent to Contractor's obligation to promptly commence and diligently complete any Change authorized by the District hereunder. The District's right to make Changes shall not invalidate the Contract nor relieve the Contractor of its obligations under the Contract Documents. Any requirement of notice of Changes to the Surety shall be the responsibility of the Contractor. Changes shall be subject to DSA approval.

9.2. Contractor Notice of Oral Order of Change in the Work. Any oral order, direction, instruction, interpretation, or determination (collectively "Instruction Order") from the District, Construction Manager, Project Inspector or Architect which Contractor believes is a change to the Work, or requires an adjustment to the Contract Price or the Contract Time, shall be treated as a Change only if the Contractor gives the Architect, Construction Manager and Project Inspector written notice within ten (10) days of the Instruction Order and prior to acting in accordance therewith. Time is of the essence in Contractor's written notice pursuant to the preceding sentence and the Contractor acknowledges that its failure to give written notice within ten (10) days of the date of an Instruction Order is deemed Contractor's waiver of any right to adjustment of the Contract Time or the Contract Price on account of such Instruction Order. The written notice shall state the date, circumstances, extent of adjustment to the Contract Price or the Contract Time, if any, requested, and the source of the Instruction Order that the Contractor regards as a Change. Unless the Contractor acts in strict accordance with this procedure, no Instruction Order shall not be treated as a Change and the Contractor waives any adjustment to the Contract Price or the Contract Time on account thereof.

9.3. Contractor Submittal of Data. Within thirty (30) days after receipt of a written order directing a Change or furnishing the written notice regarding any Instruction Order, the Contractor shall submit to the Architect, Project Inspector, Construction Manager and District a detailed written statement setting forth the general nature of the Change, the amount of any adjustment to the Contract Price on account thereof, properly itemized and supported by sufficient substantiating data to permit evaluation of the same, and the extent of adjustment of the Contract Time, if any, required by such Change. No claim or adjustment to the Contract Price or the Contract Time shall be allowed if not asserted by the Contractor in strict conformity herewith or if asserted after Final Payment is made.

9.4. Adjustment to Contract Price on Account of Changes to the Work. Adjustments to the Contract Price due to Changes in the Work shall be determined by application of one of the following methods, in the following order of priority:

9.4.1. Mutual Agreement. By negotiation and mutual agreement, on a lump sum basis, between the District and the Contractor on the basis of the estimate of the actual and direct increase or decrease in costs on account of the Change. Upon request of the District or the Architect, the Contractor shall provide a detailed estimate of increase or decrease in costs directly associated with performance of the Change along with cost breakdowns of the components of the Change and supporting data and documentation.

9.4.2. Determination by the District. By the District, whether or not negotiations are initiated pursuant to Article 9.4.1 above, based upon actual and necessary costs incurred by the Contractor as determined by the District. If the procedure set forth in this Article 9.4.2 is utilized to determine the extent of adjustment to the Contract Price on account of Changes to the Work, promptly upon determining the extent of adjustment to the Contract Price, the District shall notify the Contractor in writing of the same; the Contractor shall be deemed to have accepted the District's determination of the amount of adjustment to the Contract Price on account of a Change to the Work unless Contractor shall notify the District, Architect and Construction Manager, in writing, not more than fifteen (15) days from the date of the District's written notice, of any objection to the District's determination. Failure of the Contractor to timely notify the District, Architect and Construction Manager of Contractor's objections to the District's determination of the Contract Price adjustment is deemed Contractor's acceptance of the District's determination and a waiver of any right of the Contractor to thereafter protest or otherwise object to the District's determination. Notwithstanding any objection of the Contractor to the

District's determination of the adjustment to the Contract Price pursuant to this Article 9.4.2, Contractor shall promptly commence and diligently complete any such Change.

9.4.3. Basis for Adjustment of Contract Price. If Changes in the Work require an adjustment of the Contract Price pursuant to Articles 9.4.1or 9.4.2 above, the basis for adjustment of the Contract Price shall be as follows:

9.4.3.1. Labor. The Contractor shall be compensated for the costs of field labor actually and directly utilized in the performance of the Change. Labor costs shall be limited to field labor for labor classification(s) necessary to perform the Change. Use of a labor classification which increases labor costs associated with any Change shall not be permitted. Labor costs shall exclude costs incurred by the Contractor in preparing estimate(s) of the costs of the Change, in the maintenance of records relating to the costs of the Change, coordination and assembly of materials and information relating to the Change or performance thereof, or the supervision and other overhead and general conditions costs associated with the Change or performance thereof.

9.4.3.2. Materials and Equipment. Contractor shall be compensated for the costs of materials and equipment necessarily and actually used or consumed in connection with the performance of Changes. Costs shall be the then lowest wholesale price at which identical or similar materials/equipment are available in the quantities required to perform the Change. The District may furnish materials and/or equipment for Changes, in which event the Contractor shall not be compensated for any mark-up thereon.

9.4.3.3. Construction Equipment. The Contractor shall be compensated for the actual cost of the necessary and direct use of Construction Equipment in the performance of Changes in increments of fifteen (15) minutes. No costs or compensation shall be allowed for time while Construction Equipment is inoperative, idle or on standby, for any reason. The Contractor shall not be entitled to compensation for Construction Equipment or tools used for Changes with a replacement value of $500.00 or less. Construction Equipment costs shall not exceed rental rates established by construction equipment rental agencies in the locality of the Site. The allowable rate for Construction Equipment includes compensation for rental costs, fuel, power, oil, lubrication, supplies, necessary attachments, repairs or maintenance of any kind, depreciation, storage, insurance, labor (exclusive of labor costs of the Construction Equipment operator), and any all other costs incidental to the use of such Construction Equipment.

9.4.4. Mark-up on Costs of Changes to the Work. The allowance for mark-ups on the costs of the Change for all overhead (including home office, supervision and field overhead costs, including personnel costs; labor burdens on personnel costs; insurance premiums), general conditions costs and profit associated with the Change shall not exceed the percentage set forth in the Special Conditions, regardless of the number of Subcontractors performing any portion of any Change. If a Change reduces the Contract Price, no profit, general conditions or overhead costs shall be paid by the District to the Contractor for the reduced or deleted Work; the Contract Price shall be reduced by the actual cost for the reduced or deleted Work multiplied by the percentage set forth in the Special Conditions for mark-ups on the cost of a Change adding to the scope of the Work.

9.4.5. Contractor Maintenance of Records. If the Contractor is directed to perform any Change pursuant to Article 9.1 or 9.2, the Contractor shall maintain detailed

separate records on a daily basis for each separate Change. Such records shall include without limitation hourly records for labor and Construction Equipment and itemized records of materials and equipment used that day in connection with any Change to the Work. Subcontractors shall maintain records in accordance with this Article. Each daily record maintained hereunder shall be signed by Contractor's Superintendent/Subcontractor's Superintendent and shall incorporate a statement that all information contained therein is true, accurate, complete and relates only to the Change referenced therein. All records maintained hereunder shall be subject to inspection, review and/or reproduction by the District, Architect, Construction Manager or Project Inspector upon request. If the Contractor fails or refuses, for any reason, to maintain or make available for inspection, review and/or reproduction such records and the adjustment to the Contract Price on account of any Change to the Work is determined by the District, the District's reasonable good faith determination of the adjustment to the Contract Price on account of such Change shall be final, conclusive and binding upon the Contractor. The Contractor's obligation to maintain records hereunder is in addition to, and not in lieu of, other Contractor obligations relating to Changes to the Work.

9.5. Adjustment to Contract Time. If any Change(s) are authorized by the District, the Contract Time shall be extended or reduced by Change Order for a period of time commensurate with the time reasonably necessary to perform such Change

9.6. Addition or Deletion of Alternate Bid Item(s). If the Bid for the Work includes proposal(s) for Alternate Bid Item(s), during performance of the Work, the District may elect, to add any such Alternate Bid Item(s) if the same did not form a basis for award of the Contract or delete any such Alternate Bid Item(s) if they formed a basis for award of the Contract. If the District elects to add or delete any such Alternate Bid Item(s) pursuant to the foregoing, the cost or credit for such Alternate Bid Item(s) shall be as set forth in the Contractor's Bid. If any Alternate Bid Item is added or deleted pursuant to the foregoing, the Contract Time shall be adjusted by the number of days allocated for the added or deleted Alternate Bid Item in the Contract Documents; if days are not allocated for any Alternate Bid Item added or deleted pursuant to the foregoing, the Contract Time shall be equitably adjusted.

9.7. Change Orders. If the District approves of a Change, a written Change Order prepared by the Architect on behalf of the District shall be forwarded to the Contractor describing the Change and setting forth the adjustment to the Contract Time and the Contract Price, if any, on account of such Change. All Change Orders shall: (i) be deemed full payment and final settlement of all claims for direct, indirect and consequential costs, including without limitation, costs of delays or impacts related to, or arising out of, items covered and affected by the Change Order; (ii) incorporate adjustments to the Contract Time; and (iii) constitute the Contractor's waiver of rights of rights under Civil Code §1542. Any claim or item relating to any Change incorporated into a Change Order not presented by the Contractor for inclusion in the Change Order shall be deemed waived. The Contractor shall execute the Change Order prepared pursuant to the foregoing; once the Change Order has been prepared and forwarded to the Contractor for execution. The Contractor shall not modify or amend the form or content of such Change Order, or any portion thereof; attempted or purported modifications or amendments are not binding upon the District and are null, void and unenforceable. Change Orders shall be binding upon the District only upon action of the District's Board of Trustees approving and ratifying such Change Order.

9.8. Unilateral Change Order. A Unilateral Change Order is a written Change Order issued by or on behalf of the District before the Contractor and District have agreed on the extent of adjustment of the Contract Time or the Contract Price relating to the Change reflected in a Unilateral Change Order. A Unilateral Change Order shall describe the scope and nature of

the Change and set forth the adjustment to the Contract Time and Contract Price, if any. Any Unilateral Change Order issued hereunder shall be binding upon the District and Contractor upon action of the District's Board of Trustees to ratify or approve such Unilateral Change Order. The objections, if any, of the Contractor to the extent of adjustment of the Contract Time or the Contract Price on account of the Change(s) incorporated into a Unilateral Change Order shall be submitted in writing by the Contractor to the District, Construction Manager and Architect not more than five (5) days after the date of the District's Board of Trustees action to approve or ratify a Unilateral Change Order. If the Contractor does not submit written objections to a Unilateral Change Order within five (5) days after the District's Board of Trustees approval/ratification of the Unilateral Change Order shall be deemed the Contractor's acceptance of the Contract Time and/or Contract Price adjustment set forth in a Unilateral Change Order for the Changes described therein and the Contractor shall be deemed to have knowingly waived any right to seek additional adjustments of the Contract Time or the Contract Price on account of Change(s) incorporated into such a Unilateral Change Order.

9.9. Construction Change Directive. A Construction Change Directive is a written instrument issued by or on behalf of the District directing a Change to the Work prior to the Contractor and District reaching full agreement on an adjustment of the Contract Time and/or Contract Price on account of such Change. The Contractor shall promptly commence and diligently complete any Change to the Work subject to a Construction Change Directive issued hereunder. The issuance of a Change Order in connection with any Construction Change Directive is not a condition precedent to Contractor's obligation to promptly commence and diligently complete a Construction Change Directive. Upon completion of a Construction Change Directive, if the Contractor and District have not agreed on the adjustment of Contract Time and/or Contract Price, the District shall issue a Unilateral Change Order for such Construction Change Directive.

9.10. Contractor Notice of Changes. If the Contractor claims that any instruction, request, the Drawings, the Specifications, action, condition, omission, default, or other situation obligates the District to increase the Contract Price or to extend the Contract Time ("Potential Changes"), the Contractor shall notify the Project Inspector, Construction Manager and Architect, in writing, of such claim within ten (10) days from the date of its actual or constructive notice of the factual basis supporting the Potential Changes. The District shall consider any such claim of the Contractor only if sufficient supporting documentation is submitted with the Contractor's notice to the Construction Manager, Project Inspector and Architect. Time is of the essence in Contractor's written notice pursuant to the preceding so that the District can promptly investigate and consider alternative measures to the address such Potential Changes. Accordingly, Contractor acknowledges that its failure, for any reason, to give written notice (with sufficient supporting documentation to permit the District's review and evaluation) within ten (10) days of its actual or constructive knowledge of any Potential Changes shall be deemed Contractor's waiver, release, discharge and relinquishment of any right to assert or claim any entitlement to an adjustment of the Contract Time or the Contract Price on account of any such Potential Changes.

9.11. Disputed Changes. If any dispute or disagreement between the Contractor and the District or the Architect regarding the characterization of any item as a Change or as to the appropriate adjustment of the Contract Price or the Contract Time on account thereof, the Contractor shall promptly proceed with the performance, subject to a subsequent resolution of such dispute or disagreement in accordance with the terms of the Contract Documents.

9.12. Minor Changes in the Work. The Architect may order minor Changes in the Work not involving an adjustment in the Contract Price or the Contract Time and not inconsistent with the intent of the Contract Documents. Such Changes shall be effected by written order and shall be binding on the District and the Contractor.

9.13. Unauthorized Changes. Any Work beyond the lines and grades shown on the Contract Documents, or any extra Work performed or provided by the Contractor without notice in strict conformity with the Contract Documents shall be considered unauthorized and at the sole expense of the Contractor. Work so done will not be measured or paid for, no extension to the Contract Time will be granted on account thereof and any such Work may be ordered removed at the Contractor's sole cost and expense.

10. Separate Contractors

10.1. District's Right to Award Separate Contracts. The District reserves the right to perform construction or operations related to the Work with the District's own forces or to award separate contracts in connection with other portions of the Project or other construction or operations at or about the Site. If the Contractor claims that delay or additional cost is involved because of such action by the District, the Contractor shall seek an adjustment to the Contract Price or the Contract Time as provided for in the Contract Documents. Failure of the Contractor to request such an adjustment in strict conformity with the Contract Documents shall be deemed a waiver of the same.

10.2. District's Coordination of Separate Contractors. The District shall coordinate the activities of the District's own forces and separate contractor(s) with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with other separate contractors and the District in reviewing their respective Construction Schedules when directed to do so. The Contractor shall make any revisions to the Accepted Construction Schedule deemed necessary after a joint review and mutual agreement. The Construction Schedules shall then constitute the Construction Schedules to be used by the Contractor, separate contractors and the District until subsequently revised.

10.3. Mutual Responsibility. The Contractor shall afford the District and separate contractors of the District with a reasonable opportunity for storage of their materials and equipment and performance of their activities at the Site.

10.4. Discrepancies or Defects. If any part of the Work depends for proper execution or results upon construction or operations by the District or a separate contractor to the District, the Contractor shall, prior to proceeding with that portion of the Work, promptly report to the Architect, Construction Manager and Project Inspector any discrepancies or defects in such other construction that renders it unsuitable for such proper execution and results.

11. Tests; Inspections; Observations

11.1. Contractor's Notice. If the Contract Documents, Laws or any public authority with jurisdiction over the Work require the Work, or any portion thereof, to be specially tested, inspected or approved, the Contractor shall give the Architect, Construction Manager and Project Inspector written notice of the readiness of such Work for observation, testing or inspection at least two (2) working days prior to the time for the conducting of such test, inspection or observation. If any portion of the Work subject to tests, inspection or approval is covered up by Contractor prior to completion and satisfaction of the requirements of such tests, inspection or approval, Contractor shall be responsible for the uncovering of such portion of the Work as is necessary for performing such tests, inspection or approval without adjustment of the Contract Price or the Contract Time.

11.2. Cost of Tests and Inspections. The District will pay for fees, costs and expenses for the initial tests/inspections of materials/equipment which are conducted at the Site or locations within a one hundred (100) mile radius of the Site. All fees, costs or expenses for subsequent tests/inspections or for tests/inspections conducted at a location more than a one hundred (100) mile radius from the Site (including without limitation, travel and travel-related expenses) shall be borne solely and exclusively by the Contractor.

11.3. Testing/Inspection Laboratory. The District shall select duly qualified person(s) or testing laboratory(ies) to conduct the tests and inspections to be paid for by the District and required by the Contract Documents or the Laws. Tests and inspections required of the Work shall be as set forth in the Contract Documents and as required by the Laws, including without limitation, Title 24 of the California Code of Regulations. Test/inspection standards shall be as set forth in the Contract Documents or established by the Laws. Where inspection or testing is to be conducted by an independent laboratory or testing agency, materials or samples thereof shall be selected by the laboratory, testing agency, the Project Inspector, Construction Manager or Architect and not by the Contractor.

11.4. Additional Tests, Inspections and Approvals. If the Architect, Construction Manager, Project Inspector or public authorities having jurisdiction over any portion of the Work require additional testing, inspection or approval, the Architect, Project Inspector or Construction Manager will instruct the Contractor to make arrangements for such additional testing, inspection or approval by an entity acceptable to the District, and the Contractor shall give timely notice to the Architect, Construction Manager and Project Inspector of when and where tests and inspections are to be made so the Construction Manager, Project Inspector and Architect may observe such procedures. The District shall bear the costs of such additional tests, inspections or approvals, except to the extent that such additional tests, inspections or approvals reveal any failure of the Work to comply with the requirements of the Contract Documents, in which case the Contractor shall bear all costs made necessary by such failures, including without limitation, the costs of corrections, repeat tests, inspections or approvals and the costs of the services, the Architect or its consultants, the Construction Manager and Project Inspector in connection therewith.

11.5. Delivery of Certificates. Required certificates of testing, inspection or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect, Project Inspector and Construction Manager.

11.6. Timeliness of Tests, Inspections and Approvals. Tests or inspections required and conducted pursuant to the Contract Documents shall be made or arranged by Contractor to avoid delay in the progress of the Work. The Contractor shall be liable for delays to completion of the Work if the Contractor fails coordinate and timely schedule required tests, inspections or observations of the Work.

12. Uncovering and Correction of Work

12.1. Uncovering of Work. If any portion of the Work is covered contrary to the request of the Architect, Construction Manager, Project Inspector or the requirements of the Contract Documents, it must, if required by the Architect, Construction Manager or Project Inspector, be uncovered for observation by the Architect, Project Inspector and/or the Construction Manager and be replaced at the Contractor's expense without adjustment of the Contract Time or the Contract Price.

12.2. Rejection of Work. Defective or Non-Conforming Work may be rejected by the District, Construction Manager, Architect or Project Inspector. The Contractor shall correct such rejected Work without adjustment to the Contract Price or the Contract Time, even if the Work, materials or equipment have been previously inspected by the Architect or the Project Inspector or even if they failed to observe the Defective or Non-conforming Work.

12.3. Correction of Work. The Contractor shall promptly correct any portion of the Work rejected by the District, Construction Manager, Architect or Project Inspector as Defective or Non-Conforming Work, whether observed before or after Substantial Completion and whether or not fabricated, installed or completed. The Contractor shall bear all costs of correcting such rejected Work, including additional testing and inspections and compensation for the

Architect's services and expenses made necessary thereby. The Contractor shall bear all costs of correcting destroyed or damaged Work, whether completed or partially completed.

12.4. Removal of Non-Conforming or Defective Work. The Contractor shall, at its sole cost and expense, remove from the Site all portions of the Work which are defective or are not in accordance with the requirements of the Contract Documents which are neither corrected by the Contractor nor accepted by the District.

12.5. Failure of Contractor to Correct Work. If the Contractor fails to commence to correct Defective or Non-Conforming Work within three (3) days of notice of such condition and promptly thereafter complete the same within a reasonable time, the District may correct it in accordance with the Contract Documents and at the expense of the Contractor.

12.6. Acceptance of Defective or Non-Conforming Work. The District may, in its sole and exclusive discretion, elect to accept Defective or Non-Conforming Work instead of requiring its removal and correction, in which case the Contract Price shall be equitably reduced.

13. Warranties

13.1. Workmanship and Materials. The Contractor warrants to the District that: (i) all materials and equipment furnished under the Contract Documents are new, of good quality and of the most suitable grade and quality for the purpose intended, unless otherwise specified in the Contract Documents; and (ii) all Work and workmanship is of good quality, free from faults and defects and in conformity with the requirements of the Contract Documents. If required by the Architect or the District, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment incorporated into the Work. Any Work, or portion thereof not conforming to these requirements, including substitutions or alternatives not properly approved in accordance with the Contract Documents may be deemed Defective or Non-Conforming Work and subject to repair, replacement or other remedial action by the Contractor to render such work in accordance the Contract Documents. The Contractor expressly warrants the merchantability, the fitness for use, and quality of all Work; such warranty of the Contractor in addition, and not in lieu of, any warranty given by the manufacturer or supplier of such item.

13.2. Warranty Work. If, within one (1) year after the date of Final Acceptance, or such other time frame set forth elsewhere in the Contract Documents, any Work is Defective, Non-Conforming, not in accordance with the requirements of the Contract Documents, or otherwise contrary to the warranties contained in the Contract Documents, the Contractor shall commence all necessary corrective action within seven (7) days after receipt of a written notice from the District to do so, and to thereafter diligently complete the same. If the Contractor fails or refuses to commence correction of any such item within said seven (7) day period or to diligently prosecute such corrective actions to completion, the District may, without further notice to Contractor, the District may, in the sole discretion of the District: (i) cause such corrective Work to be performed and completed; or (ii) upon notice and demand to the Performance Bond Surety, require the Surety to complete corrective work. If the District elects to complete corrective work under (i) above, the Contractor and the Performance Bond Surety shall be responsible for all costs in connection with such corrective Work, including without limitation, general administrative overhead costs of the District in securing and overseeing such corrective Work. The obligations of the Contractor hereunder are in addition to, and not in lieu of, any other obligations imposed by any special guarantee or warranty required by the Contract Documents, guarantees or warranties provided by any manufacturer of any item incorporated into the Work, or otherwise recognized, prescribed or imposed by the Laws. Neither the District's Final Acceptance, the making of Final Payment, nor the use or occupancy of the Work, in whole or in part, by District shall nor relieve the Contractor or the Contractor's Performance Bond Surety from liability with respect to any warranties or responsibility for faulty or defective Work or materials, equipment and workmanship incorporated therein.

13.3. Guarantee. Upon completion of the Work, Contractor shall execute and deliver to the District the form of Guarantee included within the Contract Documents. The Contractor's execution and delivery of the form of Guarantee is an express condition precedent to any obligation of the District to disburse the Final Payment to the Contractor.

13.4. Survival of Warranties. The Contractor' warranty and guaranty obligations hereunder shall survive the Contractor's completion of Work under the Contract Documents, the District's Final Acceptance or the termination of the Contract.

14. Suspension of Work

14.1. District's Right to Suspend Work. The District may, without cause, and without invalidating or terminating the Contract, order the Contractor, in writing, to suspend, delay or interrupt the Work in whole or in part for such period of time as the District may determine. The Contractor shall resume and complete the Work suspended by the District in accordance with the District's directive, whether issued at the time of the directive suspending the Work or subsequent thereto.

14.2. Adjustments to Contract Price and Contract Time. If the District directs suspension of the Work, an adjustment shall be made to the Contract Price for increases in the direct cost of performance of the Work of the Contract Documents, actually caused by suspension, delay or interruption ordered by the District; provided however that no adjustment of the Contract Price shall be made to the extent: (i) that performance is, was or would have been so suspended, delayed or interrupted by another cause for which the Contractor is responsible; or (ii) that an equitable adjustment is made or denied under another provision of the Contract Documents. The term "direct cost of performance of the Work" as used in the preceding sentence shall be limited to: (i) increased costs of materials or equipment incorporated into the Work or required to complete the Work; and (ii) the costs of general conditions items/services (excluding project management/supervision) during the period of District directed suspension of the Work which are proximately caused by the District directed suspension of Work. The term "direct cost of performance of the Work" shall exclude costs (including home office costs) arising out of or related to delay, hindrance, disruption of Work, loss of productively, inefficiencies or other similar consequences of District directed suspension. Adjustment of the Contract Price for District directed suspension of work shall not include any adjustment to increase the Contractor's overhead, general administrative costs or profit, all of which will remain as reflected in the Cost Breakdown submitted by the Contractor pursuant to the Contract Documents. If the District directs suspension of the Work, the Contract Time shall be equitably adjusted to reflect the duration of the District's suspension of the Work.

15. Termination

15.1. Termination for Cause.

15.1.1. District's Right to Terminate. The District may terminate the Contract by written notice to the Contractor and the Surety upon the occurrence of any one or more of the following events of the Contractor's default: (i) the Contractor refuses or fails to prosecute the Work with diligence to achieve Substantial Completion of the Work within the Contract Time; (ii) the Contractor fails to achieve Substantial Completion of the Work within the Contract Time; (iii) the Contractor becomes bankrupt or insolvent, or makes a general assignment for the benefit of creditors, or if the Contractor or a third party files a petition to reorganize or for protection under any bankruptcy or similar laws; (iv) the Contractor repeatedly fails to supply sufficient skilled workmen or sufficient quantities of suitable materials or equipment; (v) the Contractor repeatedly fails to make payments to any Subcontractor, Material Suppliers or others for labor, materials or equipment furnished in connection with

the Work; (vi) the Contractor disregards the Laws or other requirements of any public entity having jurisdiction over the Work; (vii) the Contractor disregards proper directives of the Architect, Construction Manager, Project Inspector or District; (viii) the Contractor performs Work which deviates from requirements of the Contract Documents and fails or refuses to correct such Work; or (ix) the Contractor otherwise violates in any material way any provisions or requirements of the Contract Documents. The District shall have the sole discretion to permit the Contractor to remedy the cause for the termination without waiving the District's right to terminate the Contract, or otherwise waiving, restricting or limiting any other right or remedy of the District under the Contract Documents or the Laws.

15.1.2. District's Rights Upon Termination. If the Contract is terminated pursuant to this Article 15.1, the District may take over the Work and prosecute it to completion, by contract or otherwise, and may exclude the Contractor from the Site. The District may take possession of the Work and of all of the Contractor's tools, appliances, Construction Equipment, machinery, materials, and other items at or about the Site, and use the same to the full extent they could be used by the Contractor without liability to the Contractor. The District shall have the sole discretion as to the manner, methods, and reasonableness of the costs of completing the Work; the District shall not be required to obtain the lowest price for completion of the Work. If the District takes bids for completion of the Work, the Contractor is not eligible for award of such contract(s).

15.1.3. Completion by the Surety. If the Contract is terminated pursuant to this Article 15.1, the District may demand that the Surety take over and complete the Work, in which case the rights and obligations of the District and the Surety shall be as set forth in the Performance Bond. The Contractor shall not be retained, designated or contracted by the Surety to complete the Work. Upon the failure or refusal of the Surety to take over and begin completion of the Work within twenty (20) days after demand therefor, the District may take over the Work and prosecute it to completion as provided for above, provided that such action of the District shall not operate to modify, diminish or otherwise affect the liability of the Surety or Contractor to the District under the Contract Documents, Performance Bond or the Laws.

15.1.4. Assignment and Assumption of Subcontracts. Upon termination pursuant to the foregoing, the District shall, in its sole and exclusive discretion, have the option of requiring any Subcontractor or Material Supplier to perform in accordance with its Subcontract or Purchase Order with the Contractor and/or assign the Subcontract or Purchase Order to the District or such other person or entity designated by the District.

15.1.5. Costs of Completion. In the event of termination under this Article 15.1, the Contractor shall not receive any further payment of the Contract Price until the Work is completed. If the unpaid balance of the Contract Price as of the date of termination exceeds the District's direct and indirect costs and expenses for completing the Work, including without limitation, attorneys' fees and compensation for additional professional and consultant services, such excess shall be used to pay the Contractor for the cost of the Work performed prior to the effective date of termination with a reasonable allowance for overhead and profit. If the District's costs and expenses to complete the Work exceed the unpaid Contract Price, the Contractor and the Surety shall be jointly and severally liable for payment of the difference to the District.

15.1.6. Conversion to Termination for Convenience. If the Contract is terminated under this Article 15.1, and it is determined, for any reason, that the Contractor was not in default under the provisions hereof, the termination shall be deemed a Termination for Convenience of the District and thereupon, the rights and obligations of the District and the Contractor shall be determined in accordance with Article 15.2 hereof.

15.1.7. District's Rights Cumulative. If the Contract is terminated pursuant to this Article 15.1, the termination shall not affect or limit any rights or remedies of the District against the Contractor or the Surety. The rights and remedies of the District under this Article 15.1 are in addition to, and not in lieu of, any other rights and remedies provided by the Laws or under the Contract Documents.

15.2. Termination for Convenience of the District. The District may at any time, in its sole and exclusive discretion, by written notice to the Contractor, terminate the Contract in whole or in part when it is in the interest of, or for the convenience of, the District. In such case, the Contractor shall be entitled to payment for: (i) Work actually performed and in place as of the effective date of such termination for convenience of the District, with a reasonable allowance for profit and overhead on such Work, and (ii) reasonable termination expenses for reasonable protection of Work in place and suitable storage and protection of materials and equipment delivered to the Site but not yet incorporated into the Work, provided that such payments exclusive of termination expenses shall not exceed the total Contract Price as reduced by payments previously made to the Contractor and as further reduced by the value of the Work as not yet completed. The Contractor shall not be entitled to profit and overhead on Work which was not performed as of the effective date of the termination for convenience of the District. The District may, in its sole discretion, elect to have subcontracts assigned pursuant to Article 15.1.4 above after exercising the right hereunder to terminate for the District's convenience.

16. Miscellaneous

16.1. Governing Law; Interpretation. This Contract shall be governed by and interpreted pursuant to the laws of the State of California. The titles used in the Contract Documents are for convenience of reference only shall have no effect upon the interpretation of the Contract Documents. The Contract Documents shall be construed as a whole in accordance with their fair meaning and not strictly for or against the District or the Contractor. The neuter gender shall include the feminine and masculine, the masculine gender shall include the feminine and neuter, the singular number shall include the plural and the plural number shall include the singular. Except as otherwise expressly provided, capitalized terms used in the Contract Documents shall have the meaning and definition for such term as set forth in the Contract Documents.

16.2. Successors and Assigns. Unless otherwise expressly provided in the Contract Documents, all terms, conditions and covenants of the Contract Documents shall be binding upon, and shall inure to the benefit of the District and the Contractor and their respective heirs, representatives, successors-in-interest and assigns.

16.3. Cumulative Rights and Remedies; No Waiver. Duties and obligations imposed by the Contract Documents and rights or remedies available thereunder shall be in addition to and not in lieu of or otherwise a limitation or restriction of duties, obligations, rights and remedies otherwise imposed or available by the Laws. No action or failure to act by the District shall constitute a waiver of a right or remedy afforded it under the Contract Documents or the Laws nor shall such an action or failure to act constitute approval of or acquiescence in a breach hereunder.

16.4. Severability. If any provision of the Contract Documents is deemed illegal, invalid, unenforceable and/or void, by a court or any other governmental agency of competent jurisdiction, such provision shall be deemed to be severed and deleted from the Contract Documents, but all remaining provisions hereof, shall in all other respects, continue in full force and effect.

16.5. No Assignment by Contractor. The Contractor shall not assign the Contract or any obligation of the Contractor thereunder, in whole or in part, without the express prior written consent and approval of the District, which may be granted, conditioned or withheld in the sole and exclusive discretion of the District.

16.6. Time of Essence. Time is of the essence in the Contractor's performance of its obligations under the Contract Documents.

16.7. Independent Contractor Status. The Contractor is an independent contractor to the District and not an agent or employee of the District.

16.8. Notices. Notices under the Contract Documents shall be delivered by United States Mail, Certified, Return Receipt Requested with postage fully prepaid or by email. Notices delivered by United States Mail shall be deemed effective the third (3rd) working day after the postmark date. Notices delivered by email before 12:00 PM on District workdays shall be deemed effective four (4) hours after delivery to the recipient's email server. Emails delivered to the recipient's email server after 12:00 PM on a District work day or on District holiday days shall be deemed effective as of 12:00 PM the ensuing workday. The recipients and addresses for notices may be modified by the Parties by notice to the other. Notices shall be addressed as set forth in the Agreement.

16.9. Disputes; Continuation of Work. Notwithstanding any claim, dispute or other disagreement between the District and the Contractor regarding performance under the Contract Documents, the scope of Work thereunder, or any other matter arising out of or related to, in any manner, the Contract Documents or the Work, the Contractor shall proceed diligently with performance of the Work in accordance with the District's written direction, pending any final determination or decision regarding any such claim, dispute or disagreement.

16.10. Dispute/Claims Resolution.

16.10.1. Public Contract Code §9204 Claims Resolution Procedures. Claims of the Contractor are subject to the non-binding dispute resolution procedures set forth in Public Contract Code §9204 ("Section 9204") provided, however, that the Contractor's initiation of Section 9204 procedures is expressly subject to the Contractor's prior full and timely compliance with requirements and procedures of the Contract Documents relating to procedures for resolution of claims, change orders, disputes and other matters in controversy under the Contract Documents.

16.10.2. Claim Defined. The term "Claim" shall be as defined in Section 9204.

16.10.3. Claim Documentation. The Contractor shall furnish reasonable documentation to support each Claim. "Reasonable documentation" includes, without limitation: (i) contractual and legal basis establishing Claim entitlement or merit; (ii) factual basis establishing District liability for the Claim; (iii) detailed breakdown of labor, materials, equipment and other costs included in the Claim; and (iv) detailed basis, including Construction Schedule analysis and fragnets supporting any Contract Time adjustment or Liquidated Damages relief included in the scope of a Claim.

16.10.4. District Claim Review Statement. Within forty five (45) days (or such other time mutually agreed to by the District and the Contractor) after receipt of a properly submitted and properly documented Claim, the District will conduct a reasonable

review of the Claim and provide the Contractor with a written statement identifying the disputed and undisputed portions of the Claim ("Claim Review Statement"). If the District does not provide the Contractor with the Claim Review Statement for any Claim within forty five (45) days (or other time mutually agreed to by the District and the Contractor) after receipt of a properly submitted and properly documented Claim, the Claim is deemed rejected in its entirety and thereupon, the Contractor may initiate the Meet and Confer process described below. A Claim deemed rejected pursuant to the foregoing does not constitute an adverse finding of Claim merit or the Contractor's responsibility or qualifications. If the Claim Review Statement identifies any undisputed portion of a Claim ("Undisputed Claim") and payment is due from the District on the Undisputed Claim, the District shall process and make payment on the Undisputed Claim within sixty (60) days after the issuance date of the Claim Review Statement.

16.10.5. Meet and Confer.

16.10.5.1. Meet and Confer Demand. If the Contractor disputes any portion of the Claim Review Statement, or if a Claim is deemed rejected by the District, the Contractor may demand an informal meet and confer with the District for settlement of the issues in dispute ("Meet and Confer"). The Contractor's Meet and Confer request must be submitted to the District: (i) in writing; (ii) by registered mail or certified mail, return receipt requested; and (iii) within ten (10) days after the Claim Review Statement is submitted to the Contractor or within ten (10) days after the date the Claim is deemed rejected, as applicable. Failure of the Contractor to strictly comply with the foregoing is deemed a waiver of the Contractor's right to request the Meet and Confer and the Non-Binding Mediation procedures under Section 9204. If the Contractor strictly complies with the foregoing, the District will schedule the Meet and Confer conference within thirty (30) days of the Contractor's Meet and Confer request.

16.10.5.2. Meet and Confer Statement. Within ten (10) business days after conclusion of the Meet and Confer conference, if any portion of a Claim remains disputed, the District shall provide the Contractor a written statement identifying the disputed and undisputed portions of the Claim ("Meet and Confer Statement"). If the Meet and Confer Statement identifies any Undisputed Claim and payment is due from the District on the Undisputed Claim, the District shall process and make payment on the Undisputed Claim within sixty (60) days after date the Meet and Confer Statement is issued.

16.10.6. Non-Binding Mediation.

16.10.6.1. Contractor Initiation. The Contractor may request nonbinding mediation ("Mediation") of disputed portions of a Claim identified in the Meet and Confer Statement. The Contractor's Mediation demand must be submitted to the District: (i) in writing; (ii) by registered mail or certified mail, return receipt requested; (iii) within ten (10) days after the Meet and Confer Statement is submitted to the Contractor; and (iv) with specific identification of the disputed Claims issues subject to Mediation. Failure of the Contractor to strictly comply with the foregoing is deemed a waiver of the Contractor's right to demand Mediation procedures under Section 9204.

16.10.6.2. Mediator Selection. The District and Contractor shall mutually agree to a mediator within ten (10) business days after the date of the Contractor's demand for Mediation. If the District and Contractor do not mutually agree to a mediator, the District and Contractor shall each select a mediator and the District/Contractor

selected mediators shall select a qualified neutral third party to mediate the disputed portion of the Claim.

16.10.6.3. Mediation Procedures. Mediation includes any nonbinding process, including, but not limited to, neutral evaluation or a dispute review board, in which an independent third party or board assists the District and Contractor in dispute resolution through negotiation or by issuance of an evaluation.

16.10.6.4. Mediation Costs. All costs, fees and expenses of the mediator(s) and mediation administration shall be shared equally by the District and Contractor. The foregoing notwithstanding, the Contractor and District shall each bear the costs, fees and expenses of their own attorneys, experts and consultants.

16.10.6.5. Post-Mediation Disputed Claims. Any Claims issues in dispute after Mediation shall be resolved in accordance with the applicable provisions of the Contract Documents.

16.10.6.6. Waiver. The District and Contractor may mutually agree to waive, in writing, Mediation under Section 9204 and subject to the Contractor's compliance with Government Code Claim requirements, proceed directly to commencement of a civil action or binding arbitration.

16.10.7. Payments of Undisputed Claims. If a payment due from the District for Undisputed Claims identified in the Claim Review Statement or the Meet and Confer Statement is not made within the time established under Section 9204 the overdue portion of such payment shall bear interest at the rate of seven percent (7%) per annum from the date due. The District's credit application of any amount due for an Undisputed Claim against amounts due from the Contractor under the Contract Documents shall be deemed payment of the Undisputed Claim.

16.10.8. Subcontractor Claims.

16.10.8.1. Subcontractor Claim Submittal. If a Subcontractor, of any tier (collectively "Subcontractor") lacks legal standing to assert a Claim against the District because privity of contract does not exist, the Contractor may present the District a Claim on behalf of the Subcontractor ("Subcontractor Claim"). Each Subcontractor requesting submittal of a Subcontractor Claim to the District shall furnish reasonable documentation to support the Subcontractor Claim. Within forty-five (45) days of receipt of a Subcontractor's written request to submit a Subcontractor Claim, the Contractor shall notify the Subcontractor in writing as to whether the Contractor presented the Subcontractor Claim to the District. If the Contractor did not present the Subcontractor Claim, the Contractor shall provide the Subcontractor with a statement of the reasons for not having done so.

16.10.8.2. Contractor Certification of Subcontractor Claim. The District's review of Subcontractor Claims is expressly subject to the Contractor's submittal of a duly completed and executed form of Contractor Certification of Subcontractor Claim certifying that the Contractor has thoroughly reviewed the Subcontractor Claim and based on the Contractor's review, certify that: (i) the Subcontractor Claim is made by the Subcontractor in good faith; (ii) the Subcontractor Claim is supported by reasonable documentation establishing entitlement to the relief requested and District liability therefor; and (iii) the Subcontractor Claim does not incorporate any request constituting a False Claim under applicable law, including the California False Claim Act (Government Code §12650 et seq). The form of Contractor Certification of Subcontractor Claim is included in the Contract Documents.

16.10.8.3. District Review of Subcontractor Claim. Subcontractor Claims presented by the Contractor to the District are subject to the Section 9204 non-binding dispute resolution procedures set forth above, as modified herein. Requests for the District to conduct Meet and Confer and/or non-binding mediation procedures must be submitted jointly by the Contractor and the Subcontractor submitting the Subcontractor Claim. If Mediation proceedings are initiated in connection with a Subcontractor Claim, mediator and mediation administration fees and costs shall be borne equally by the District, Contractor and Subcontractor.

16.10.8.4. Disputed Subcontractor Claims. Subcontractor Claims which are not fully resolved by the Section 9204 non-binding dispute resolution procedures shall be resolved by Section 20104.4 Dispute Resolution Procedures or binding arbitration, as applicable. Commencement of Section 20104.4 Dispute Resolution Procedures or binding arbitration proceedings in connection with any Subcontractor Claim is subject to compliance with Government Code Claims requirements.

16.11. Government Code Claim Requirements. Pursuant to Government Code §930.6, any claim, demand, dispute, disagreement or other matter in controversy asserted by the Contractor, whether on behalf of itself or a Subcontractor, against the District for money or damages, including without limitation Claims or portions thereof remaining in dispute after completion of the Section 9204 non-binding dispute resolution procedures described above are deemed a "suit for money or damages" and shall be subject to the provisions of Government Code §§945.4, 945.6 and 946 ("Government Code Claims Process"). An express condition precedent to the Contractor's initiation of Section 20104.4 Dispute Resolution Procedures or binding arbitration proceedings pursuant to the following is the Contractor's compliance with the Government Code Clams Process, including without limitation, presentation of the claim, demand, dispute, disagreement or other matter in controversy between the Contractor and the District seeking money or damages to the District and acted upon or deemed rejected by the District in accordance with Government Code §900, et seq.

16.12. Section 20104.4 Dispute Resolution Procedures; Claims Less Than $375,000. Any Claim, or portion thereof, in dispute after completion of the Section 9204 non-binding dispute resolution procedures and the Government Code Claims Process which is equal to or less $375,000 shall be resolved in accordance with the civil action procedures established in Public Contract Code §20104.4. Unless otherwise agreed to by the District and the Contractor in writing, the mediation conducted pursuant to Section 9204 procedures shall excuse any further obligation under Section 20104.4 to mediate after litigation has been commenced.

16.13. Binding Arbitration of Claims Exceeding $375,000.

16.13.1. AAA Arbitration. Any Claim, or portion thereof in dispute after completion of the Section 9204 procedures and the Government Code Claims Process which exceeds $375,000 and any other claims, disputes, disagreements or other matters in controversy between the District and the Contractor arising out of, or related, in any manner, to the Contract Documents, or the interpretation, clarification or enforcement thereof shall be resolved by binding arbitration conducted before a retired judge in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association ("AAA") in effect as of the date that a Demand for Arbitration is filed, except as expressly modified herein. The locale for any arbitration commenced hereunder shall be the regional office of the JAMS closest to the Site.

16.13.2. Demand for Arbitration. A Demand for Arbitration shall be filed and served within a reasonable time after the occurrence of the claim, dispute or other disagreement giving rise to the Demand for Arbitration, but in no event shall a Demand for

Arbitration be filed or served after the date when the institution of legal or equitable proceedings based upon such claim, dispute or other disagreement would be barred by the applicable statute of limitations. If more than one Demand for Arbitration is filed by either the District or the Contractor relating to the Work or the Contract Documents, all Demands for Arbitration shall be consolidated into a single arbitration proceeding, unless otherwise agreed to by the District and the Contractor. The Contractor's Surety, a Subcontractor or Material Supplier to the Contractor and other third parties may be permitted to join in and be bound by an arbitration commenced hereunder if required by the terms of their respective agreements with the Contractor, except to the extent that such joinder would unduly delay or complicate the expeditious resolution of the claim, dispute or other disagreement between the District and the Contractor, in which case an appropriate severance order shall be issued by the Arbitrator(s).

16.13.3. Discovery. In connection with any arbitration proceeding commenced hereunder, the discovery rights and procedures provided for in California Code of Civil Procedure §1283.05 shall be applicable, and the same shall be deemed incorporated herein by this reference.

16.13.4. Arbitration Award. The award rendered by the Arbitrator(s) ("Arbitration Award") shall be final and binding upon the District and the Contractor only if the Arbitration Award is: (i) supported by substantial evidence; (ii) based on applicable legal standards in effect that the time the Arbitration Award is issued; and (iii) supported by written findings of fact and conclusions of law in conformity with California Code of Civil Procedure §1296. Any Arbitration Award that does not conform to the foregoing is invalid and unenforceable. The District and Contractor hereby expressly agree that the Court shall, subject to California Code of Civil Procedure §§1286.4 and 1296, vacate the Arbitration Award if, after review, the Court determines either that the Arbitration Award does not fully conform to the foregoing. The confirmation, enforcement, vacation or correction of an arbitration award rendered hereunder shall be made by the Superior Court of the State of California for the county in which the Site is situated. The substantive and procedural rules for such post-award proceedings shall be as set forth in California Code of Civil Procedure §1285 et seq.

16.13.5. Arbitration Fees and Expenses. The expenses and fees of the Arbitrator(s) shall be divided equally among all of the parties to the arbitration. Each party to any arbitration commenced hereunder shall be responsible for and shall bear its own attorneys' fees, witness fees and other costs or expenses incurred in connection with such arbitration. The foregoing notwithstanding, the Arbitrator(s) may award arbitration costs, including Arbitrators' fees but excluding attorneys' fees, to the prevailing party. By this arbitration provision, the District and the Contractor acknowledge and agree that neither shall recover from the other any attorney's fees associated with or arising out of any legal, administrative or other proceedings filed or instituted in connection with or arising out of the Contract Documents or the performance of either the District or the Contractor thereunder. The limited exceptions in the Contract Documents that provide attorney's fees for specific issues shall neither be construed as applying to this arbitration provision under California Civil Code § 1717(a) nor be deemed to be "authorized by the Laws."

16.13.6. Limitation on Arbitrator. The Superior Court for the State of California for the County in which the Project Site is situated has the sole and exclusive jurisdiction, and an arbitrator has no authority, to hear and/or determine a challenge to the commencement or maintenance of an arbitration proceeding on the grounds that:

(i) the subject matter of the arbitration proceeding is barred by the applicable statute of limitations; (ii) the subject matter of the arbitration proceeding is barred by a provision of the California Government Claims Act; (iii) the subject matter of the arbitration proceeding is outside the scope of the arbitration clause; (iv) the Contractor has failed to satisfy all conditions precedent to commencement or maintenance of ab arbitration proceeding; (v) waiver of the right to compel arbitration; (vi) grounds exist for the revocation of the arbitration agreement; and/or, (vii) there is the prospect that a ruling in arbitration would conflict or potentially with a ruling in a pending proceeding regarding the Project on a common issue of law or fact.

16.13.7. Inapplicability to Bid Bond. The arbitration proceedings described above are not applicable to disputes, disagreements or enforcement of rights or obligations under the Bid Bond. All claims, disputes and actions to enforce rights or obligations under the Bid Bond shall be adjudicated only by judicial proceedings commenced in a court of competent jurisdiction.

16.14. Attorneys' Fees. Except as expressly provided for in the Contract Documents, or authorized by the Laws, neither the District nor the Contractor shall recover from the other any attorneys' fees or other costs associated with or arising out of any legal, administrative or other proceedings filed or instituted in connection with or arising out of the Contract Documents or the performance of either the District or the Contractor thereunder.

16.15. Provisions Required by the Laws Deemed Inserted. Each and every provision of the Laws and clause required by the Laws to be inserted in the Contract Documents is deemed to be inserted herein and the Contract Documents shall be read and enforced as though such provision or clause are included herein, and if through mistake, or otherwise, any such provision or clause is not inserted or if not correctly inserted, then upon application of either party, the Contract Documents shall forthwith be physically amended to make such insertion or correction.

16.16. Days. Unless otherwise expressly stated, references to "days" in the Contract Documents are calendar days.

16.17. Entire Agreement. The Contract Documents contain the entire agreement and understanding between the District and the Contractor concerning the subject matter hereof, and supersedes and replaces all prior negotiations, proposed agreements or amendments, whether written or oral. No amendment or modification to any provision of the Contract Documents shall be effective or enforceable except by an agreement in writing executed by the District and the Contractor.

[END OF SECTION]

SPECIAL CONDITIONS

1. Application of Special Conditions. These Special Conditions form a part of the Contract Documents for the Work generally described as: **STUDENT HOUSING**

2. Liquidated Damages. The per diem rate of Liquidated Damages for delayed Substantial Completion, delayed submission of Submittals and delayed completion of Punchlist shall be as set forth herein.

   2.1. Delayed Substantial Completion. If Substantial Completion is not achieved on or before expiration of the Contract Time, the Contractor shall be liable to the District for Liquidated Damages from the date of expiration of the Contract Time to the date that the Contractor achieves Substantial Completion of the Work at the per diem rate of Fifteen Hundred Dollars ($ 1,500.00).

   2.2. Delayed Submission of Submittals. If the Contractor fails to submit a Submittal in accordance with the Submittal Schedule, the Contractor shall be liable to the District for Liquidated Damages for each delayed Submittal at the per diem rate of Five Hundred Dollars ($ 500.00).from the date that such Submittal was due to be submitted pursuant to the Submittal Schedule and the date that the Contractor actually submits the Submittal to the Architect.

   2.3. Delayed Punchlist Completion. If the Contractor fails to complete Punchlist within the time established pursuant to the Contract Documents, the Contractor shall be liable to the District for Liquidated Damages from the date established for completion of Punchlist until the date that all Punchlist is actually completed at the per diem rate of Fifteen Hundred Dollars ($ 1,500.00).

   2.4. Surety Liability. Subject only to limitations established by the penal sum of the Performance Bond, the Surety issuing the Performance Bond shall be liable to the District for Liquidated Damages due from the Contractor.

3. Construction Manager. The Construction Manager is PCM3, Inc.

4. District Furnished Drawings and Specifications. Pursuant to Article 2.1.3 of the General Conditions, the District will furnish to the Contractor for use solely and exclusively in connection with performance of the Work zero (-0-) printed copies of the Drawings and Specifications. Additional copies of the Drawings and Specifications may be reproduced by the Contractor at its cost and expense

5. Hours and Days of Work at the Site.

   5.1. Work Hours/Days. Subject to limitations set forth elsewhere in the Contract Documents and below, the hours/days of Work at the Site are: 7am – 7pm Mondays through Fridays, except for holiday days.

   5.2. Limitations on Work Hours/Days. Work activities at the Site will be limited or prohibited on days: (i) devoted to student testing or when testing of students may be adversely affected by Work activities at the Site; or (ii) when other special events or functions are scheduled. The Contractor shall familiarize itself with District activities at the Site to avoid Work activity interferences or disturbances to such District activities. The Contractor's Construction Schedule shall take into account the District activities which limit or preclude Work activities at the Site.

6. Contractor Personnel Parking. Personnel of the Contractor, Subcontractors and others performing Work at the Site will be allowed to park, with a valid District parking permit, in the parking spaces at a location designated by the District. Parking permit charges, if any, shall be borne and paid by

the Contractor without adjustment of the Contract Price. The foregoing notwithstanding, the extent or location of parking for such personnel may be limited, restricted, eliminated or modified by the District as reasonably necessary to facilitate and accommodate necessary parking for the District's students, staff and visitors engaged in activities and functions in and about the Site. Neither the Contract Price nor the Contract Time shall be adjusted as a result of any such District modifications to the extent or location of parking.

7. Site Perimeter Fencing. The Contractor shall install a chain link fence with fabric privacy screen around the entire perimeter of the Site to prevent dust and debris being blown from the Site to adjacent areas, including without limitation, adjacent streets and residential areas. Without adjustment of the Contract Time or the Contract Price the Contractor shall maintain all fencing in good condition and clear of any graffiti or damage. The Contractor shall remove or relocate such fencing as directed by the District or the Construction Manager.

8. Facilities/Services for Project Inspector. Pursuant to Article 4.14 of the General Conditions, during the Work, the Contractor shall provide/furnish the following facilities/services or other items for use by the Project Inspector for the entire duration of the Work at the Site, until Final Completion is achieved. All costs, fees, expenses or other charges for the following are included within the Contract Price.

Site Office Facility	Lockable office minimum size of 12 x 24 with at least two separate offices, each with an outside door. One to be used for the Project Inspector and one for the Project As-Built plan room.
Site Office Furnishings – Project Inspector	One 3 x 5 desk, 2 chairs, one 3 x 10 plan table, one 12" x 8' shelf for spec books, one four drawer filing cabinet, plan rack with hangars capable of holding 8 sets minimum of 30 x 42 drawings.
Site Office Furnishings – Project As-Built plan room	2 chairs, two 3 x 8 plan tables, two 12" x 8' minimum shelves, plan rack with hangars capable of holding 10 sets minimum of 30 x 42 drawings.
Site Office Equipment	Desktop printer/scanner/copier with 11 x 17 capability and cables required for laptop connection
Site Office Services	Power, air conditioning,high speed wireless internet service
Site Office Consumable Materials	Ink or laser cartridges, copy paper as necessary for printer
Other Items/Services	One lockable toilet facility for Architect, CM & PI use only.

9. District Provided Temporary Utilities. Pursuant to Article 4.3.5 of the General Conditions, during the Contractor's performance of the Work, the District will not provide the Contractor with utility services. Meters will be required to be installed by the contractor for monitoring of water, electricity, high speed internet and any other utility connected to the District systems. The Contractor will be responsible to pay the District for all utility usage based on meter reads on a quarterly basis. If the District provides any utility services for use by the Contractor: (i) the District may discontinue, limit or condition use of such services by a Contractor if the District reasonably determines that the Contractor has wasted such utilities, and (ii) the District shall not be liable to the Contractor, nor shall the Contract Time or the Contract Price be increased if any District provided temporary utility service is discontinued or disrupted for any reason other than the District's non-payment of undisputed utility charges. If provided by the District, the Contractor may use the temporary electrical power and domestic potable water service in connection with the Work provided that: (i) the District may discontinue, limit or condition use of such services by a Contractor if the District reasonably determines that the Contractor has wasted such utilities, and (ii) the District shall not be liable to the Contractor, nor shall the Contract Time or the Contract Price be increased if any District provided temporary utility service is discontinued or disrupted for any reason other than

the District's non-payment of undisputed utility charges. Notwithstanding any provision of the Contract Documents to the contrary, the Contractor shall not use District provided water supply in connection with any earthwork or grading operations; water supply for earthwork or grading operations shall be obtained by the Contractor, without adjustment of the Contract Time or the Contract Price, from an offsite source or mobile water delivery service. Further, notwithstanding the District providing a point of connection for the Contractor's telephone/data service at the Site, the Contractor is solely responsible for the payment of utility service charges therefor.

10. Mark-Ups on Changes to the Work. In the event of Changes to the Work, pursuant to Article 9 of the General Conditions, the mark-up for all overhead (including home and field office overhead), general conditions costs and profit, shall not exceed the percentage of allowable direct actual costs for performance of the Change as set forth below.

    10.1. Subcontractor Performed Changes. For the portion of any Change performed by Subcontractors of any tier, the percentage mark-up on allowable actual direct labor and materials costs incurred by all Subcontractors of any tier shall be Fifteen Percent (15%). In addition, for the portion of any Change performed by a Subcontractor of any tier, the Contractor may add an amount equal to Five Percent (5%) of the allowable actual direct labor and materials costs of Subcontractors performing the Change; the foregoing mark-up shall not be applied to the Subcontractor mark-up.

    10.2. Contractor Performed Changes. For the portion of any Change performed by the Contractor's own forces, the mark-up on the allowable actual direct labor and materials costs of such portion of a Change shall be Fifteen Percent (15%).

    10.3. Bond Premium Costs. In addition to the foregoing mark-ups on the direct costs of labor and materials, a bond premium expense in an amount equal to the lesser of the Contractor's actual bond premium rate of One Percent (1%) of the total actual direct costs of labor and materials (before Subcontractor and Contractor mark-ups) will be allowed.

    10.4. Exclusions From Mark-Up of Actual Costs. Mark-ups on the actual cost of materials/equipment incorporated into a Change or for purchase/rental of Construction Equipment shall not be applied to any portion of such costs which are for sales, use or other taxes arising out of the purchase of materials/equipment and/or for purchase/rental of Construction Equipment.

11. Use of Project Allowance. If the Contract Price incorporates an Allowance, use of the Allowance shall be subject to the following.

    11.1. District Authorization. The Allowance is used only as authorized by the District. If the use of the Allowance is designated in the Contract Documents for specific purposes, use of any portion of the Allowance shall be limited to the specific purposes set forth in the Contract Documents.

    11.2. Allowance Costs. If use of the Allowance is authorized by the District, the Contractor shall prepare a detailed breakdown of all costs associated with the work defined for the Allowance. These amounts will be charged against the Allowance by Change Order, based on final detailed payment receipts and back-up as required by Architect, and will include all costs of Work performed under the defined Work scope. If required by the District, Contractor shall obtain quotes for equipment from three separate vendors and present such quotes to District for consideration and selection.

    11.3. Allowance Cost Limitations. The Contract Price is inclusive of all cost of coordination, supervision, bond costs, overhead and profit, supervision, installation and all indirect costs associated with performing the Work of each Allowance. Contractor shall be permitted to charge only its direct costs to perform the Allowance Work, as indicated through

documentation approved by the District.

11.4. Deductive Change Order. At project closeout, any unused Allowance shall be credited to the District by deductive Change Order. Contractor shall not deduct costs such as bond costs, overhead and profit or other indirect costs when crediting any unused Allowance.

11.5. Costs Exceeding Allowance. If the costs to complete specific Work subject to an Allowance exceeds the Allowance, costs to complete the Work exceeding the Allowance shall be incorporated into a Change Order issued in accordance with the terms of the Contract Documents.

12. Rain Days. The Contractor's Construction Schedules prepared pursuant to Article 7 of the General Conditions shall incorporate the Rain Days set forth below; there shall be no adjustment to the Contract Time on account of unusually severe weather conditions resulting from rainfall until the actual number of Rain Days exceeds the number of Rain Days set forth below. The Contractor's Construction Schedule shall incorporate the following number of Rain Days for each Calendar Month of the Contract Time:

Month	Rain Days
January	four (4)
February	four (4)
March	three (3)
April	two (2)
May	two (2)
June	none
July	none
August	none
September	none
October	two (2)
November	three (3)
December	four (4)

13. Deferred Approval Items. The following Deferred Approval Items are incorporated into and made a part of the Work: Soil Improvement final sign off by CGS, Elevator Guide Rails, Aluminum Curtainwall System and Exterior Sun Control Devices connected to the Curtainwall System. The Contractor is responsible for preparing all materials necessary for DSA review and approval of Deferred Approval Items without adjustment of the Contract Time or the Contract Price.

14. Contractor/Subcontractor Insurance.

14.1. OCIP. *CONTRACTOR/SUBCONTRACTOR SHOULD REFER TO THE ACTUAL POLICIES FOR DETAILS CONCERNING COVERAGE, EXCLUSIONS, AND LIMITATIONS. IN THE EVENT OF ANY CLAIM OR QUESTION WITH REGARD TO COVERAGE PROVIDED BY THE OCIP, THE ORIGINAL POLICIES WILL PREVAIL AS THE SOLE BINDING AGREEMENT. OCIP POLICIES AND PROJECT INSURANCE MANUAL ARE AVAILABLE UPON WRITTEN REQUEST TO THE PROGRAM ADMINISTRATOR.*

14.2. Off-Site Operations and Automobile Liability. The OCIP is for the benefit of the Owner and all Enrolled Contractors/Subcontractors who have on-site employees. OCIP coverage applies only to Work performed under the contract at the Project (see Section 1.1, B for definition). All Contractors must provide their own insurance for Automobile Liability and off-site locations, labor, and operations.

Policy of Insurance	Minimum Coverage Amount
Automotive Liability	One Million Dollars ($1,000,000) per occurrence/Two Million Dollars ($2,000,000) aggregate

14.3. Excluded Parties Insurance Requirements. Each Excluded Party to the OCIP policy shall obtain and maintain the following insurance coverages with at least the minimum coverage amounts noted below. No Excluded Party or any person employed by or affiliated with an Excluded Party shall be permitted on the Site or to perform any Work at the Site until the District is in receipt of Certificates of Insurance evidencing each of the following insurance coverages in the minimum coverage amounts set forth below. The Contract Price shall not be subject to adjustment for the costs or premium charges relating to insurance policies obtained by an Excluded Party.

Policy of Insurance	Minimum Coverage Amount
Commercial General Liability Insurance	Per Occurrence: One Million Dollars ($1,000,000)
	Aggregate: Two Million Dollars ($2,000,000)
Automotive Liability	One Million Dollars ($1,000,000) per occurrence/Two Million Dollars ($2,000,000) aggregate
Workers Compensation	In accordance with the Laws
Employers Liability	One Million Dollars ($1,000,000)
Contractor's Pollution Liability (As applicable, if Subcontractor's work involves SWPPP, the removal of asbestos, the removal/replacement of underground tanks or the removal of toxic chemicals and substances)	Per Occurrence: One Million Dollars ($1,000,000)
	Aggregate: Two Million Dollars ($2,000,000)

[END OF SECTION]

Attachment A

Special Conditions 00 73 00

Community Benefits Agreement (CBA)

Attachment A to Specification 00 73 00

COMMUNITY BENEFITS AGREEMENT

BY AND AMONG

THE COMPTON COMMUNITY COLLEGE DISTRICT

AND

THE LOS ANGELES AND ORANGE COUNTIES
BUILDING AND CONSTRUCTION TRADES COUNCIL

AND

THE SIGNATORY CRAFT COUNCILS AND UNIONS

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COMPTON COMMUNITY COLLEGE DISTRICT
COMMUNITY BENEFITS AGREEMENT

This Community Benefits Agreement (hereinafter, "Agreement" or "CBA") is entered into this 16th day of July 2019, by and among the Board of Trustees of the Compton Community College District, its successors or assigns (the "District"), the Los Angeles/Orange Counties Building and Construction Trades Council (the "Council"), and the Craft Councils and Unions signing this Agreement (hereinafter together with the Council, collectively, the "Union" or "Unions"). This Agreement establishes the labor relations guidelines and procedures for the District and for the contractors and craft employees represented by the Unions and engaged in Project Work. The District, Council and Unions are referred to herein, as the context may require, as "Party" or "Parties."

It is further understood that the District shall actively administer and enforce the obligations of this Agreement to ensure that the benefits envisioned from it flow to all Parties, the contractors and crafts persons working under it, and the ratepayers, residents and students of the District. The District shall designate, the Director of Purchasing and Auxiliary Services as the "Project Labor Coordinator," to monitor compliance with this Agreement; assist, as the District's authorized representative, in developing and implementing the programs referenced herein, all of which are critical to fulfilling the intent and purposes of the Parties and this Agreement; and to otherwise implement and administer this Agreement.

The term "Apprentice" as used in this Agreement shall mean those employees registered and participating in Joint Labor/Management Apprenticeship Programs approved by the Division of Apprenticeship Standards, Department of Industrial Relations of the State of California.

The term "Contractor" as used in this Agreement includes any contractor to whom the District awards a construction contract through its public bidding process for Project Work, and also to subcontractors of whatever tier utilized by such contractors for Project Work.

The term "Contractor" as used in this Agreement includes any individual, firm, partnership, or corporation, or combination thereof, including joint ventures, which as an independent contractor has entered into a contract with the District with respect to the Project Work, or with another contractor as a subcontractor of whatever tier for Project Work.

The term "Joint Labor/Management Apprenticeship Program" as used in this Agreement shall mean a joint union and contractor administered apprenticeship program certified by the Division of Apprenticeship Standards, Department of Industrial Relations of the State of California.

The term "Letter of Assent" as used in this Agreement means the document that each Contractor (of any tier) must sign and submit to the Project Labor Coordinator and the Council, before beginning any Project Work, which formally binds them to adherence to all the forms, requirements and conditions of this Agreement, in the form attached hereto as Attachment A.

The term "Project" or "Project Work" as used in this Agreement means the District's renovation, rehabilitation, repair, upgrade, improvement and construction work, as more specifically defined in Section 2.2 of this Agreement.

The term "Master Labor Agreements" or "MLAs" as used in this Agreement means the local collective bargaining agreements of the Unions having jurisdiction over the Project Work and which have signed this Agreement.

The term "Subscription Agreement" as used in this Agreement means the contract between a Contractor and a Union's Labor/Management Trust Fund(s) that allows the Contractor to make the appropriate fringe benefit contributions in accordance with the terms of the MLAs.

The use of masculine or feminine gender or titles in this Agreement should be construed as including both genders and not as gender limitations unless the Agreement clearly requires a different construction. Further, the use of Article titles and/or Section headings are for information only and carry no legal significance.

ARTICLE 1
INTENT AND PURPOSE

Section 1.1 Background. The District's infrastructure, maintenance, repair, safety enhancements, reconfiguration and new construction will affect the school buildings and offices that are owned, leased or controlled by the District. The goal of this work is to provide major rehabilitation of the District's facilities so as to provide sufficient facilities and technologies to properly educate the children within the District's boundaries. The District, therefore, wishing to utilize the most modern, efficient and effective procedures for construction, including assurances of a sufficient supply of skilled craft-persons and the elimination of disruptions or interference with Project Work, adopts this Agreement in the best interests of the students, parents, District staff, and the taxpayers of the District to meet the District's goal that the Project work be completed on time and within budget.

Section 1.2 Identification and Retention of Skilled Labor and Employment District Residents. The infrastructure, maintenance, repair, safety enhancements, reconfiguration and new construction work scheduled to be performed will require large numbers of craft personnel and other supporting workers. It is therefore the explicit understanding and intention of the Parties to this Agreement to use the opportunities provided by the extensive amount of work to be covered by this Agreement to identify and promote, through cooperative efforts, programs and procedures (which may include, for example, programs to prepare persons for entrance into formal Joint Labor Management Apprenticeship Programs, or outreach programs to the community describing opportunities available as a result of the Project), the interest and involvement of District residents and students in the construction industry; assist them in entering the construction trades, and through utilization of the Joint Labor Management Apprenticeship Programs, provide training opportunities for those District residents, students and other individuals wishing to pursue a career in construction. Further, with assistance of the Project Labor Coordinator, the District, the Contractors, the Council, the Unions and their affiliated regional and national organizations, will work jointly to promptly develop and implement procedures for the identification of craft needs,

the scheduling of work to facilitate the utilization of available craft workers, and the securing of services of craft workers in sufficient numbers to meet the high demands of the Project Work to be undertaken.

Section 1.3 Encouragement of Small Local Business. The Project Work will provide many opportunities for local small business enterprises to participate as Contractors or suppliers, and the Parties therefore agree that they will cooperate with all efforts of the District, the Project Labor Coordinator, and other organizations retained by the District for the purpose, to encourage and assist the participation of local small businesses in Project Work. Specifically, the Parties understand the District places a strong emphasis on the utilization of small, local business on the Project. Each Party agrees that it shall employ demonstrable efforts to encourage utilization to achieve such goals. This may include, for example, participation in outreach programs, education and assistance to businesses not familiar with working on a project of this scope, and the encouragement of local residents to participate in Project Work through programs and procedures jointly developed to prepare and encourage such local residents for apprenticeship programs and formal employment on the Project through the referral programs sponsored and/or supported by the Parties to this Agreement. Further, the Parties shall ensure that the provisions of this Agreement do not inadvertently establish impediments to participation of such small local businesses and residents of the District.

Section 1.4 Project Cooperation. The Parties recognize that the construction to take place under this Agreement involves unique and special circumstances which dictate the need for the parties to develop specific procedures to promote high quality, rapid and uninterrupted construction methods and practices. The smooth operation and successful and timely completion of the work is vitally important to the residents, parents and the students of the District. The parties therefore agree that maximum cooperation among all parties involved is required; and that with construction work of this magnitude, with multiple contractors and crafts performing work on multiple sites of over an extended period of time, it is essential that all parties work in a spirit of harmony and cooperation, and with an overriding commitment to maintain the continuity and completion of Project Work. Further, the Parties recognize that an Act of God or on Act of War could require the District to partially or fully suspend Project Work. The parties shall fully cooperate with any District request to redirect their equipment, skills and expertise to support the District's efforts necessitated by such events.

Section 1.5 Workers' Compensation Carve-out. Further, the Parties recognize the potential which the Project may provide for the implementation of a cost-effective workers' compensation system as permitted by revised California Labor Code Section 3201.5. Upon the District's request, the Union parties agree to meet and negotiate in good faith with representatives of the District for the development, and subsequent implementation, of an effective program involving improved and revised dispute resolution and medical care procedures for the delivery of workers' compensation benefits and medical coverage as permitted by the Labor Code.

Section 1.6 Peaceful Resolution of All Disputes. In recognition of the special needs of the Project and to maintain a spirit of harmony, stability and labor-management peace during the term of this Community Benefits Agreement, the Parties agree to establish effective and binding methods for the settlement of all misunderstandings, disputes and grievances; and in recognition

of such methods and procedures, the Unions agree not to engage in any strike, slowdowns or interruptions or disruption of Project Work, and the Contractors agree not to engage in any lockout.

Section 1.7 Binding Agreement on Parties and Inclusion of District Residents and Business. By executing this Agreement, the District, Council, Unions and Contractors agree to be bound by each and all of the provisions of this Agreement, and pledge that they will work together to adopt, develop and implement processes and procedures which are inclusive of Local Residents and Small Local Businesses.

ARTICLE 2
SCOPE OF THE AGREEMENT

Section 2.1 General. This Agreement shall apply and is limited to all of the District's Project Work, as specified in Section 2.2 of this Article, performed by those Contractor(s) of whatever tier that have contracts awarded for such work where such work

Section 2.2 Specific. The Covered Projects are defined and limited to:

(a) The construction of a new Student Services/Administration Building.

(b) It is understood by the Parties that the District may at any time, and at its sole discretion, add additional projects with a construction cost value exceeding 3 million dollars to be covered under this Agreement.

Section 2.3 Exclusions. Items specifically excluded from the Scope of this Agreement include the following:

(a) The CBA shall be limited to Project Work, undertaken pursuant to covered contracts which are awarded by the District on or after the Effective Date, and is not intended to, and shall not govern, any construction contracts entered into prior to the Effective Date of this CBA, or after the expiration or termination of the CBA; and

(b) Work of non-manual employees, including but not limited to: superintendents; teachers; supervisors; staff engineers; quality control and quality assurance personnel, provided such personnel does not perform work covered by prevailing wage determinations; time keepers, mail carriers, clerks, office workers, messengers; guards, safety personnel, emergency medical and first aid technicians; and other professional, engineering, administrative, supervisory and management employees;

(c) Equipment and machinery owned or controlled and operated by the District;

(d) All off-site manufacture, fabrication, and handling of materials, equipment or machinery; provided, however, that lay down or storage areas for equipment or material and manufacturing (prefabrication) sites, dedicated solely to the Project or Project Work, and the movement of materials or goods between locations on a Project site are within the scope of this Agreement;

(e) All employees of the District, Project Labor Coordinator, design teams (including, but not limited to architects engineers and master planners), or any other consultants for the District (including, but not limited to, project managers and construction managers and their employees where not engaged in Project Work) and their sub-consultants, and other employees of professional service organizations, not performing manual labor within the scope of this Agreement; provided, however, that it is understood and agreed that Building/Construction Inspector and Field Soils and Materials Testers (Inspectors) are a covered craft under the CBA. (This inclusion applies to the scope of work defined in the State of California Prevailing Wage Determination for said Craft. Every Inspector performing under the Wage classification of Building/Construction Inspector and Field Soils and Material Testers under a professional services agreement of a construction contract shall be bound to all applicable requirements of the CBA.) Nothing in this section will be construed to include Department of State Architects-certified inspectors employed by the District as included under the scope of this Agreement. Work covered by this Agreement shall be performed pursuant to the terms and conditions of this Agreement regardless of the manner in which the work was awarded; and

(f) Any work performed on or near or leading to or into a site of work covered by this Agreement and undertaken by state, county, city or other governmental bodies, or their Contractors; or by public utilities, or their contractors; and/or by the District or its contractors (for work for which is not within the scope of this Agreement);

(g) Off-site maintenance of leased equipment and on-site supervision of such work;

(h) Work by employees of a manufacturer or vendor necessary to maintain such manufacturer's or vendor's warranties or guaranty;

(i) Non-construction support services contracted by the District, Project Labor Coordinator, or Contractor in connection with this Project; and

(j) Offsite Laboratory work for testing.

(k) Maintenance, repair or warranty work performed after Final Completion of the Project.

Section 2.4 Awarding of Contracts.

(a) The District and/or the Contractors, as appropriate, have the absolute right to award contracts or subcontracts on this Project to any contractor notwithstanding the existence or non-existence of any agreements between such contractor and any Union parties, provided only that such contractor is ready, willing and able to execute and comply with this Community Benefits Agreement should such contractor be awarded work covered by this Agreement.

(b) It is agreed that all Contractors and subcontractors of whatever tier, who have been awarded contracts for work covered by this Agreement, shall be required to accept and be bound to the terms and conditions of this Community Benefits Agreement, and shall evidence their acceptance by the execution of the Letter of Assent as set forth in Attachment "A" hereto, prior to

the commencement of work. At the time that any Contractor enters into a subcontract with any subcontractor of any tier for the performance of work covered by this Agreement, the Contractor shall provide a copy of this Agreement to said subcontractor and shall require the subcontractor, as a part of accepting the award of a construction subcontract, to agree in writing in the form of a Letter of Assent to be bound by each and every provision of this Agreement prior to the commencement of work on the Project. No Contractor or subcontractor shall commence Project Work without having first provided a copy of the Letter of Assent as executed by it to the Project Labor Coordinator and to the Council forty-eight (48) hours before the commencement of Project Work, or within forty-eight (48) hours after the award of Project Work to that Contractor (or subcontractor), whichever occurs later.

(c) Under all circumstances, however, the District shall retain the absolute right to select the lowest reliable and responsible bidder for the award of contracts on all Project Work.

Section 2.5 Coverage Exception. This Agreement shall not apply to any work that would otherwise be work covered under this Agreement when a governmental agency or granting authority partially or fully funding such Project Work determines it will not provide funds if such Project Work is covered by this Agreement; or a law, regulation, proposition or measure prohibits such coverage or the use by the District, or for its benefit of particular funds if such coverage exists. The District agrees that it will make every effort to establish the enforcement of this Agreement with any governmental agency or granting authority.

Section 2.6 Master Labor Agreements.

(a) The provisions of this Agreement, including the Master Labor Agreements, (which are the local collective bargaining agreements of the Unions having jurisdiction over the work on the Project, as such may be changed from time-to-time consistent with Section 22.3 and which are incorporated herein by reference) shall apply to the work covered by this Agreement, notwithstanding the provisions of any other local, area and/or national agreement which may conflict with or differ from the terms of this Agreement. However, such does not apply to work performed under the National Cooling Tower Agreement, the National Stack Agreement, the National Transit Division Agreement (NTD), or within the jurisdiction of the International Union of Elevator Constructors and all instrument calibration and loop checking work performed under the terms of the UA/IBEW Joint National Agreement for Instrument and Control Systems Technicians except that Articles dealing with Work Stoppages and Lock-Outs, Work Assignments and Jurisdictional Disputes, and Settlement of Grievances and Disputes shall apply to such work. It is specifically agreed that no later agreement shall be deemed to have precedence over this Agreement unless signed by all Parties signatory hereto who are then currently employed or represented at the Project. Where a subject covered by the provisions of this Agreement is also covered by an MLA, the provisions of this Agreement shall apply. Where a subject is covered by a provision of an MLA and not covered by this Agreement, the provisions of the MLA shall prevail. Any dispute as to the applicable source between this Agreement and any MLA for determining the wages, hours or working conditions of employees on this Project shall be resolved under the procedures established in Article 10.

(b) It is understood that this Agreement, together with the referenced MLAs, constitutes a self-contained, stand-alone agreement and by virtue of having become bound to this Community Benefits Agreement, the Contractor will not be obligated to sign any other local, area or national collective bargaining agreement as a condition of performing work within the scope of this Agreement (provided, however, that the Contractor may be required to sign an uniformly applied, non-discriminatory Subscription Agreement at the request of the trustees or administrator of a trust fund established pursuant to Section 302 of the Labor Management Relations Act, and to which such Contractor is bound to make contributions under this Agreement, provided that such Subscription Agreement does not purport to bind the Contractor beyond the terms and conditions of this Agreement and/or expand its obligation to make contributions pursuant thereto). It shall be the responsibility of the prime Contractor to have each of its subcontractors sign the Subscription Agreement with the appropriate Craft Union prior to the subcontractor beginning Project Work.

Section 2.7 Binding Signatories Only. This Agreement shall only be binding on the Parties hereto, and shall not apply to the parents, affiliates, subsidiaries, or other ventures of any such Party.

Section 2.8 Other District Work. This Agreement shall be limited to the Project referenced in Section 2.2 above. Nothing contained herein shall be interpreted to prohibit, restrict, or interfere with the performance of any other operation, work or function not covered by this Agreement, which may be performed by District employees or contracted for by the District for its own account, on its property or in and around a Project site.

Section 2.9 Separate Liability. It is understood that the liability of the Contractor(s) and the liability of the separate Unions under this Agreement shall be several and not joint. The Unions agree that this Agreement does not have the effect of creating any joint employment status between or among the District or Project Labor Coordinator and/or any Contractor.

Section 2.10 Completed Project Work. As areas of covered work are accepted by the District, this Agreement shall have no further force or effect on such items or areas except where the Contractor is directed by the District or its representatives to engage in repairs, modification, check-out and/or warranties functions required by its contract(s) with the District.

ARTICLE 3
UNION RECOGNITION AND EMPLOYMENT

Section 3.1 Recognition. The Contractor recognizes the Council and the signatory local Unions as the exclusive bargaining representative for the employees engaged in Project Work. Unless a Contractor is a signatory contractor, such recognition does not extend beyond the Project.

Section 3.2 Contractor Selection of Employees. The Contractor shall have the right to determine the competency of all employees, the number of employees required, the duties of such employees within their craft jurisdiction, and shall have the sole responsibility for selecting employees to be laid off, consistent with Section 3.3 and Section 4.3, below. The Contractor shall also have the right to reject any applicant referred by a Union for any reason, subject to any reporting pay required by Section 6.6; provided, however, that such right is exercised in good faith

and not for the purpose of avoiding the Contractor's commitment to employ qualified workers through the procedures endorsed in this Agreement.

Section 3.3 Referral Procedures.

(a) For signatory Unions having a job referral system contained in an MLA, the Contractor agrees to comply with such system, and it shall be used exclusively by such Contractor, except as modified by this Agreement. Such job referral system will be operated in a nondiscriminatory manner and in full compliance with federal, state, and local laws and regulations which require equal employment opportunities and non-discrimination. All of the foregoing hiring procedures, including related practices affecting apprenticeship, shall be operated so as to consider the goals of the District to encourage employment of District residents and utilization of small local businesses on the Project, and to facilitate the ability of all Contractors to meet their employment needs.

The local Unions will exert their best efforts to recruit and refer sufficient numbers of skilled craft workers to fulfill the labor requirements of the Contractor, including specific employment obligations to which the Contractor may be legally and/or contractually obligated; and to refer apprentices as requested to develop a larger, skilled workforce. The Unions will work with their affiliated regional and national unions, and jointly with the Project Labor Coordinator and others designated by the District, to identify and refer competent craft persons as needed for Project Work, and to identify individuals, particularly residents of the District, for entrance into joint labor/management apprenticeship programs, or for participation in other identified programs and procedures to assist individuals in qualifying and becoming eligible for such apprenticeship programs, all maintained to increase the available supply of skilled craft personnel for Project Work and future construction of maintenance work to be undertaken by the District.

(b) The Union shall not knowingly refer an employee currently employed by a Contractor on Project Work to any other Contractor.

Section 3.4 Non-Discrimination in Referral, Employment, and Contracting. The Unions and Contractors agree that they will not discriminate against any employee or applicant for employment on the basis of race, color, religion, sex, gender, national origin, age, membership in a labor organization, sexual orientation, political affiliation, marital status or disability in hiring or dispatching. Further, it is recognized that the District has certain policies, programs, and goals for the utilization of local small business enterprises. The Parties shall jointly endeavor to assure that these commitments are fully met, and that any provisions of this Agreement which may appear to interfere within a local small business enterprises successfully bidding for work within the scope of this Agreement shall be carefully reviewed, and adjustments made as may be appropriate and agreed upon among the Parties, to ensure full compliance with the spirit and letter of the District's policies and commitment to its goals for the significant utilization of local small businesses as direct Contractors or suppliers on Project Work.

Section 3.5 Employment of Local Residents.

(a) In recognition of the fact that the District and the communities surrounding Project Work will be impacted by the construction of the Project Work, the Parties agree to support the hiring of workers from the residents of these surrounding areas. The Unions and Contractors agree that, to the extent allowed by law, and as long as they possess the requisite skills and qualifications, the Unions will exert their best efforts to refer and/or recruit sufficient numbers of skilled craft area residents, as described below, as well as graduates from the District ("Student Graduates") and Veterans (regardless of where the Student Graduates and Veterans reside) hereinafter collectively referred to as "Local Residents," to fulfill the requirements of the Contractors. Towards that end, the Unions shall, first, exert their best efforts to encourage and provide referrals and utilization of area residents residing within the Districts geographic jurisdiction, as well as Veterans and Student Graduates (regardless of where they reside). If the Unions cannot provide the Contractors in the attainment of a sufficient number of Local Residents from within the first tier, as described immediately above, the Unions shall, second, exert their best efforts to then recruit and identify for referral area residents residing within a ten (10) mile radius from the District's headquarters, as reflected on the list of U.S. Postal Service zip codes attached hereto as Attachment "B." If the Unions still have not provided the Contractors in the attainment of a sufficient number of Local Residents, the Unions shall then exert their best efforts to recruit and identify for referral area residents residing within Los Angeles County. For dispatch purposes, employees referred from any of the above three (3) tiers, as well as veterans and student graduates, regardless of where they reside, shall be referred to as "Local Residents."

(b) A goal of 30% of the total work hours for each Contractor shall be from Local Residents. To facilitate the dispatch of Local Residents, all Contractors will be required to utilize the Craft Employee Request Form whenever they are requesting the referral of any employee from a Union referral list for any Covered Work, a sample of which is attached as **Attachment "C."** When Local Residents are requested by the Contractors, the Unions will refer such workers regardless of their place in the Unions' hiring halls' list and normal referral procedures.

(c) The Project Labor Coordinator shall work with the Unions and Contractors in the administration of this local residency goal. The Unions shall, upon the Project Labor Coordinator's request, provide their response(s) to the Craft Request Form submitted to them by the Contractors.

(d) Notwithstanding the transfer or portability provisions of the MLAs, Contractors which are directly signatory to an MLA shall comply with subsection (a) in transferring and employing workers on Project Work.

Section 3.6 Helmets to Hardhats. The Contractors and the Unions recognize a desire to facilitate the entry into the building and construction trades of veterans who are interested in careers in the building and construction industry. The Contractors and Unions agree to utilize the services of the Center for Military Recruitment, Assessment and Veterans Employment (hereinafter "Center") and the Center's "Helmets to Hardhats" program to serve as a resource for preliminary orientation, assessment of construction aptitude, referral to apprenticeship programs or hiring halls, counseling and mentoring, support network, employment opportunities and other needs as identified by the Parties. For purposes of this Agreement, the term "Eligible Veteran"

shall have the same meaning as the term "veteran" as defined under Title 5, Section 2108(1) of the United States Code as the same may be amended or re-codified from time to time. It shall be the responsibility of each qualified District resident to provide the Unions with proof of his/her status as an Eligible Veteran.

The Unions and Contractors agree to coordinate with the Center to create and maintain an integrated database of veterans interested in working on this Project and of apprenticeship and employment opportunities for this Project. To the extent permitted by law, the Unions will give credit to such veterans for bona fide, provable past experience.

Section 3.7 Core Employees.

(a) Contractors that are not independently signatory to an MLA for the employees in their employ, may employ, as needed, first, a member of his core workforce, then an employee through a referral from the appropriate Union hiring hall, then a second core employee, then a second employee through the referral system, and so on until a maximum of five (5) core employees are employed, thereafter, all additional employees in the affected trade or craft shall be requisitioned from the craft hiring hall in accordance with Section 3.3. In the laying off of employees, the number of core employees shall not exceed one-half plus one of the workforce for a Contractor with 10 or fewer employees, assuming the remaining employees are qualified to undertake the work available. This provision does not apply to contractors which are directly signatory to one or more of the MLAs and is not intended to limit the transfer provisions of the MLA of any trade. As part of this process, and in order to facilitate the contract administration procedures, as well as appropriate fringe benefit fund coverage, all Contractors shall require their core employees and any other persons employed other than through the referral process, to register with the appropriate Union hiring hall, if any, prior to their first day of employment at a project site.

(b) The core workforce is comprised of those employees

(1) whose names appeared on the Contractor's active payroll for at least sixty (60) of the last one hundred (100) working days before award of the Project Work to the Contractor; and

(2) who possess any license required by state or federal law for the Project Work to be performed;

(3) who have worked at least fifteen hundred (1,500) hours in the construction craft in which they are employed, during the prior four (4) years;

(4) who have the ability to safely perform the basic functions of the applicable trade; and

(5) who are residents of the District on the effective date of this agreement or have been residents of the District for one hundred (100) working days prior to the award of Project Work to the Contractor.

(c) Prior to each Contractor performing any work on the Project, each Contractor shall provide a list of his core employees to the Project Labor Coordinator and the Council. Failure to do so will prohibit the Contractor from using any core employees. Upon request by any Party to this Agreement, the Contractor hiring any core employee shall provide to Project Labor Coordinator and the Council, appropriate proof of a core employee's eligibility under this provision. For proof of employment eligibility, payroll records or quarterly tax records normally maintained by the Contractor (or officially recognized substitutes) shall be utilized; and for residency, adequate proof thereof through driver's license, voter registration, postal address, or other official acknowledgements.

Section 3.8 Time for Referral. If any Union's registration and referral system does not fulfill the requirements for specific classifications requested by any Contractor within forty-eight (48) hours (excluding Saturdays, Sundays and holidays), that Contractor may use employment sources other than the Union registration and referral services and may employ applicants meeting such standards from any other available source. The Contractors shall inform the Union of any applicants hired from other sources within forty-eight (48) hours of such applicant being hired, and such applicants shall register with the appropriate hiring hall, if any.

Section 3.9 Lack of Referral Procedure. If a signatory local Union does not have a job referral system as set forth in Section 3.3 above, the Contractors shall give the Union equal opportunity to refer applicants. The Contractors shall notify the Union of employees so hired, as set forth in Section 3.5.

Section 3.10 Union Membership. No employee covered by this Agreement shall be required to join any union as a condition of being employed, or remaining employed, for the completion of Project Work; provided, however, that any employee who is a member of the referring Union at the time of referral shall maintain that membership in good standing while employed under this Agreement. All employees shall, however, be required to comply with the union security provisions of the applicable MLA for the period during which they are performing on-site Project Work to the extent, as permitted by law, of rendering payment of an amount equal to the applicable monthly window and working dues uniformly required for membership in the Union.

Section 3.11 Individual Seniority. Except as provided in Section 4.3, individual seniority shall not be recognized or applied to employees working on the Project; provided, however, that group and/or classification seniority in a Union's MLA as of the effective date of this Agreement shall he recognized for purposes of layoffs.

Section 3.12 Foremen. The selection and number of craft foreman and/or general foreman shall be the responsibility of the Contractor. All foremen shall take orders exclusively from the designated Contractor representatives. Craft foreman shall be designated as working foreman at the request of the Contractors.

Section 3.13 District Security Requirements. The Parties are aware of the District's policy that Contractors of any tier and other employers shall not employ a person on Project Work when minors may be present on or around the site of such Project Work during working hours, or a person who would not be eligible for employment by the District under Education Code section

45123. All persons working on Project Work, including all employees hired by a Contractor (or referred by a Union) to work on Project Work shall be required to comply with all criminal background check certification requirements and District policies for those persons who may come in contact with, or work in close proximity to, minors in the course of performing work on a Project. Contractors may refuse to employ any person who declines to comply with District's background check requirements or who otherwise is determined to be disqualified from participating in Project Work because of a disqualifying conviction. Similarly, the District or the Project Labor Coordinator may ban or order the immediate removal of any person disqualified from working in the presence of, or in close proximity to, minors.

Section 3.14 Out of State Workers. Hours worked by residents of states other than California shall not be included in the calculation of total hours of Project Work for purposes of the percentage requirements, or the residency requirements, set forth above.

ARTICLE 4
UNION ACCESS AND STEWARDS

Section 4.1 Access to Project Sites. Authorized representatives of the Unions shall have access to Project Work, provided that they do not interfere with the work of employees and further provided that such representatives fully comply with posted visitor, security and safety rules.

Section 4.2 Stewards.

(a) Each Union shall have the right to dispatch a working journeyperson as a steward for each shift and shall notify the Contractor of the identity of the designated steward or stewards prior to the assumption of such person's duties as steward in writing. Such designated steward or stewards shall not exercise any supervisory functions. There will be no non-working stewards. Stewards will receive the regular rate of pay for their respective crafts.

(b) In addition to his/her work as an employee, the steward should have the right to receive, but not to solicit, complaints or grievances and to discuss and assist in the adjustment of the same with the employee's appropriate supervisor. Each steward should be concerned only with the employees of the steward's Contractor and, if applicable, subcontractor(s), and not with the employees of any other Contractor. A Contractor will not discriminate against the steward in the proper performance of his/her Union duties.

(c) When a Contractor has multiple, non-contiguous work locations at one site, the Contractor may request, and the Union shall appoint such additional working stewards as the Contractor requests to provide independent coverage of one or more such locations. In such cases, a steward may not service more than one work location without the approval of the Contractor.

(d) The stewards shall not have the right to determine when overtime shall be worked or who shall work overtime.

Section 4.3 Steward Layoff/Discharge. The relevant Contractor agrees to notify the appropriate Union twenty-four (24) hours before the layoff of a steward, except in the case of

disciplinary discharge for just cause. If the steward is protected against such layoff by the provisions of the applicable MLA, such provisions shall be recognized when the steward possesses the necessary qualifications to perform the remaining work. In any case in which the steward is discharged or disciplined for just cause, the appropriate Union will be notified immediately by the Contractor, and such discharge or discipline shall not become final (subject to any later filed grievance) until twenty-four (24) hours after such notice has been given.

Section 4.4 Employees on Non-Project Work. On work where the personnel of the District may be working in close proximity to the construction activities covered by this Agreement, the Union agrees that the Union representatives, stewards, and individual workers will not interfere with the District personnel, or with personnel employed by the any other employer not a party to this Agreement.

ARTICLE 5
WAGES AND BENEFITS

Section 5.1 Wages. All employees covered by this Agreement shall be classified in accordance with work performed and paid by the Contractors the hourly wage rates for those classifications in compliance with the applicable prevailing wage rate determination established by the Department of Industrial Relations pursuant to the California Labor Code. If a prevailing rate increases under California law, the Contractor shall pay that rate as of its effective date under the law. If the prevailing wage laws are repealed during the term of this Agreement, the Contractor shall pay the wage rates established under the MLAs, except as otherwise provided in this Agreement. Notwithstanding any provision in this Agreement, Contractors directly signatory to one or more the MLAs are required to pay all of the wages set forth in those MLAs provided that those wage rates are equal to or greater than the applicable prevailing wage rates.

Section 5.2 Benefits.

(a) Contractors shall pay contributions to the established employee benefit funds in the amounts designated in the appropriate MLA and make all employee authorized deductions in the amounts designated in the appropriate MLA; provided, however, that the Contractor and Union agree that only such bona fide employee benefits as accrue to the direct benefit of the employees (such as pension and annuity, health and welfare, vacation, apprenticeship, training funds, etc.) shall be included in this requirement and required to be paid by the Contractor on the Project; and provided further, however, that such contributions shall not exceed the contribution amounts set forth in the applicable prevailing wage determination. Notwithstanding any other provision in this Agreement, Contractors directly signatory to one or more of the MLAs are required to make all contributions set forth in those MLAs without reference to the foregoing. Bona fide jointly-trusteed benefit plans or authorized employee deduction programs established or negotiated under the applicable MLA or by the Parties to this Agreement during the life of this Agreement may be added, subject to the limitations upon such negotiated changes contained in Section 22.3 of this Agreement, and provided that the contributions do not exceed the amounts set forth in the applicable prevailing wage determination.

(b) The Contractor adopts and agrees to be bound by the written terms of the applicable, legally established, trust agreement(s) specifying the detailed basis on which payments are to be

made into, and benefits paid out of, such trust funds for its employees. The Contractor authorizes the parties to such trust funds to appoint trustees and successor trustees to administer the trust funds and hereby ratifies and accepts the trustees so appointed as if made by the Contractor.

(c) Each Contractor and subcontractor is required to certify to the Project Labor Coordinator that it has paid all benefit contributions due and owing to the appropriate Trust(s) prior to the receipt of its final payment and/or retention. Further, upon timely notification by a Union to the Project Labor Coordinator, the Project Labor Coordinator shall work with any prime Contractor or subcontractor who is delinquent in payments to assure that proper benefit contributions are made, to the extent of requesting the District or the prime Contractor to withhold payments otherwise due such Contractor, until such contributions have been made or otherwise guaranteed.

Section 5.3 Wage Premiums. Wage premiums, including but not limited to pay based on height of work, hazard pay, scaffold pay, and special skills shall not be applicable to work under this Agreement, except to the extent provided for in any applicable prevailing wage determination.

Section 5.4 Compliance with Prevailing Wage Laws. The Parties agree that the Project Labor Coordinator shall monitor the compliance with all applicable federal and state prevailing wage laws and regulations by all Contractors and subcontractors, and that such monitoring shall include Contractors of any tier engaged in what would otherwise be Project Work but for the exceptions to Agreement coverage in Section 2.2. All complaints regarding possible prevailing wage violations may be submitted as a grievance under Article 10 of this Agreement or be referred to the Project Labor Coordinator for processing, investigation and resolution, and if not resolved within thirty (30) calendar days, may be referred by the Project Labor Coordinator to the State Labor Commissioner. The Council or Union, as appropriate, shall be advised in a timely manner with regard to the facts and resolution, if any, of any complaint. It is understood that this Section does not restrict any individual rights as established under the California Labor Code, including the rights of an individual to file a complaint with the State Labor Commissioner

ARTICLE 6
HOURS OF WORK, OVERTIME, SHIFT AND HOLIDAYS

Section 6.1 Hours of Work. Eight (8) hours per day between the hours of 6:00 a.m. and 5:30 p.m., plus a one-half (1/2) hour unpaid lunch approximately mid-way through the shift, shall constitute the standard workday. Forty (40) hours per week shall constitute a regular week's work. The work week will start on Sunday and conclude on Saturday. The foregoing provisions of this Article are applicable unless otherwise provided in the applicable prevailing wage determination, or unless changes are permitted by law and such are agreed upon by the Parties. Nothing herein shall be construed as guaranteeing any employee eight (8) hours per day or forty (40) hours per week, or a Monday through Friday work standard work schedule.

Section 6.2 Place of Work. Employees shall be at their place of work (as designated by the Contractor), at the starting time and shall remain at their place of work, performing their assigned functions, until quitting time. The place of work is defined as the gang or tool box or equipment at the employee's assigned work location or the place where the foreman gives instructions. The

Parties reaffirm their policy of a fair day's work for a fair day's wage. There shall be no pay for time not worked unless the employee is otherwise engaged at the direction of the contractor or as otherwise provided for in this Agreement.

Section 6.3 Overtime. Overtime shall be paid in accordance with the requirements of the applicable prevailing wage determination. There shall be no restriction on the Contractor's scheduling of overtime or the nondiscriminatory designation of employees who will work overtime. There shall be no pyramiding of overtime (payment of more than one form of overtime compensation for the same hour) under any circumstances.

Section 6.4 Shifts and Alternate Work Schedules.

(a) Alternate starting and quitting time and/or shift work may be performed at the option of the Contractor upon three (3) days prior notice to the affected Union(s), unless a shorter notice period is provided for in the applicable MLA and shall continue for a period of not less than five (5) working days. Saturdays and Sundays, if worked, may be used for establishing the five (5) day minimum work shift. If two shifts are worked, each shall consist of eight (8) hours of continuous work exclusive of a one-half (1/2) hour non-paid lunch period, for 8 hours pay unless otherwise provided in the appropriate prevailing wage determination. The last shift shall start on or before 6:00 p.m. The first shift starting at or after 6:00 a.m. is designated as the first shift, with the second shift following.

(b) Contractors, the Council and the Union recognize the economic impact upon the District and District rate payers of the massive project being undertaken by the District and agree that all Parties to this Agreement desire and intend Project Work to be undertaken in a cost efficient and effective manner to the highest standard of quality and craftsmanship. Recognizing the economic conditions, the Parties agree that, unless required by the applicable prevailing wage determination, employees performing Project Work shall not be entitled to any differentials or additional pay based upon the shift or work schedule of the employees. Instead, all employees working on Project Work shall be paid at the same base rate regardless of shift or work schedule worked unless shift pay is required by an applicable prevailing wage determination.

(d) Because of operational necessities, the second shift may, at the District's direction, be scheduled without the preceding shift having been worked. It is recognized that the District's operations and/or mitigation obligations may require restructuring of normal work schedules. Except in an emergency or when specified in the District's bid specification, the Contractor shall give affected Union(s) at least three (3) days' notice of such schedule changes.

Section 6.5 Holidays. Recognized holidays on this Project shall be those set forth and governed by the prevailing wage determination(s) applicable to this Project, unless or until such may be, and are, revised by mutual agreement of the Parties to this Agreement.

Section 6.6 Show-up Pay.

(a) Employees reporting for work and for whom no work is provided, except when given prior notification not to report to work, shall receive two (2) hours pay at the regular straight

time hourly rate. Employees who are directed to start work shall receive four (4) hours of pay at the regular straight time hourly rate. Employees who work beyond four (4) hours shall be paid for actual hours worked. Whenever reporting pay is provided for employees, they will be required to remain at the Project Site and available for work for such time as they receive pay, unless released earlier by the principal supervisor of the Contractor(s) or his/her designated representative. Each employee shall furnish his/her Contractor with his/her current address and telephone number and shall promptly report any changes to the Contractor.

(b) An employee called out to work outside of his/her shift shall receive a minimum of two (2) hours pay at the appropriate rate. This does not apply to time worked as an extension of (before or after) the employee's normal shift.

(c) When an employee leaves the job or work location of his/her own volition or is discharged for cause or is not working as a result of the Contractor' s invocation of Section 12.3, the employee shall only be paid for actual time worked.

Section 6.7 "Brassing." The Contractor may utilize "brassing" (or similar system) to check employees in and out. Each employee must check himself/herself in and out. The Contractor will provide adequate facilities for checking in and out in an expeditious manner.

Section 6.8 MealPeriods. The Contractor will schedule a meal period of no more than one-half (1/2) hour duration at the work location at approximately mid-point of the schedule shift; provided, however, that the Contractor may, for efficiency of the operation, establish a schedule which coordinates the meal periods of two or more crafts. An employee may be required to work through his meal period because of an emergency or a threat to life or property; or for such other reasons as are in the applicable MLA, and if he is so required, he shall be compensated in the manner established in the applicable MLA.

Section 6.9 Make-up Days. To the extent permitted by the applicable prevailing wage determination, when an employee has been prevented from working for reasons beyond the control of the employer, including, but not limited to inclement weather or other natural causes, during the regularly scheduled work week, a make-up day may be worked on a non-regularly scheduled work day for which an employee shall receive eight (8) hours pay at the straight time rate or any premium rate required for such hours under prevailing wage laws.

ARTICLE 7
WORK STOPPAGES AND LOCK-OUTS

Section 7.1 No Work Stoppages or Disruptive Activity. The Council and the Unions signatory hereto agree that neither they, and each of them, nor their respective officers or agents or representatives, shall incite or encourage, condone or participate in any strike, walk-out, slow-down, picketing, observing picket lines or other activity of any nature or kind whatsoever, for any cause or dispute whatsoever with respect to or any way related to Project Work, or which interferes with or otherwise disrupts, Project Work, or with respect to or related to the District or Contractors or subcontractors, including, but not limited to, economic strikes, unfair labor practice strikes, safety strikes, sympathy strikes and jurisdictional strikes whether or not the underlying dispute is

arbitrable. Any such actions by the Council, or Unions, or their members, agents, representatives or the employees they represent shall constitute a violation of this Agreement. The Council and the Union shall take all steps necessary to obtain compliance with this Article and neither should be held liable for conduct for which it is not responsible.

Section 7.2 Employee Violations. The Contractor may discharge any employee violating Section 6.1 above and any such employee will not be eligible for rehire under this Agreement.

Section 7.3 Standing to Enforce. The District, the Project Labor Coordinator, or any Contractor affected by an alleged violation of Section 7.1 shall have standing and the right to enforce the obligations established therein.

Section 7.4 Expiration of MLAs. If the MLA, or any local, regional, and other applicable collective bargaining agreements expire during the term of the Project, the Union(s) agree that there shall be no work disruption of any kind as described in Section 7.1 above as a result of the expiration of any such agreement(s) having application on this Project and/or failure of the involved Parties to that agreement to reach a new contract. Terms and conditions of employment established and set at the time of bid shall remain established and set. Otherwise to the extent that such agreement does expire and the Parties to that agreement have failed to reach concurrence on a new contract, work will continue on the Project on one of the following two (2) options, both of which will be offered by the Unions involved to the signatory Contractors affected:

(a) Each of the Unions with a contract expiring must offer to its signatory Contractors to continue working on the Project under interim agreements that retain all the terms of the expiring contract, except that the Unions involved in such expiring contract may each propose wage rates and Contractor contribution rates to employee benefit funds under the prior contract different from what those wage rates and Contractor contributions rates were under the expiring contracts. The terms of the Union's interim agreement offered to its signatory Contractors will be no less favorable than the terms offered by the Union to any other Contractors or group of Contractors covering the same type of construction work in Los Angeles County.

(b) Each of the Unions with a contract expiring must offer to its signatory Contractors to continue working on the Project under all the terms of the expiring contract, including the wage rates and employer contribution rates to the employee benefit funds, if the signatory Contractor affected by that expiring contract agrees to the following retroactive provisions: if a new MLA, local, regional or other applicable labor agreement for the industry having application at the Project is ratified and signed during the term of this Agreement and if such new labor agreement provides for retroactive wage increases, then each affected signatory Contractor shall pay to its employees who performed work covered by this Agreement at the Project during the hiatus between the effective dates of such expired and new labor agreements, an amount equal to any such retroactive wage increase established by such new labor agreement, retroactive to whatever date is provided by the new labor agreement for such increase to go into effect, for each employee's hours worked on the Project during the retroactive period. All Parties agree that such affected signatory Contractors shall be solely responsible for any retroactive payment to its employees.

(c) Some signatory Contractors may elect to continue to work on the Project under the terms of the interim agreement option offered under paragraph (a) above and other signatory Contractors may elect to continue to work on the Project under the retroactivity option offered under paragraph (b) above. To decide between the two options, signatory Contractors will be given one week after the particular labor agreement has expired or one week after the Union has personally delivered to the signatory Contractors in writing its specific offer of terms of the interim agreement pursuant to paragraph (a) above, whichever is the later date. If the signatory Contractor fails to timely select one of the two options, the signatory Contractor shall be deemed to have selected option (b).

Section 7.5 No Lockouts. Contractors shall not cause, incite, encourage, condone or participate in any lock-out of employees with respect to Project Work during the term of this Agreement. The term "lock-out" refers only to a Contractor's exclusion of employees in order to secure collective bargaining advantage, and does not refer to the discharge, termination or layoff of employees by the Contractor for any reason in the exercise of rights pursuant to any provision of this Agreement, or any other agreement, nor does "lock-out" include the District's decision to stop, suspend or discontinue any Project Work or any portion thereof for any reason.

Section 7.6 Best Efforts to End Violations.

(a) If a Contractor contends that there is any violation of this Article, or Section 8.3, it shall notify, in writing, the Executive Secretary of the Council, the Senior Executive of the involved Union(s) and the Project Labor Coordinator. The Executive Secretary and the leadership of the involved Union(s) will immediately instruct, order and use their best efforts to cause the cessation of any violation of the relevant Article.

(b) If the Union contends that any Contractor has violated this Article, it will notify that Contractor and the Project Labor Coordinator, setting forth the facts which the Union contends violate the Agreement, at least twenty-four (24) hours prior to invoking the procedures of Section 7.8. The Project Labor Coordinator shall promptly order the involved Contractor(s) to cease any violation of the Article.

Section 7.7 Expedited Enforcement Procedure. Any party, including the District, which the Parties agree is a party to the Agreement for purposes of this Article and an intended beneficiary of this Article, or the Project Labor Coordinator, may institute the following procedures, in lieu of or in addition to any other action at law or equity, when a breach of Sections 7.1, 7.5 or 8.3 is alleged.

(a) The party invoking this procedure shall notify Lou Zigman, who has been selected by the negotiating Parties, and whom the Parties agree shall be the permanent arbitrator under this procedure. If the permanent arbitrator is unavailable at any time, the party invoking this procedure shall notify one of the other arbitrators mutually agreed upon by the Parties and listed under Section 10.2, Step 3 (a), on an alternating basis. Notice to the arbitrator shall be by the most expeditious means available, with notices to the Parties alleged to be in violation, and to the Council if it is a Union alleged to be in violation. For purposes of this Article, written notice may be given by -

electronic mail, facsimile, hand delivery or overnight mail and will be deemed effective upon receipt.

(b) Upon receipt of said notice, the arbitrator named above or his/her alternate shall sit and hold a hearing within twenty-four (24) hours if it is contended that the violation still exists, but not sooner than twenty-four (24) hours after notice has been dispatched to the Executive Secretary of the Council and the Senior Official of the involved Union(s) and/or Contractor as required by Section 7.6, above.

(c) The arbitrator shall notify the Parties of the place and time chosen for this hearing. Said hearing shall be completed in one session, which, with appropriate recesses at the arbitrator's discretion, shall not exceed twenty-four (24) hours unless otherwise agreed upon by all Parties. A failure of any Party or Parties to attend said hearings shall not delay the hearing of evidence or the issuance of any award by the arbitrator.

(d) The sole issue at the hearing shall be whether or not a violation of Sections 7.1, 7.5, 8.3 has in fact occurred. The arbitrator shall have no authority to consider any matter in justification, explanation or mitigation of such violation or to award damages (except for damages set forth in Section 7.8 below), which issue is reserved for court proceedings, if any. The Award shall be issued in writing within three (3) hours after the close of the hearing and may be issued without an opinion. If any party desires a written opinion, one shall be issued within fifteen (15) days, but its issuance shall not delay compliance with, or enforcement of, the Award. The arbitrator may order cessation of the violation of the Article and other appropriate relief, and such Award shall be served on all Parties by hand or registered mail upon issuance.

(e) Such Award shall be final and binding on all Parties and may be enforced by any court of competent jurisdiction upon the filing of this Agreement and all other relevant documents referred to herein above in the following manner. Written notice of the filing of such enforcement proceedings shall be given to the other party. In any judicial proceeding to obtain a temporary order enforcing the arbitrator's Award as issued under Section 7.7(d) of this Article, all Parties waive the right to a hearing and agree that such proceedings may be ex parte. Such agreement does not waive any Party's right to participate in a hearing for a final order of enforcement. The court's order or orders enforcing the arbitrator's award shall be served on all Parties by hand or by delivery to their address as shown on this Agreement (for a Union), as shown in their business contract for work under this Agreement (for a Contractor) and to the representing Union (for an employee), by certified mail by the Party or Parties first alleging the violation.

(f) Any rights created by statute or law governing arbitration proceedings inconsistent with the above procedure or which interfere with compliance hereto are hereby waived by the Parties to whom they accrue.

(g) The fees and expenses of the arbitrator shall be equally divided between the Party or Parties initiating this procedure and the respondent Party or Parties.

Section 7.8. Liquidated Damages.

(a) If the Arbitrator determines in accordance with Section 7.7 above that a work stoppage has occurred, the respondent Union(s) shall, within eight (8) hours of receipt of the award, direct all the employees they represent on the Project to immediately return to work. If the craft(s) involved do not return the work by the beginning of the next regularly scheduled shift following such eight (8) hour period after receipt of the arbitrator's award, and the respondent Union(s) have not complied with their obligations to immediately instruct, order and use their best efforts to cause a cessation of the violation and return the employees they represent to work, then the non-complying respondent Union(s) shall each pay a sum as liquidated damages to the District, and each will pay an additional sum per shift, as set forth in (c), below, for each shift thereafter on which the craft(s) has not returned to work.

(b) If the arbitrator determines in accordance with Section 7.7 above that a lock-out has occurred, the respondent contractor(s) shall, within eight (8) hours after receipt of the award, return all the affected employees to work on the Project, or otherwise correct the violations found by the arbitrator. If the respondent contractor(s) do not take such action by the beginning of the next regular scheduled shift following the eight (8) hour period, each non-complying respondent contractor shall pay or give as liquidated damages, to the affected Union(s) (to be apportioned among the affected employees and the benefit funds to which contributions are made on their behalf, as designated by the arbitrator) and each shall pay an additional sum per shift, as set forth in (c), below, for each shift thereafter in which compliance by the respondent contractor(s) has not been completed.

(c) The arbitrator shall retain jurisdiction to determine compliance with this Section and to establish the appropriate sum of liquidated damages, which shall not be less than $1,000 (one thousand dollars) and no more than $15,000.00 (fifteen thousand dollars) per shift for each non-complying entity.

ARTICLE 8
WORK ASSIGNMENTS AND JURISDICTIONAL DISPUTES

Section 8.1 Assignment of Work. The assignment of Covered Work will be solely the responsibility of the Contractor performing the work involved; and such work assignments will be in accordance with the Plan for the Settlement of Jurisdictional Disputes in the Construction Industry currently in effect (the "Plan") or any successor Plan.

Section 8.2 The Plan. All jurisdictional disputes on this Project between or among the Building and Construction Trades Unions and the Contractors parties to this Agreement, shall be settled and adjusted according to the present Plan established by the Building Trades Department or any other plan or method of procedure that may be adopted in the future by the Building and Construction Trades Department. Decisions rendered shall be final, binding and conclusive on the Contractors and Unions parties to this Agreement.

(a) If a dispute arising under this Article involves the Southwest Regional Council of Carpenters or any of its subordinate bodies, an Arbitrator shall be chosen by the procedures specified in Article V, Section 5, of the Plan from a list composed of John Kagel, Thomas Angelo, Robert Hirsch, and Thomas Pagan, and the Arbitrator's hearing on the dispute shall be held at the

offices of the Council within 14 days of the selection of the Arbitrator. All other procedures shall be as specified in the Plan.

Section 8.3 No Work Disruption Over Jurisdiction. All jurisdictional disputes shall be resolved without the occurrence of any strike, work stoppage, or slow-down of any nature, and the Contractor's assignment shall be adhered to until the dispute is resolved. Individuals violating this section shall be subject to immediate discharge.

Section 8.4 Pre-Job Conferences. As provided in Article 16, each Contractor will conduct a pre-job conference with the Council prior to commencing work. The Primary Contractor and the Project Labor Coordinator shall be advised in advance of all such conferences and may participate if they wish. Pre-job conferences for different Contractors may be held together.

Section 8.5 Resolution of Jurisdictional Disputes. If any actual or threatened strike, sympathy strike, work stoppage, slow down, picketing, hand-billing or otherwise advising the public that a labor dispute exists, or interference with the progress of Project Work by reason of a jurisdictional dispute or disputes occurs, the Parties shall exhaust the expedited procedures set forth in the Plan, if such procedures are in the plan then currently in effect, or otherwise as in Article 7 above.

ARTICLE 9
MANAGEMENT RIGHTS

Section 9.1 Contractor and District Rights. The Contractors and the District have the sole and exclusive right and authority to oversee and manage construction operations on Project Work without any limitations unless expressly limited or required by another Article of this Agreement or an MLA. In addition to the following and other rights of the Contractors enumerated in this Agreement, the Contractors expressly reserve their management rights and all the rights conferred upon them by law. The Contractor's rights include, but are not limited to, the right to:

(a) Plan, direct and control operations of all work;

(b) Hire, promote, transfer and layoff their own employees, respectively, as deemed appropriate to satisfy work and/or skill requirements;

(c) Promulgate and require all employees to observe reasonable job rules and security and safety regulations;

(d) Discharge, suspend or discipline their own employees for just cause;

(e) Utilize, in accordance with District approval, any work methods, procedures or techniques, and select, use and install any types or kinds of materials, apparatus or equipment, regardless of source of manufacture or construction; assign and schedule work at their discretion; and

(f) Assign overtime, determine when it will be worked, and the number and identity of employees engaged in such work, subject to such provisions in the applicable MLA (s) requiring such assignments be equalized or otherwise made in a nondiscriminatory manner.

Section 9.2 Specific District Rights. In addition to the following and other rights of the District enumerated in this Agreement, the District expressly reserves its management rights and all the rights conferred on it by law. The District's rights (and those of the Contractor Administrator on its behalf) include but are not limited to the right to:

(a) Inspect any construction site or facility to ensure that the Contractor follows the applicable safety and other work requirements;

(b) Require Contractors to establish a different work week or shift schedule for particular employees as required to meet the operational needs of the Project Work at a particular location or in order to accommodate the instructional programs and pupil control problems at various project sites where school may be in session during periods of construction activity;

(c) At its sole option, terminate, delay and/or suspend any and all portions of the Covered Work at any time; prohibit some or all work on certain days or during certain hours of the day to accommodate the ongoing operations of the District's educational facilities and/or to mitigate the effect of ongoing Project Work on businesses and residents in the neighborhood of the Project site; and/or require such other operational or schedule changes it deems necessary, in its sole judgment, to effectively maintain its primary mission and remain a good neighbor to those in the area of its facilities. In order to permit the Contractors and Unions to make appropriate scheduling plans, the District will provide the Project Labor Coordinator, and the affected Contractor(s) and Union(s) with reasonable notice of any changes it requires pursuant to this section, provided, however, that if notice is not provided in time to advise employees not to report for work, show-up pay shall be due pursuant to Section 6.6.

(d) Approve any work methods, procedures and techniques used by Contractors whether or not these methods, procedures or techniques are part of industry practices or customs; and

(e) Investigate and process complaints, through its Project Labor Coordinator, in the matter set forth in Articles 7 and 10.

Section 9.3 Use of Materials. There should be no limitations or restriction by Union upon a Contractor's choice of materials or design, nor, regardless of source or location, upon the full use and utilization, of equipment, machinery, packaging, precast, prefabricated, prefinished, or preassembled materials, tools or other labor-saving devices, subject to the application of the State Public Contracts and Labor Codes as required by law in reference to offsite construction. Generally, the onsite installation or application of such items shall be performed by the craft having jurisdiction over such work. The District and its Project Labor Coordinator shall advise all Contractors of, and enforce as appropriate, the off-site application of the prevailing wage law as it affects Project Work.

Section 9.4 Special Equipment, Warranties and Guaranties

(a) It is recognized that certain materials, equipment and systems of a highly technical and specialized nature may be installed at Project Work sites. The nature of the materials, equipment and systems, together with requirements of manufacturer's or vendor's warranty, may dictate that it be prefabricated, pre-piped, and/or pre-wired and that it be installed under the supervision and direction of the District's and/or manufacturer's personnel. The Unions agree that such material, equipment and systems are to be installed without incident.

(b) The Parties recognize that the Contractor will initiate from time to time the use of new technology, equipment, machinery, tools, and other labor-savings devices and methods of performing Project Work. The Unions agree that they will not restrict the implementation of such devices or work methods The Unions will accept and will not refuse to handle, install or work with any standardized and/or catalogue parts, assemblies, accessories, prefabricated items, preassembled items, partially assembled items, or materials whatever their source of manufacture or construction.

(c) If any disagreement between the Contractor and the Unions concerning the methods of implementation or installation of any equipment, device or item, or method of work, arises, or whether a particular part or pre-assembled item is a standardized or catalog part or item, the work will proceed as directed by the Contractor and the Parties shall immediately consult over the matter. If the disagreement is not resolved, the affected Union(s) shall have the right to proceed through the procedures set forth in Article 10.

ARTICLE 10
SETTLEMENT OF GRIEVANCES AND DISPUTES

Section 10.1 Cooperation and Harmony on Site.

(a) This Agreement is intended to establish and foster continued close cooperation between management and labor. The Council shall assign a representative to this Project for the purpose of assisting the Unions, and working with the Project Labor Coordinator, together with the Contractors, to complete the construction of the Project economically, efficiency, continuously and without any interruption, delays or work stoppages.

(b) The Project Labor Coordinator, the Contractors, Unions, and employees collectively and individually, realize the importance to all Parties of maintaining continuous and uninterrupted performance of Project Work, and agree to resolve disputes in accordance with the grievance provisions set forth in this Article or, as appropriate, those of Articles 7 or 8.

(c) The Project Labor Coordinator shall oversee the processing of grievances under this Article and Articles 7 and 8, including the scheduling and arrangements of facilities for meetings, selection of the arbitrator from the agreed-upon panel to hear the case, and any other administrative matters necessary to facilitate the timely resolution of any dispute; provided, however, it is the responsibility of the principal parties to any pending grievance to insure the time limits and deadlines are met.

Section 10.2 Processing Grievances. Any questions arising out of and during the term of this Agreement involving its interpretation and application, which includes applicable provisions of

the MLAs, but not jurisdictional disputes or alleged violations of Section 7.1 and 7.5 and similar provisions, shall be considered a grievance and subject to resolution under the following procedures.

Step 1. Employee Grievances. When any employee subject to the provisions of this Agreement feels aggrieved by an alleged violation of this Agreement, the employee shall, through his Union business representative or job steward, within ten (10) working days after the occurrence of the violation, give notice to the work site representative of the involved Contractor stating the provision(s) alleged to have been violated. A business representative of the Union or the job steward and the work site representative of the involved Contractor shall meet and endeavor to adjust the matter within ten (10) working days after timely notice has been given. If they fail to resolve the matter within the prescribed period, the grieving party may, within ten (10) working days thereafter, pursue Step 2 of this grievance procedure provided the grievance is reduced to writing, setting forth the relevant information, including a short description thereof, the date on which the alleged violation occurred, and the provision(s) of the Agreement alleged to have been violated. Grievances and disputes settled at Step 1 shall be non-precedential except as to the parties directly involved.

Union or Contractor Grievances. Should the Union(s) or any Contractor have a dispute with the other Party(ies) and, if after conferring within ten (10) working days after the disputing Party knew or should have known of the facts or occurrence giving rise to the dispute, a settlement is not reached within five (5) working days, the dispute shall be reduced to writing and processed to Step 2 in the same manner as outlined in 1(a) above for the adjustment of an employee complaint.

Step 2. The business manager of the involved Union or his designee, together with the site representative of the involved Contractor, and the labor relations representative of the Project Labor Coordinator, shall meet within seven (7) working days of the referral of the dispute to this second step to arrive at a satisfactory settlement thereof. If the Parties fail to reach an agreement, the dispute may be appealed in writing in accordance with the provisions of Step 3 within seven (7) calendar days after the initial meeting at Step 2.

Step 3.

(a) If the grievance shall have been submitted but not resolved under Step 2, either the Union or Contractor Party may request in writing to the Project Labor Coordinator (with copy (ies) to the other Party (ies) within seven (7) calendar days after the initial Step 2 meeting), that the grievance be submitted to an arbitrator selected from the agreed upon list below, on a rotational basis in the order listed. Those arbitrators are: (1) Louis Zigman; (2) Joseph Gentile; (3) Sara Adler; (4) Walt Daugherty; (5) and William Rule. The decision of the arbitrator shall be final and binding on all Parties and the fee and expenses of such arbitrations shall be borne equally by the involved Contractor(s) and the involved Union(s).

(b) Failure of the grieving Party to adhere to the time limits established herein shall render the grievance null and void. The time limits established herein may be extended only by written consent of the Parties involved at the particular step where the extension is agreed upon.

The arbitrator shall have the authority to make decisions only on issues presented and shall not have the authority to change, amend, add to or detract from any of the provisions of this Agreement.

(c) The fees and expenses incurred by the arbitrator, as well as those jointly utilized by the Parties (i.e., conference room, court reporter, etc.) in arbitration, shall be divided equally by the Parties to the arbitration, including Union(s) and Contractor(s) involved.

Section 10.3 Limit on Use of Procedures. Procedures contained in this Article shall not be applicable to any alleged violation of Articles 7 or 8, with a single exception that any employee discharged for violation of Section 7.2, or Section 8.3, may resort to the procedures of this Article to determine only if he/she was, in fact, engaged in that violation.

Section 910.4 Notice. The Project Labor Coordinator (and the District, in the case of any grievance regarding the Scope of this Agreement), shall be notified by the involved Contractor of all actions at Steps 2 and 3, and further, the Project Labor Coordinator shall, upon its own request, be permitted to participate fully as a party in all proceedings at such steps.

ARTICLE 11
REGULATORY COMPLIANCE

Section 11.1 Compliance with All Laws. The Council and all Unions, Contractors, subcontractors and their employed shall comply with all applicable federal and state laws, ordinances and regulations including, but not limited to, those relating to safety and health, employment and applications for employment. All employees shall comply with the safety regulations established by the District, the Project Labor Coordinator or the Contractor. Employees must promptly report any injuries or accidents to a supervisor.

Section 11.2 Monitoring Compliance. The parties agree that the District shall require, and that the Project Labor Coordinator and Council shall monitor, compliance by all Contractors and subcontractors with all federal and state laws regulation that, from time to time may apply to Project Work. It shall be the responsibility of both the Council and the Project Labor Coordinator (on the District's behalf) to investigate or monitor compliance with these various laws and regulations. The Council may recommend to the Project Labor Coordinator and/or the District procedures to encourage and enforce compliance with these laws and regulations.

Section 11.3 Violations of Law. Based upon a finding of a violation by the District of a federal and/or state law, and upon notice to the Contractor that it or its subcontractors is in such violation, the District, in the absence of the Contractor or subcontractor remedying such violation, shall take such action as it is permitted by law or contract to encourage that Contractor to come into compliance, including, but not limited to, assessing fines and penalties and/or removing the offending Contractor from Project Work. Additionally, in accordance with the Agreement between the District and the Contractor, the District may cause the Contractor to remove from Project Work any subcontractor who is in violation of state or federal law.

ARTICLE 12
SAFETY AND PROTECTION OF PERSON AND PROPERTY

Section 12.1 Safety.

(a) It shall be the responsibility of each Contractor to ensure safe working conditions and employee compliance with any safety rules contained herein or established by the District, the Project Labor Coordinator or the Contractor. It is understood that employees have an individual obligation to use diligent care to perform their work in a safe manner and to protect themselves and the property of the Contractor and the District.

(b) Employees shall be bound by the safety, security and visitor rules established by the Contractor, the Project Labor Coordinator and/or the District. These rules will be published and posted. An employee's failure to satisfy his/her obligations under this section will subject him/her to discipline, up to and including discharge.

(c) The parties agree to adopt the Los Angeles/Orange Counties Building and Construction Trades Council Approved Drug and Alcohol Testing policy, a copy of which is attached hereto as Attachment "D," which shall be applicable to work on the Project pursuant to their terms.

Section 12.2 Suspension of Work for Safety. A Contractor may suspend all or a portion of the job to protect the life and safety of employees. In such cases, employees will be compensated only for the actual time worked; provided, however, that where the Contractor requests employees to remain at the site and be available for work, the employees will be compensated for stand-by time at their basic hourly rate of pay.

Section 12.3 Water and Sanitary Facilities. The Contractor shall provide adequate supplies of drinking water and sanitary facilities for all employees as required by state law or regulation.

ARTICLE 13
TRAVEL AND SUBSISTENCE

Travel expenses, travel time, subsistence allowances, zone rates and parking reimbursements shall be paid in accordance with the applicable prevailing wage determination, if any. Parking for employees covered by this Agreement shall be provided by the Contractor(s) according to the provisions of the MLAs existing on the effective date of this Agreement.

ARTICLE 14
APPRENTICES

Section 14.1 Importance of Training. The Parties recognize the need to maintain continuing support of the programs designed to develop adequate numbers of competent workers in the construction industry, the obligation to capitalize on the availability of the local work force in the area served by the District, and the opportunities to provide continuing work under the construction program. To these ends, the Parties will facilitate, encourage, and assist local residents to

commence and progress in Labor/Management Apprenticeship and/or training Programs in the construction industry leading to participation in such apprenticeship programs. The District, the Project Labor Coordinator, other District consultants, and the Council, will work cooperatively to identify, or establish and maintain, effective programs and procedures for persons interested in entering the construction industry and which will help prepare them for the formal joint labor/management apprenticeship programs maintained by the Unions.

Section 14.2 Use of Apprentices.

(a) Apprentices used on Projects under this Agreement shall, to the extent permitted by law, be registered in Joint Labor Management Apprenticeship Programs approved by the State of California. Apprentices may comprise up to thirty percent (30%) of each craft's work force at any time, unless the standards of the applicable joint apprenticeship committee confirmed by the Division of Apprenticeship Standards ("DAS"), establish a lower or higher maximum percentage. Where the standards permit a higher percentage, such percentage shall apply on Project Work. Where the applicable standards establish a lower percentage, the applicable Union will use its best efforts with the Joint Labor Management apprenticeship committee and, if necessary, the DAS to permit up to thirty percent (30%) apprentices on the Project.

(b) The Unions agree to cooperate with the Contractor in furnishing apprentices as requested up to the maximum percentage. The apprentice ratio for each craft shall be in compliance, at a minimum, with the applicable provisions of the Labor Code relating to utilization of apprentices. The District shall encourage such utilization, and, both as to apprentices and the overall supply of experienced workers, the Project Labor Coordinator will work with the Council to assure appropriate and maximum utilization of apprentices. The District shall encourage such utilization, and, both as to apprentices and the overall supply of experienced workers, the Project Labor Coordinator will work with the Council to assure appropriate and maximum utilization of apprentices and the continuing availability of both apprentices and journey persons.

(c) The Parties agree that apprentices will not be dispatched to Contractors working under this Agreement unless there is a journeyman working on the Project where the apprentice is to be employed who is qualified to assist and oversee the apprentice's progress through the program in which he or she is participating.

(d) All apprentices shall work under the direct supervision of a journeyman from the trade in which the apprentice is indentured. A journeyman shall be defined as set forth in the California Code of Regulations, Title 8 [apprenticeship] section 205. Should a question arise as to a journeyman's qualification under this subsection, the Contractor shall provide adequate proof evidencing the worker's qualification as a journeyman to the Construction Manager and the Council.

ARTICLE 15
WORKING CONDITIONS

Section 15.1 Meal and Rest Periods. There will be no non-working times established during working hours except as may be required by applicable state law or regulations. Meal periods and

Rest periods shall be as provided for in Wage Order 16. Individual coffee containers will be permitted at the employees' work location; however, there will be no organized coffee breaks.

Section 15.2 Work Rules. The District, the Project Labor Coordinator, and/or relevant Contractor shall establish such reasonable work rules as they deem appropriate and not inconsistent with this Agreement. These rules will be posted at the work sites by the Contractor and may be amended thereafter as necessary. Failure to observe these rules and regulations by employees may be grounds for discipline up to an including discharge.

Section 15.3 Emergency Use of Tools and Equipment. There should be no restrictions on the emergency use of any tools by any qualified employee or supervisor, or on the use of any tools or equipment for the performance of work within the jurisdiction, provided the employee can safely use the tools and/or equipment involved and is in compliance with applicable governmental rules and regulations.

Section 15.4 Access Restrictions for Cars. Recognizing the nature of the work being conducted on the site, employee access by a private automobile may be limited to certain roads and/or parking areas.

ARTICLE 16
PRE-JOB CONFERENCES

Consistent with Section 8.4, Each Prime Contractor shall notify the Project Labor Coordinator at least two weeks prior to commencing work under this Agreement, and the Project Labor Coordinator shall coordinate the scheduling of a pre-job conference with the Council, the Contractor(s) and the affected Union(s). All work assignments shall be disclosed by the Prime Contractor and all Contractors at a pre-job conference. Should there be any jurisdictional dispute raised under Article 8, the Project Labor Coordinator shall be promptly notified. The purpose of the conference will be to, among other things, determine craft manpower needs, schedule of work for the contract and Project Work rules/District rules. Should there be Project Work that was not previously discussed at the pre-job conference, or should additional Project Work be added, the Project Labor Coordinator will coordinate the scheduling of a separate pre-job conference with the Council, the Contractor(s) and the affected Union(s) for such newly included work.

ARTICLE 17
SAVINGS AND SEPARABILITY

Section 17.1 Savings Clause. It is not the intention of the District, the Project Labor Coordinator, Contractor or the Union parties to violate any laws governing the subject matter of this Agreement. The Parties hereto agree that in the event any provision of this Agreement is finally held or determined to be illegal or void as being in contravention of any applicable law or regulation, the remainder of the Agreement shall remain in full force and effect unless the part or parts so found to be void are wholly inseparable from the remaining portions of this Agreement. Further, the Parties agree that if and when any provision(s) of this Agreement is finally held or determined to be illegal or void by a court of competent jurisdiction, the Parties will promptly enter into negotiations concerning the substantive effect of such decision for the purposes of achieving

conformity with the requirements of any applicable laws and the intent of the Parties hereto. If the legality of this Agreement is challenged and any form of injunctive relief is granted by any court, suspending temporarily or permanently the implementation of this Agreement, then the Parties agree that all Project Work that would otherwise be covered by this Agreement should be continued to be bid and constructed without application of this Agreement so that there is no delay or interference with the ongoing planning, bidding and construction of any Project Work.

Section 17.2 Effect of Injunctions or Other Court Orders. The Parties recognize the right of the District to withdraw, at its absolute discretion, the utilization of the Agreement as part of any bid specification should a Court of competent jurisdiction issue any order, or any applicable statute which could result, temporarily or permanently in delay of the bidding, awarding and/or construction of Project Work. Notwithstanding such an action by the District, or such court order or statutory provision, the Parties agree that the Agreement shall remain in full force and effect on Project Work to the maximum extent legally possible.

ARTICLE 18
WAIVER

A waiver of or a failure to assert any provisions of this Agreement by any or all of the Parties hereto shall not constitute a waiver of such provision for the future. Any such waiver shall not constitute a modification of the Agreement or change in the terms and conditions of the Agreement and shall not relieve, excuse or release any of the Parties from any of their rights, duties or obligations hereunder.

ARTICLE 19
AMENDMENTS

The provisions of this Agreement can be renegotiated, supplemented, rescinded or otherwise altered only by mutual agreement in writing, hereafter signed by the negotiating Parties hereto.

ARTICLE 20
WORK OPPORTUNITIES PROGRAM

Section 21.1 Work Opportunities. The Parties to this Agreement support the development of increased numbers of skilled construction workers from among residents of the District to meet the labor needs of covered projects specifically and the requirements of the local construction industry generally. Towards that end, the Parties agree to cooperate respecting the establishment of a work opportunities program for District residents, the primary goals of which shall be to maximize construction work opportunities for District residents. In furtherance of the foregoing, the Unions specifically agree to:

(a) Encourage the referral and utilization, to the extent permitted by law and hiring hall practices, of qualified District residents as journeymen, and apprentices on Project Work and entrance into such qualified apprenticeship and training programs as may be operated by Unions; and

(b) Work cooperatively with the District, the Project Labor Coordinator, and other District consultants to identify, or establish and maintain, effective programs, events and procedures for persons interested in entering the construction industry; and

(c) Assist District residents in contacting the Apprenticeship Training Committee for the crafts and trades they are interested in. The Unions shall assist District residents who are seeking Union jobs on the Project and Union membership in assessing their work experience and giving them credit for provable past experience in their relevant craft or trade, including experience gained working for non-union Contractors. The Unions shall put on their rolls qualified bona fide District residents for work on this Project; and

(d) Allow tours of their training facilities as requested; and

(e) Provide a contact information list for all Union representatives and Joint Apprenticeship Committee representatives; and

(f) Support local events and programs designed to recruit and develop adequate numbers of competent workers in the construction industry; and

(g) Assist First Tier Area Residents, as described in Section 3.5(a), in contacting pre-apprenticeship programs that utilize the Building Trades multi-craft core curriculum (MC3) and the Apprenticeship Training Committees for the crafts and trades they are interested in. The Unions shall assist such Area Residents who are seeking Union jobs on the Project and Union membership in assessing their work experience and giving them credit for provable past experience in their relevant craft or trade, including experience gained working for non-union Contractors.

ARTICLE 21
DURATION OF THE AGREEMENT

Section 21.1 Duration.

(a) This Agreement shall be effective from the date signed by all Parties and shall expire upon Final Completion of the Project.

(b) This Agreement may be extended by mutual consent of the District and the Unions for such further periods as the Parties shall agree to, or for the performance of further construction work which may be added to this Agreement, as set forth in Section 2.2, above. Any such extension shall be binding and enforceable only if by a written instrument approved by the District's Board of Trustees in a public open meeting of the Board of Trustees.

Section 21.2 Turnover and Final Acceptance of Completed Work.

(a) Construction of any phase, portion, section, or segment of Project Work shall be deemed complete when such phase, portion, section or segment has been turned over to the District by the Contractor and the District has accepted such phase, portion, section, or segment. As areas and systems of the Project are inspected and construction-tested and/or approved and accepted by

the District or third parties with the approval of the District, the Agreement shall have no further force or effect on such items or areas, except when the Contractor is directed by the District to engage and repairs or modifications required by its contract(s) with the District before Final Completion and acceptance of the Project by the District's Board of Trustees.

(b) Notice of each final acceptance received by the Contractor will be provided to the Council with the description of what portion, segment, etc. has been accepted. Final acceptance may be subject to a "punch" list, and in such case, the Agreement will continue to apply to each such item on the list until it is completed to the satisfaction of the District and Notice of Acceptance is given by the District or its representative to the Contractor. At the request of the Union, complete information describing any "punch" list work, as well as any additional work required of a Contractor at the direction of the District pursuant to Section 22.2 (a) above, involving otherwise turned-over and completed facilities which have been accepted by the District, will be available from the Project Labor Coordinator.

Section 21.3 Continuation of MLAs. MLAs incorporated as part of this Agreement shall continue in full force and effect, as previously stated, until the Contractor and Union parties to the collective bargaining agreement(s) which are the basis for such MLAs notify the Project Labor Coordinator of the mutually agreed upon changes in such agreement and their effective date(s). The Parties agree to recognize and implement all applicable changes on their effective dates, except as otherwise provided by this Agreement; provided, however, that any such provisions negotiated in said collective bargaining agreements will not apply to work covered by this Agreement if such provisions are less favorable to the Contractor under the Agreement than those uniformly required of contractors for construction work normally covered by those agreements; nor shall any provision be recognized or applied if it may be construed to apply exclusively or predominately to work covered by this Agreement. Any disagreement between the Parties over the incorporation into an MLA of any such provision agreed upon in a negotiation of the Local Collective Bargaining Agreement which is the bases for an MLA shall be resolved under the procedures established in Article 10.

IN WITNESS whereof the Parties have caused this Community Benefits Agreement to be executed as of the date and year above stated.

COMPTON COMMUNITY COLLEGE DISTRICT

By: _____
Keith Curry, Ed.D.
President/CEO

LOS ANGELES/ORANGE COUNTIES BUILDING & CONSTRUCTION TRADES COUNCIL

By: _____
Ron Miller
Executive Secretary

LOS ANGELES/ORANGE COUNTIES BUILDING AND CONSTRUCTION TRADES COUNCIL CRAFT UNIONS AND DISTRICT COUNCILS

Asbestos Heat & Frost Insulators (Local 5)

Boilermakers (Local 92)

Bricklayers & Allied Craftworkers (Local 4)

Cement Masons (Local 500)

District Council of Laborers

Electricians (Local 11)

Elevator Constructors (Local 18)

Gunite Workers (Local 345)

Iron Workers (Reinforced – Local 416)

Iron Workers (Structural – Local 433)

Laborers (Local 1309)

Laborers (Local 300) (Remediation)

Laborers (Local 1184)

Operating Engineers (Local 12)

Operating Engineers (Local 12)

Operating Engineers (Local 12)

Painters & Allied Trades DC 36

Pipe Trades (Pipe Fitters Local 250)

Pipe Trades (Local 345)

Pipe Trades (Plumbers Local 78)

Pipe Trades (Sprinkler Fitters Local 709)

Plasterers (Local 200)

Plaster Tenders Local (1414)

Roofers & Waterproofers (Local 36)

Sheet Metal Workers (Local 105)

Teamsters (Local 986)

Southwest Regional Council of Carpenters

LETTER OF ASSENT

To be signed by all contractors awarded work covered by the Community Benefits Agreement prior to commencing work.

[Contractor's Letterhead]
Project Labor Coordinator
C/O Compton Community College District
1234 address
City, state, zip code
Attn: _____

Re: Community Benefits Agreement for the Construction Project Work - Letter of Assent

Dear Sir:

This is to confirm that [name of company] agrees to be party to and bound by the Compton Community College District Community Benefits Agreement effective _____, 201__, as such Agreement may, from time to time, be amended by the negotiating parties or interpreted pursuant to its terms. Such obligation to be a party and bound by this Agreement shall extend to all work covered by the Agreement undertaken by this company and this Company shall require all of its contractors and subcontractors of whatever tier to be similarly bound for all work within the scope of the Agreement by signing and furnishing to you an identical Letter of Assent prior to their commencement of work.

Sincerely,

[Name of Construction Company]

By: [_____] Name and Title of Authorized Executive

Contractor State License No.: _____

Project: _____

[Copies of this letter must be submitted to the Project Labor Coordinator and to the Council]

ATTACHMENT B
Local Resident Zip Codes

Tier 1
District Service Area Zip Codes

[to be provided by the District]

Tier 2
10-mile radius zip codes

90001	90247	90640
90002	90248	90650
90003	90249	90651
90011	90250	90652
90021	90251	90660
90022	90255	90662
90023	90260	90670
90037	90261	90671
90040	90262	90701
90043	90270	90702
90044	90278	90703
90047	90280	90706
90052	90301	90707
90058	90303	90710
90059	90304	90711
90061	90305	90712
90062	90306	90713
90082	90307	90714
90089	90308	90715
90091	90310	90716
90201	90501	90717
90202	90502	90721
90220	90503	90723
90221	90504	90744
90222	90506	90745
90223	90507	90746
90224	90508	90747
90239	90509	90748
90240	90510	90749
90241	90606	90755
90242	90610	90801

90802	90813	90840
90804	90814	90842
90805	90815	90844
90806	90831	90846
90807	90832	90847
90808	90833	90848
90809	90834	90895
90810	90835	90899

Tier 3

Remainder of Los Angeles County Zip Codes

ATTACHMENT C
EMPLOYEE CRAFT REQUEST FORM

TO THE CONTRACTOR: Please complete and fax or e-mail this form to the applicable union to request craft workers that fulfill the hiring requirements for this project. After faxing or e-mailing your request, please call the Local to verify receipt and substantiate their capacity to furnish workers as specified below. Please print your Fax Transmission Verification Reports or e-mail and keep copies for your records.

The Compton Community College District Community Benefits Agreement establishes a goal that 30% of all of the work hours performed on the Project shall be from residents residing: first, within the Districts geographic jurisdiction, as well as Veterans and Student Graduates (regardless of where they reside). If the Unions cannot provide the Contractors in the attainment of a sufficient number of Local Residents from within the first tier, as described immediately above, the Unions shall, second, exert their best efforts to then recruit and identify for referral area residents residing within a ten (10) mile radius from the District's headquarters, as reflected on the list of U.S. Postal Service zip codes attached hereto as Attachment "B." If the Unions still have not provided the Contractors in the attainment of a sufficient number of Local Residents, the Unions shall then exert their best efforts to recruit and identify for referral area residents residing within Los Angeles County. For dispatch purposes, employees referred from any of the above three (3) tiers, as well as veterans and student graduates, regardless of where they reside, shall be referred to as "Local Residents."

TO THE UNION: Please complete the "Union Use Only" section on the next page and fax or e-mail this form back to the requesting Contractor. Be sure to retain a copy of this form for your records.

CONTRACTOR USE ONLY

To: Union Local #___ **Fax#** (_____)_____ **Date:**_____ **From:**
Company:_____ **Issued By:** _____
Contact Phone :( )_____ Contact Fax: (___)_____

PLEASE PROVIDE ME WITH THE FOLLOWING UNION CRAFT WORKERS.

Craft Classification (i.e., plumber, painter, etc.)	Journeyman or Apprentice	Local Resident or General Dispatch	Number of workers needed	Report Date	Report Time
TOTAL WORKERS REQUESTED = ___					

Please have worker(s) report to the following work address indicated below:

Project Name:___Site:___Address: _____

Report to: _____On-site Tel: _____

On-site Fax: _____

Comment or Special Instructions:_____

UNION USE ONLY

Date dispatch request received:
Dispatch received by:
Classification of worker requested:
Classification of worker dispatched:

WORKER REFERRED

Name:
Date worker was dispatched:
Is the worker referred a: (check all that apply)

JOURNEYMAN	Yes _____	No _____
APPRENTICE	Yes _____	No _____
LOCAL RESIDENT	Yes	No
GENERAL DISPATCH FROM OUT OF WORK LIST	Yes _____	No _____

ATTACHMENT D

LOS ANGELES/ORANGE COUNTIES BUILDING AND CONSTRUCTION TRADES COUNCIL APPROVED DRUG AND ALCOHOL TESTING POLICY

The Parties recognize the problems which drug and alcohol abuse have created in the construction industry and the need to develop drug and alcohol abuse prevention programs. Accordingly, the Parties agree that in order to enhance the safety of the work place and to maintain a drug and alcohol-free work environment, individual Employers may require applicants or employees to undergo drug and alcohol testing.

1. It is understood that the use, possession, transfer or sale of illegal drugs, narcotics, or other unlawful substances, as well as being under the influence of alcohol and the possession or consuming alcohol is absolutely prohibited while employees are on the Employer's job premises or while working on any jobsite in connection with work performed under the Community Benefits Agreement ("CBA").

2. No Employer may implement a drug testing program which does not conform in all respects to the provisions of this Policy.

3. No Employer may implement drug testing at any jobsite unless written notice is given to the Union setting forth the location of the jobsite, a description of the project under construction, and the name and telephone number of the Project Supervisor. Said notice shall be addressed to the office of each Union signing the CBA. Said notice shall be delivered in person or by registered mail before the implementation of drug testing. Failure to give such notice shall make any drug testing engaged in by the Employer a violation of the CBA, and the Employer may not implement any form of drug testing at such jobsite for the following six months.

4. An employer who elects to implement drug testing pursuant to this Agreement shall require all employees on the Project to be tested. With respect to individuals who become employed on the Project subsequent to the proper implementation of this drug testing program, such test shall be administered upon the commencement of employment on the project, whether by referral from a Union Dispatch Office, transfer from another project, or another method. Individuals who were employed on the project prior to the proper implementation of this drug testing program may only be subjected to testing for the reasons set forth in Paragraph 5(f) (1) through 5(f) (3) of this Policy. Refusal to undergo such testing shall be considered sufficient grounds to deny employment on the project.

5. The following procedure shall apply to all drug testing:

a. The Employer may request urine samples only. The applicant or employee shall not be observed when the urine specimen is given. An applicant or employee, at his or her sole option, shall, upon request, receive a blood test in lieu of a urine test. No employee of the

Employer shall draw blood from a bargaining unit employee, touch or handle urine specimens, or in any way become involved in the chain of custody of urine or blood specimens. A Union Business Representative, subject to the approval of the individual applicant or employee, shall be permitted to accompany the applicant or employee to the collection facility to observe the collection, bottling, and sealing of the specimen.

b. The testing shall be done by a laboratory approved by the Substance Abuse & Mental Health Services Administration (SAMHSA), which is chosen by the Employer and the Union.

c. An initial test shall be performed using the Enzyme Multiplied Immunoassay Technique (EMZT). In the event a question or positive result arises from the initial test, a confirmation test must be utilized before action can be taken against the applicant or employee. The confirmation test will be by Gas Chromatography Mass Spectrometry (GC/MS). Cutoff levels for both the initial test and confirmation test will be those established by the SAMHSA. Should these SAMHSA levels be changed during the course of this agreement or new testing procedures are approved, then these new regulations will be deemed as part of this existing agreement. Confirmed positive samples will be retained by the testing laboratory in secured long-term frozen storage for a minimum of one year. Handling and transportation of each sample must be documented through strict chain of custody procedures.

d. In the event of a confirmed positive test result the applicant or employee may request, within forty-eight (48) hours, a sample of his/her specimen from the testing laboratory for purposes of a second test to be performed at a second laboratory, designated by the Union and approved by SAMHSA. The retest must be performed within ten (10) days of the request. Chain of custody for this sample shall be maintained by the Employer between the original testing laboratory and the Union's designated laboratory. Retesting shall be performed at the applicant's or employee's expense. In the event of conflicting test results the Employer may require a third test.

e. If, as a result of the above testing procedure, it is determined that an applicant or employee has tested positive, this shall be considered sufficient grounds to deny the applicant or employee his/her employment on the Project.

f. No individual who tests negative for drugs or alcohol pursuant to the above procedure and becomes employed on the Project shall again be subjected to drug testing with the following exceptions:

1. Employees who are involved in industrial accidents resulting in damage to plant, property or equipment or injury to himself/herself or others may be tested pursuant to the procedures stated hereinabove.

2. The Employer may test employees following thirty (30) days advance written notice to the employee(s) to be tested and to the applicable Union. Notice to the applicable Union shall be as set forth in Paragraph 3 above and such testing shall be pursuant to the procedures stated hereinabove.

3. The Employer may test an employee where the Employer has reasonable cause to believe that the employee is impaired from performing his/her job. Reasonable cause shall be defined as exhibiting aberrant or unusual behavior, the type of which is a recognized and accepted symptom of impairment (i.e., slurred speech, unusual lack of muscular coordination, etc.). Such behavior must be actually observed by at least two persons, one of whom shall be a Supervisor who has been trained to recognize the symptoms of drug abuse or impairment and the other of whom shall be the job steward. If the job steward is unavailable or there is no job steward on the project the other person shall be a member of the applicable Union's bargaining unit. Testing shall be pursuant to the procedures stated hereinabove. Employees who are tested pursuant to the exceptions set forth in this paragraph and who test positive will be removed from the Employer's payroll.

g. Applicants or employees who do not test positive shall be paid for all time lost while undergoing drug testing. Payment shall be at the applicable wage and benefit rates set forth in the applicable Union's Master Labor Agreement. Applicants who have been dispatched from the Union and who are not put to work pending the results of a test will be paid waiting time until such time as they are put to work. It is understood that an applicant must pass the test as a condition of employment. Applicants who are put to work pending the results of a test will be considered probationary employees.

6. The employers will be allowed to conduct periodic job site drug testing on the Project under the following conditions:

a. The entire jobsite must be tested, including any employee or subcontractor's employee who worked on that project three (3) working days before or after the date of the test;

b. Jobsite testing cannot commence sooner than thirty (30) days after start of the work on the Project;

c. Prior to start of periodic testing, a business representative will be allowed to conduct an educational period on company time to explain periodic jobsite testing program to affected employees;

d. Testing shall be conducted by a SAMHSA certified laboratory, pursuant to the provisions set forth in Paragraph 5 hereinabove.

e. Only two periodic tests may be performed in a twelve-month period.

7. It is understood that the unsafe use of prescribed medication, or where the use of prescribed medication impairs the employee's ability to perform work, is a basis for the Employer to remove the employee from the jobsite.

8. Any grievance or dispute which may arise out of the application of this Agreement shall be subject to the grievance and arbitration procedures set forth in the CBA.

9. The establishment or operation of this Policy shall not curtail any right of any employee found in any law, rule or regulation. Should any part of this Agreement be found unlawful by a court of competent jurisdiction or a public agency having jurisdiction over the parties, the remaining portions of the Agreement shall be unaffected, and the parties shall enter negotiations to replace the affected provision.

10. Present employees, if tested positive, shall have the prerogative for rehabilitation program at the employee's expense. When such program has been successfully completed the Employer shall not discriminate in any way against the employee. If work for which the employee is qualified exists he/she shall be reinstated.

11. The Employer agrees that results of urine and blood tests performed hereunder will be considered medical records held confidential to the extent permitted or required by law. Such records shall not be released to any persons or entities other than designated Employer representatives and the applicable Union. Such release to the applicable Union shall only be allowed upon the signing of a written release and the information contained therein shall not be used to discourage the employment of the individual applicant or employee on any subsequent occasion.

12. The Employer shall indemnify and hold the Union harmless against any and all claims, demands, suits, or liabilities that may arise out of the application of this Agreement and/or any program permitted hereunder.

13. Employees who seek voluntary assistance for substance abuse may not be disciplined for seeking such assistance. Requests from employees for such assistance shall remain confidential and shall not be revealed to other employees or management personnel without the employee's consent. Employees enrolled in substance abuse programs shall be subject to all Employer rules, regulations and job performance standards with the understanding that an employee enrolled in such a program is receiving treatment for an illness.

14. This Memorandum, of Understanding shall constitute the only Agreement in effect between the parties concerning drug and alcohol abuse, prevention and testing. Any modifications thereto must be accomplished pursuant to collective bargaining negotiations between the parties.

DRUG ABUSE PREVENTION AND DETECTION

APPENDIX A

CUTOFF LEVELS

DRUG	SCREENING METHOD	SCREENING LEVEL **	CONFIRMATION METHOD	CONFIRMATION LEVEL
Alcohol	EMIT	0.02%	CG/MS	0.02%
Amphetamines	EMIT	1000 ng/m*	CG/MS	500 ng/ml*
Barbiturates	EMIT	300 ng/ml	CG/MS	200 ng/ml
Benzodiazepines	EMIT	300 ng/ml	CG/MS	300 ng/ml
Cocaine	EMIT	300 ng/ml*	CG/MS	150 ng/ml*
Methadone	EMIT	300 ng/ml	CG/MS	100 ng/ml
Methaqualone	EMIT	300 ng/ml	CG/MS	300 ng/ml
Opiates	EMIT	2000 ng/ml*	CG/MS	2000 ng/ml*
PCP (Phencyclidine)	EMIT	25 ng/ml*	CG/MS	25 ng/ml*
THC (Marijuana)	EMIT	50 ng/ml*	CG/MS	15 ng/ml*
Propoxyphene	EMIT	300 ng/ml	CG/MS	100 ng/ml

* SAMHSA specified threshold

** A sample reported positive contains the Indicated drug at or above the cutoff level for that drug. A negative sample either contains no drug or contains a drug below the cutoff level.

EMIT - Enzyme Immunoassay
CC/MS - Gas Chromatography/Mass Spectrometry

SIDE LETTER OF AGREEMENT TESTING POLICY FOR DRUG ABUSE

It is hereby agreed between the parties hereto that an Employer who has otherwise properly implemented drug testing, as set forth in the Testing Policy for Drug Abuse, shall have the right to offer an applicant or employee a "quick" drug screening test. This "quick" screen test shall consist either of the "ICUP" urine screen or similar test or an oral screen test. The applicant or employee shall have the absolute right to select either of the two "quick" screen tests, or to reject both and request a full drug test.

An applicant or employee who selects one of the quick screen tests, and who passes the test, shall be put to work immediately. An applicant or employee who fails the "quick" screen test, or who rejects the quick screen tests, shall be tested pursuant to the procedures set forth in the Testing Policy for Drug Abuse. The sample used for the "quick" screen test shall be discarded immediately upon conclusion of the test. An applicant or employee shall not be deprived of any rights granted to them by the Testing Policy for Drug Abuse as a result of any occurrence related to the "quick" screen test.

DIVISION 01 - GENERAL REQUIREMENTS

END OF SECTION

SECTION 010100 SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
1. Work covered by the Contract Documents.
2. Type of the Contract.
3. Work phases.
4. Use of premises.
5. Owner/Development Manager’s occupancy requirements.
6. Work restrictions.
7. Specification formats and conventions.
8. Deferred Approvals.
9. Pollution Control.
10. Storm Water Pollution Prevention Plan.
11. Additional DSA requirements.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: Student Housing at Compton College.

B. Project Location: 1111 E. Artesia Blvd, Compton, CA 90221

C. Owner: Compton College

D. Architect: HPI Architecture.

E. The Work consists of the following:
1. The Work includes construction of Student Housing and as indicated on Drawings.

2. The Work consists of two increments:
    1 Increment 01 Scope of Work: Demolition of existing structures and site improvements, Soil Mitigation (Deep Soil Mixing), Underground Utilities and Rough Grading.
    2 Increment 02: Three Story Student Housing Building which includes pre-fabricated modular residential units and site-built support spaces. Site improvements include an accessible paths of travel, fire department access, hardscape, landscape, (5) five parking stalls for loading unloading and (1) one van accessible parking stall.

3. The intent of these drawings and specifications is that the alteration, rehabilitation or reconstruction is to be in accordance with Title 24, California Code of Regulations. Should any existing conditions such as deterioration or non-complying construction be discovered which is not covered by the contract documents wherein the finished work will not comply with Title 24, California Code of Regulations, a change order, or a separate set of plans and specifications, detailing and specifying the required repair work shall be submitted to and approved by Division of the State Architect before proceeding with the repair work.

1.4 TYPE OF CONTRACT

A. Project will be constructed under a single prime contract.

1.5 WORK PHASES

A. The Work shall be conducted in single phase.

1.6 USE OF PREMISES

A. General: Contractor shall have limited use of premises for construction operations as indicated on Drawings by the Contract limits.

B. Use of Site: Limit use of premises to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
    1. Owner/Development Manager Occupancy: Allow for Owner/Development Manager occupancy of Project site and use by the public.
    2. Driveways and Entrances: Keep driveways loading areas, and entrances serving premises clear and available to Owner/Development Manager, Owner/Development Manager’s employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.

a. Schedule deliveries to minimize use of driveways and entrances.
b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

1.7 OWNER/DEVELOPMENT MANAGER'S OCCUPANCY REQUIREMENTS

A. Owner/Development Manager Occupancy of Completed Areas of Construction: Owner/Development Manager reserves the right to occupy and to place and install equipment in completed areas of building, before Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and partial occupancy shall not constitute acceptance of the total Work.
   1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied before Owner/Development Manager occupancy.
   2. Obtain a Certificate of Occupancy from authorities having jurisdiction before Owner/ Development Manager occupancy.
   3. Before partial Owner/Development Manager occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner/Development Manager will operate and maintain mechanical and electrical systems serving occupied portions of building.
   4. On occupancy, Owner/Development Manager will assume responsibility for maintenance and custodial service for occupied portions of building.

1.8 WORK RESTRICTIONS

A. On-Site Work Hours:
   1. Work shall be generally performed inside the existing building during normal business working hours of 7 a.m. to 5 p.m., Monday through Friday, except otherwise indicated.
   2. Weekend working hours per City of Napa.
B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner/Development Manager or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
   1. Notify Architect not less than two days in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without Architect's written permission.

1.9 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections using the 49- division format and CSI's MasterFormat 2004 numbering system.
   1. Section Identification: The Specifications use Section numbers and titles to help cross- referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.
   2. Division 1: Sections in Division 1 govern the execution of the Work of all Sections in the Specifications.

B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
   1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
   2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
      a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

1.10 DEFERRED APPROVALS

A. Deferred approval items are listed on Drawings.

B. Contractor is solely responsible for obtaining all necessary approvals and all costs associated with obtaining the approval of DSA including all Architectural and Engineering fees for coordinating with DSA beyond review and shipping of two separate Contractor provided submittals. Do not commence installation of any deferred approval item until all approvals have been obtained.

C. Deferred Approvals. Only where a portion of the construction cannot be adequately detailed on the approved plans because of variations in product design and/or manufacturer, the approval of plans for such portion, when specifically accepted by DSA, may be deferred until the material suppliers are selected provided the following conditions are met:
   1. The project plans clearly indicate that a deferred approval by DSA is required for the indicated portions of the work prior to fabrication and installation.
   2. The project plans and specifications adequately describe the performance and loading criteria for such work.
   3. An architect or registered engineer stamps and signs the plans and specifications for the deferred approval item. The architect or engineer in general responsible charge of the design of the project shall submit the plans and specifications for the deferred approval item to the enforcement agency, with notation indicating that the deferred approval documents have been found to be in general conformance with the design of the building.
   4. Fabrication of deferred approval items shall not begin with out first obtaining the approval of plans and specifications by DSA.

D. Deferred Approval Submittals, General:
   1. Submit initial deferred approval submittal to Architect within 35 calendar days from the date of issuance of Notice to Proceed, and before any materials are delivered to the job site. Contractor is solely responsible for obtaining all necessary approvals. Do not commence installation of any deferred approval item until all approvals have been obtained.
   2. Product Data: Submit manufacturer’s specifications and certified test reports made by an independent testing organization for each type and class of material to show compliance with code requirements and gain approval of DSA.
   3. Shop Drawings: Submit complete shop drawings including dimensioned plans, elevations, and all details of typical sections and connections. Shop drawings shall show design loads and all details of the installation. Title sheet of shop drawings shall list testing requirements and shall state that licensed engineer shall review and certify the completed installation is in accordance with the approved shop drawings. Shop drawings shall be stamped, dated and signed by professional engineer licensed in the State of California as evidence of his or her responsibility for the work.
   4. Shop drawings:
      a. Format: 30’ x 42” sheet format with border and title block identifying, at a minimum, the project name, project number, project location, date, contractor and structural engineer of record.
      b. 1 set of reproducible shop drawings each submittal review.

c. 1 set of reproducible shop drawings for each plan check review.
d. 1 set of reproducible shop drawings approved by DSA.

5. Calculations: Submit calculations prepared by a professional engineer licensed in the State of California. Engineer shall sign, date and stamp calculations as evidence of his or her responsibility for the work.
6. Submittals shall be approved first by the Architect, then by DSA.

1.11 POLLUTION CONTROL

A. Provide positive methods, means and facilities required to prevent contamination of the soil, water or atmosphere by the discharge of noxious substances from the construction operations.

1.12 STORM WATER POLLUTION PREVENTION PLAN (SWPPP)

A. Comply with Storm Water Pollution Prevention Plan (SWPPP). See specification by Civil consultant.

1.13 MISCELLANEOUS PROVISIONS

A. General: Comply with the Project Conditions of Approval for both noise and dust control. If there is any conflict between drawings and specifications and the Project Conditions of Approval regarding noise and dust control, the Project Conditions of Approval shall govern.

B. Noise Control:
   1. The Contractor shall install noise reducing devices on construction equipment. Contractor shall comply with the requirements of the city and county having jurisdiction with regard to noise ordinances governing construction sites and activities. Construction Equipment noise at the Site shall be limited and only as permitted by applicable law, rule or regulation.
   2. If classes are in session at any point during the progress of the Work, and, in the Owner/Development Manager's reasonable discretion, the noise from any Work disrupts or disturbs the students or faculty or the normal operation of Owner/Development Manager, at the Owner/Development Manager's request, the Contractor shall schedule the performance of all such Work around normal hours or make other arrangements so that the Work does not cause such disruption or disturbance. In no event shall such arrangements result in adjustment of the Contract Price or the Contract Time.

C. Dust Control.
   1. The Contractor shall be fully and solely responsible for maintaining and upkeeping all areas of the Site and adjoining areas, outdoors and indoors, free from flying debris, grinding powder, sawdust, dirt and dust as well as any other product, product waste or work waste, that by becoming airborne may cause respiratory inconveniences to persons and Owner/Development Manager's personnel.
   2. Additionally, the Contractor shall take specific care to avoid deposits of airborne dust or airborne elements. Such protection devices, systems or methods shall be in accordance with the regulations set forth by the EPA and OSHA, and other applicable law, rule or regulation.
   3. Additionally, the Contractor shall be the sole party responsible to regularly and routinely clean up and remove any and all deposits of dust and other elements. Damage and/or any liability derived from the Contractor's failure to comply with these requirements shall be exclusively at the cost of the Contractor, including, without limitation, any and all penalties that may be incurred for violations of applicable law, rule or regulation, and any amounts expended by the Owner/Development Manager to pay such damages shall be due and payable to the Owner/Development Manager on demand.
   4. Contractor shall replace any damages property or part thereof and professionally clean any and all items that become covered or partially covered to any degree by dust or other airborne elements.
   5. If classes are in session at any point during the progress of Work, and, in the Owner/Development Manager's reasonable discretion, flying debris, grinding powder, sawdust, dirt or dust from any Work disrupts or disturbs the students or faculty or the normal operation of the college, at the Owner/Development Manager's request, the Contractor shall schedule the performance of all such Work around normal college hours and make other arrangements so that the Work does not cause such disruption or disturbance. In no event shall such arrangements result in adjustment of the Contract Price or the Contract Time.

1.14 ADDITIONAL DSA REQUIREMENTS

A. Comply with the following:
   1. Compliance with Title 24, for Parts 1-6 and 9.
   2. Title 24, Parts 1-5 shall be kept on site during construction.
   3. All addenda must be signed by Architect and approved by DSA. (Section 4-338, Part 1)
   4. All substitutions affecting DSA regulated items shall be considered as a Change Order or Addenda, and shall be approved by DSA prior to fabrication and installation. (IR-A6) (Section 4-338(c), Part 1)

5. Change Order and Field Change Directives (Preliminary Change Orders) (Section 4-338 (c), Part 1) must be signed by all the following:
   a. A/E of Record.
   b. Owner/Development Manager (change order only).
   c. SEOR (when applicable).
   d. Delegated Professional Engineer (when applicable).
   e. DSA.
6. Project Inspector and testing lab must be employed by the school district and approved by all of the following:
   a. A/E of Record.
   b. SEOR (when applicable).
   c. DSA.

B. Tests and Inspections - Chapter 17A:
   1. All tests shall be performed by a testing facility acceptable to the architect and DSA. The testing facility shall be directly employed by the school district and no other entity or individual. Section Title 24, Part 1, Section 4-335(b).
   2. Test reports shall be addressed to, and sent to, the school district by the testing facility. Copies of all test reports shall be sent to DSA, the architect, the structural engineer, and the project inspector by the testing facility. All reports shall be sent within 14 days of the date of the test. See Title 24, Part 1, Section 4-335(d).
   3. A Verified Report, sighed by the California licensed civil engineer in charge of the testing facility which conducted the tests, shall be submitted to DSA upon completion of the project. The verified report shall state that all tests and inspections were made as required by the DSA approved documents. If the tests or inspections indicate that materials or workmanship did not meet the requirements of the DSA approved documents, the Verified Report shall list all noncompliant work. A copy of all test reports involving unresolved noncompliant work shall be attached to the Verified Report. In the event that not all required tests or inspections were made by the testing facility making this verified report, those tests and inspections not made shall be listed on the Verified Report. See Title 24, Part 1, Section 4-335(e).

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

COMPTON COMMUNITY COLLEGE DISTRICT

ALLOWANCES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Allowances which the Contractor shall provide for designated construction activities in the Work and in this bid.

B. The provisions in this Section only apply if the Owner includes Allowances in the Contract.

1.2 RELATED DOCUMENTS

A. The Conditions of the Contract and other section of Division 01 apply to this section as fully as if repeated herein, including Section 01 01 00 – Scope of Work.

1.3 DESCRIPTION OF REQUIREMENTS

A. Definitions and Explanations: Certain requirements of the construction related to each allowance are indicated and specified. The Allowance has been established by the Owner and represents selection by the Owner of selected Sub-Contractors for designated portions of the work specified and shown.

B. Types of allowance scheduled herein for the Work include lump sum cash allowances. Include all allowances in Contract sum, and identify all allowances in Schedule of Values as separate line items.

C. Selection and Purchase: At earliest feasible date after award of contract, advise the Architect/Engineer of scheduled date when final selection and purchase of each product or system described by each allowance must be accomplished in order to avoid delays in performance of the Work.

1. Establish date by which Prime Contractor must enter into contract and coordinate with sub-contractor responsible for work defined by allowance.

2. Establish date by which final list of products must be established for purchase of products and systems as specifically selected by the District.

1.4 DEFINITIONS AND DESCRIPTION OF REQUIREMENTS

A. Cash Allowance Criteria

1. The Allowance is used only as directed by the Owner.

2. The Allowance is used exclusively for the Owner's purposes and for scope(s) of work as directed by Owner.

3. The sub-contractor will prepare detailed breakdown of all costs associated with the work defined for the Allowance. These amounts will be charged against the Allowance by Change Order, based on final detailed payment receipts and back-up as required by Architect/Engineer, and will include all costs of work performed under the defined work scope.

   a. If required by Owner, Contractor shall obtain quotes for equipment from three separate vendors and present to District for consideration and selection.

4. Contractor shall include in the base bid contract amount all cost of coordination, supervision, bond costs, overhead and profit, supervision, installation and all indirect project costs associated with performing the work of each Allowance. Contractor shall be permitted to charge only its direct costs to perform the work, as indicated through documentation approved by the District.

   a. At project closeout, any unused Cash Allowance amounts shall be credited to the Owner by Change Order. Contractor shall not deduct costs such as bond costs, overhead and profit or other indirect costs when returning any unused Cash Allowance amounts.

   b. Changes that exceed the scope of work or amount of each Allowance covered by each allowance will be processed as a Change Order per Contract Documents.

PART 2 – PRODUCTS - (Not Applicable)

PART 3 – EXECUTION

3.1 SCHEDULE OF CASH ALLOWANCES

COMPTON COMMUNITY COLLEGE DISTRICT

1. **This Contractor will provide a TBD Allowance which is to be included in the base bid. This allowance is to be used at the District's discretion.**

COMPTON COMMUNITY COLLEGE DISTRICT

ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements for Alternates.

B. Definition: An Alternate or Alternate Bid is an amount proposed by Bidders and stated on the Bid Form for certain construction activities defined in the Bidding Requirements that may be added to or deducted from Base Bid amount if the School District decides to accept a corresponding change in either the amount of construction to be completed, or in the products, materials, equipment, systems or installation methods described in Contract Documents.

C. Coordination: Coordinate related Work and modify or adjust adjacent Work as necessary to ensure that Work affected by each accepted Alternate is complete and fully integrated into the project.

D. Notification: Immediately following the award of the Contract, prepare and distribute to each party involved, notification of the status of each Alternate. Indicate whether Alternates have been accepted, rejected or deferred for consideration at a later date. Include a complete description of negotiated modifications to Alternates.

E. A "Schedule of Alternates" is included as an attachment at the end of this section.

1. Include as part of each Alternate, miscellaneous devices, accessory objects and similar items incidental to or required for a complete installation whether or not mentioned as part of the Alternate.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

B. Bid Form

PART 2 – PRODUCTS - (Not Applicable)

COMPTON COMMUNITY COLLEGE DISTRICT

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

1. There are no alternates for this bid.

END OF SECTION

COMPTON COMMUNITY COLLEGE DISTRICT

CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements for making modifications to the contract including:

1. Change Orders/Allowance Usage

2. Construction Change Documents (see General Conditions)

3. Contract Credits

4. Contract Additions

5. Construction Change Directives

6. Emergency Change Directives (see General Conditions)

7. Instructions

B. Modifications:

1. Provide full written data required to evaluate contract modifications, including breakdown of labor, material, equipment and description of work with unit costs for each category.

2. Maintain detailed records of work done on a time-and-material basis.

3. Provide full documentation for all proposed Change Orders to the Architect for his review.

C. Designate in writing the member of Contractor's organization:

1. Who is authorized to accept changes in the Work.

2. Who is responsible for informing others in the Contractor's employ of the authorization of changes in the Work.

1.2 RELATED SECTIONS

A. Addenda: All issued Addendums

B. Agreement: The amounts of unit prices if any as established in the Contract.

C. General Conditions Article 9, Changes in the Work.

D. Section 01 33 00 - Submittals

E. Section 01 63 00 - Product Substitution Procedures

1.3 REFERENCES

A. Change Order Requirements per Title 24 Part 1 CCR.

1. Changes in the plans and specifications are to be made by addenda or Change Orders or construction change documents approved by the Division of the State Architect, Title 24 Part 1 Section 4-338.

2. Change Orders: Changes or alterations of the approved plans or specifications after a contract for the work has been awarded are to be made by means of Change Orders. State the reason for the change and provide supplementary drawings where necessary. Change Orders must be manually signed by the Architect or Engineer in general responsible charge of observation of the work or by the Architect or Engineer delegated responsibility for observation of the portion of the work affected by the Change Order.

3. Change Orders are required to bear the approval of the School Board or their authorized representative upon delegated authority.

4. One original signed copy by all parties of each Change Order is required for the files of the Division of the State Architect.

1.4 PRELIMINARY PROCEDURES

A. The Architect or School District may initiate changes by submitting a Request For Quotation. The request will include:

1. Detailed description of the Change, Products, and location of the change in the Project. Changes may include additions and deletions from the Contract.

2. Supplementary or revised Drawings and Specifications.

3. The projected time span for making the change and a specific statement as to whether overtime work is, or is not, authorized.

4. A specific period of time during which the requested price will be considered valid.

5. Such request is for information only, and is not an instruction to execute the changes, nor to stop Work in progress.

B. Contractor may initiate changes by submitting a written Allowance Usage Request or Proposed Change Order Request to the Architect or School District containing:

1. Description of the proposed change.

2. Statement of the reason for making the changes.

3. Statement of the effect on the Contract Sum/ Contract Price and the Contract Time.

4. Statement of the effect on the Work of separate contractors with breakdown of costs for labor, materials and equipment.

5. Documentation supporting any change in Contract Sum/ Contract Price or Contract Time, as appropriate.

1.5 CONSTRUCTION CHANGE DIRECTIVES

A. In lieu of Proposal Request, the School District through the Construction Manager may issue, a Construction Change Directive (also referred to as an Immediate Change Directive in the General Conditions) for Contractor to proceed with a change which shall state a basis for adjustment, if any, in the Contract Sum/ Contract Price or Contract Time, or both.

B. Authorization will describe changes in the Work, both additions and deletions, with attachments of revised Contract Documents to define details of the change, and will designate the method of

determining any change in the Contract Sum/ Contract Price and any change in Contract Time.

C. The School District and Architect will sign and date the Construction Change Directive as authorization for the Contractor to proceed with the changes.

D. Contractor may sign and date the Construction Change Directive to indicate agreement with the terms therein.

1.6 DOCUMENTATION OF PROPOSALS AND CLAIMS

A. Support each quotation for a lump-sum proposal, and for each unit price which has not previously been established, with sufficient substantiating data to allow the Architect/Engineer and School District to evaluate the quotation.

B. On request provide additional data to support time and cost computations:

1. Labor required in hours with unit costs.

2. Equipment required.

3. Products required in units.

a. Recommended source of purchase and unit cost.

b. Quantities required.

4. Taxes, insurance and bonds.

5. Credit for Work deleted from Contract, similarly documented.

6. Overhead and profit.

7. Justification for any change in Contract Time.

C. Support each claim for additional costs, and for work done on a time and material basis, with documentation as required for a lump-sum proposal, plus additional information:

1. Name of the School District's authorized agent who ordered the work, and date of the order.

2. Dates and times work was performed, and by whom.

3. Time record, summary of hours worked, and hourly rates paid.

4. Receipts and invoices for:

   a. Equipment used, listing dates and times of use.

   b. Products used, listing of quantities.

   c. Subcontracts.

D. Document requests for Substitution of Products as specified in Section 01 63 00.

1.7 CONSTRUCTION CREDITS

A. Work deleted and no work has been completed by the Contractor: Work deleted from the contract is to be credited back to the District and subtracted from the contract amount. Credits are to be included in Change Orders.

1. Contractor shall credit back to the District total value for the work deleted from the contract. Cost of credits shall be determined by the amount stated in the Contractor's Schedule of Values.

2. Where the value of credits cannot be determined from the Contractor's Schedule of values, total value of the credit is to be determined by the cost of materials, labor, overhead and profit, insurance, bonds, etc. All General Contractor, Subcontractor and Material Supplier levels of the Contract are to be included in the total value of credits back.

3. No amount at any level of the contract shall be withheld from credits for overhead and profit, insurance, bonds, time delays, construction schedule changes and administrative expenses.

B. Work deleted and a portion of the work has been completed by the Contractor: Work deleted from the contract is to be credited back to the District and subtracted from the contract amount. Credits are to be included in Change Orders.

1. Contractor shall credit back to the District the total value of the work deleted from the contract less any work already

completed on the credit item. Cost of credits shall be determined by the amount stated in the Contractor's Schedule of Values less any work already completed. Completed work may include cost of shop drawings, submittals, site preparation, partially completed work on the credit item or other expenses related to the item.

2. Where the value of credits cannot be determined from the Contractor's Schedule of values, total value of the credit is to be determined by the cost of materials, labor, overhead and profit, insurance, bonds, etc. All General Contractor, Subcontractor and Material Supplier levels of the Contract are to be included in the total value of credits back.

3. An amount equal to the percentage of work already completed on the deleted item may be withheld from credits back for overhead and profit, insurance, bonds, construction schedule adjustments and administrative expenses, as indicated in the General Conditions (Section 00700).

1.8 PREPARATION OF CHANGE ORDERS

A. The Architect or Construction Manager will prepare each Change Order.

B. Change Order will describe changes in the Work, both additions and deletions, with attachments of revised Contract Documents to define details of the change.

C. Change Order will provide an accounting of the adjustment in the Contract Sum/ Contract Price and in the Contract Time.

1.9 LUMP-SUM/FIXED PRICE CHANGE ORDER

A. Content of Change Orders will be based on either:

1. The School District's Proposal Request and Contractor's responsive Proposal as mutually agreed with the School District.

2. Contractor's Proposal for a change, as recommended by the School District or their authorized agent.

B. The School District, Division of the State Architect and Architect or Engineer in responsible charge will sign and date the Change

Order as an authorization for the Contractor to proceed with the changes.

C. The Contractor will sign and date the Change Order to indicate agreement with the terms therein.

1.10 UNIT PRICE CHANGE ORDER

A. Content of Change Orders will be based on either:

1. The School District's definition of the scope of the required changes.

2. Contractor's Proposal for a change, as recommended by the School District or Authorized Agent.

3. Survey of completed work.

B. The amounts of the unit prices to be:

1. Those stated in the Agreement.

2. Those mutually agreed upon between School District and Contractor.

C. When quantities of each of the items affected by the Change Order can be determined prior to start of the work:

1. The School District and Architect or Engineer in responsible charge will sign and date the Change Order as authorization for Contractor to proceed with the changes.

2. Contractor is to sign and date the Change Order to indicate agreement with the terms therein.

D. When quantities of the items cannot be determined prior to start of the work:

1. The School District through the Architect will issue a Construction Change Directive directing the Contractor to proceed with the change on the basis of unit prices, and will cite the applicable unit prices.

2. At completion of the change, the School District or its authorized agent will determine the cost of such work based on the unit prices and quantities used.

3. The Contractor shall submit documentation to establish the number of units of each item and any claims for a change in Contract Time.

4. The School District, Division of the State Architect and Architect or Engineer in responsible charge will sign and date the Change Order as authorization for the Contractor to proceed with the Changes.

5. The Contractor will sign and date the Change Order to indicate agreement with the terms therein.

1.11 TIME AND MATERIALS CHANGE ORDER/CONSTRUCTION CHANGE DIRECTIVE:

A. The School District through the Architect will issue a Construction Change Directive directing Contractor to proceed with the changes

B. At completion of the change, Contractor shall submit itemized accounting and supporting data as provided in the Article 1.6, "Documentation of Proposals and Claims," of this Section.

C. The School District or its authorized representative will determine the allowable cost of such work, as provided in General Conditions and Supplementary Conditions.

D. The School District, Division of the State Architect and Architect or Engineer in general responsible charge will sign and date the Change Order to authorize the change in Contract Sum/ Contract Price and in Contract Time.

E. The Contractor will sign and date the Change Order to indicate agreement with the terms therewith.

1.12 INSTRUCTIONS

A. Architect's Supplemental Instructions:

1. Minor changes in the work shall be carried out in accordance with supplemental instructions issued in accordance with the Contract Documents without change in Contract Sum/ Contract Price or Contract Time.

2. The Architect will issue, sign, and date Supplemental Instructions.

3. The Contractor will sign and date Supplemental Instructions to indicate acceptance of minor changes consistent with the Contract Documents and return signed copy to Architect.

1.13 CORRELATION WITH CONTRACTOR'S SUBMITTALS

A. Periodically revise Schedule of Values and Request for Payment forms to record each change as a separate item of Work and to record the adjusted contract amounts.

B. Periodically revise the Construction Schedule to reflect each change in Contract Time.

C. Revise sub-schedules to show changes for other items of work affected by the changes.

D. Upon completion of work under a Change Order, enter pertinent changes in Record Documents.

1.14 FORMS

A. Submit Proposal Request typed on AIA Document G709. A Copy of this form may be obtained from the local American Institute of Architects, Chapter Office

B. Submit Change Orders typed on the Change Order Form included in this Project Manual. Form is included in General Conditions and at the end of this Section.

C. Submit Potential Change Order on the Potential Change Order Form included in this Project Manual. Form is included in General Conditions and at the end of this Section

D. Submit Supplemental Instructions typed on the form included in this Project Manual on 01 30 50-24, Requests For Information (RFI's).

E. Immediate Change Directive Form is included in the Supplementary General Conditions.

PART 2 – PRODUCTS - (Not Applicable)

PART 3 – EXECUTION - (Not Applicable)

END OF SECTION

COMPTON COMMUNITY COLLEGE DISTRICT

PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements governing the Contractor's Applications for Payment.

B. Submit applications for payment to Construction Manager in accordance with the schedule established by the conditions of the Contract and Agreement between Owner and Contractor.

C. The Contractor's Construction Schedule and Submittal Schedule are included in Section "Submittals".

D. The Contractor agrees to provide an updated certified “As-Built” with every pay application both “Hard Copy” and electronic copy that is approved by the Architect/ Engineer, Inspector of Record, and the Construction Manager.

1.2 SCHEDULE OF VALUES

A. Coordinate preparation of the Schedule of Values with preparation of the Contractor's Construction Schedule.

1. Submit the Schedule of Values to the Construction Manager at the earliest feasible date, but in no case later than 10 days before the date scheduled for submittal of the initial Application for Payment.

B. Format and Content: Use the Project Manual Table of Contents as a guide to establish the format for the Schedule of Values.

1. Identification: Include the following Project identification on the Schedule of Values:

a. Project name and location.

b. Name of the Architect/ Engineer.

c. Project number.

d. Contractor's name and address.

e. Date of submittal.

2. Arrange the Schedule of Values in a tabular form with separate columns to indicate the following for each item listed:

a. Generic name.

b. Related Specification Section.

c. Name of subcontractor.

d. Dollar value.

e. Percentage of Contract Sum/ Contract Price to the nearest one-hundredth percent, adjusted to total 100 percent.

3. Provide a breakdown of the Contract Sum/ Contract Price in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports. Break principal subcontract amounts down into specific line items.

4. Round amounts off to the nearest whole dollar; the total shall equal the Contract Sum/ Contract Price.

5. For each part of the Work where an Application for Payment may include materials or equipment, purchased or fabricated and stored, but not yet installed, provide separate line items on the Schedule of Values for initial cost of the materials, for each subsequent stage of completion, and for total installed value of that part of the Work.

6. Schedule Updating: Update and resubmit the Schedule of Values when Change Orders or Construction Change Directives result in a change in the Contract Sum/ Contract Price.

1.3 APPLICATIONS FOR PAYMENT:

A. Each Application for Payment shall be consistent with previous applications and payments as certified by the Architect/ Engineer and paid for by the School District.

B. Payment Application Times: Each progress payment date is as indicated in the Agreement. The period of construction Work

covered by each Application or Payment is the period indicated in the Agreement.

C. Payment Application Forms: Use AIA Document G702 and Continuation Sheets G 703 as the form for Application for Payment.

D. Application Preparation: Complete every entry on the form, including notarization and execution by person authorized to sign legal documents on behalf of the School District. Incomplete applications will be returned without action.

1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions have been made.

2. Include amounts of Change Orders and Construction Change Directives issued prior to the last day of the construction period covered by the application.

3. Transmit each copy with a transmittal form listing attachments, and recording appropriate information related to the application in a manner acceptable to the Engineer and Construction Manager.

4. When the Architect/ Engineer finds the application completed and correct will transmit a certificate for payment to Owner with a copy to the Contractor.

E. Lien Releases: With each Application for Payment submit Lien Releases from subcontractors or sub- subcontractors and suppliers for the construction period covered by the previous application.

1. Submit partial Lien Releases on each item for the amount requested, prior to deduction for retainage, on each item.

2. When an application shows completion of an item, submit final or full Lien Releases.

a. Submit final Application for Payment with or preceded by final Releases from every entity involved with performance of Work covered by the application that could lawfully be entitled to a lien.

3. Waiver Forms: Submit waivers of lien on forms, and executed in a manner, acceptable to the School District.

F. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of the first Application for Payment include, without limitation, the following (see also General Conditions):

1. List of subcontractors.

2. Schedule of Values.

3. Contractor's Construction Schedule (preliminary if not final).

4. Copies of authorizations and licenses from governing authorities for performance of the Work.

5. Certificates of insurance and insurance policies.

6. Performance and payment bonds (if required).

G. Application for Payment at Substantial Completion: Upon Substantial Completion, submit an Application for Payment.

1. Administrative actions and submittals that shall proceed or coincide with this application include, without limitation, the following (see also General Conditions):

a. Project inspector's status of completion report.

b. Warranties (guarantees) and maintenance agreements.

c. Test/adjust/balance records.

d. Maintenance instructions.

e. Meter readings.

f. Start-up performance reports.

g. Change-over information related to Owner's occupancy, use, operation and maintenance.

h. Final cleaning.

i. List of incomplete Work, recognized as exceptions to the Certificate of Substantial Completion.

H. Final Payment Application: Administrative actions and submittals that must precede or coincide with submittal of the final payment Application for Payment include, without limitation, the following (see also General Conditions):

1. Completion of Project closeout requirements.

2. Completion of items specified for completion after Substantial Completion.

3. Assurance that unsettled claims will be settled.

4. Assurance that Work not complete and accepted will be completed without undue delay.

5. Transmittal of required Project construction records to Owner.

6. Removal of temporary facilities and services.

7. Removal of surplus materials, rubbish and similar elements.

8. Submit the final complete “As-builts” both hard copy and electronic copies with proper electronic titles for each page.

PART 2 – PRODUCTS - (Not Applicable)

PART 3 – EXECUTION - (Not Applicable)

END OF SECTION

COMPTON COMMUNITY COLLEGE DISTRICT

COMPTON COMMUNITY COLLEGE DISTRICT
1111 E. Artesia Blvd
Compton, California 92553
(310) 900-1600

RFQ CCC-XXX
STUDENT HOUSING

POST BID INTERVIEW

1.1 SUMMARY

This Section requires each apparent low bidder to attend and participate in a POST BID INTERVIEW with the CONSTRUCTION MANAGER, prior to award of any contract by the DISTRICT. The POST BID INTERVIEW will be scheduled by the CONSTRUCTION MANAGER within three (3) calendar days after the date of bid. The Conditions of the Contract and all other Sections of the Contract apply to this Section as fully as if repeated herein.

1.2 REQUIRED ATTENDANCE

A. A duly authorized representative of the apparent low bidder is required to attend the POST BID INTERVIEW, in person.

B. The apparent low bidder's authorized representative must have signatory authority on behalf of the apparent low bidder.

C. Failure to attend the POST BID INTERVIEW will be considered just cause for the District to reject the Bid.

Initials: _____ _____
Contractor Construction Manager

1.3 POST BID INTERVIEW PROCEDURE

A. The CONSTRUCTION MANAGER will review the Bidder's Proposal with the attendees.

B. The CONSTRUCTION MANAGER will review the Contract Documents with the attendees, including but not limited to:

1. Insurance
2. Bonding
3. Addenda
4. Pre-Bid Clarifications
5. Scope of Work (Section 01 01 00)
6. Bid Alternates and Voluntary Alternates
7. Value Engineering
8. The Contract Plans
9. The Contract Specifications
10. The Master Schedule
11. Critical Materials
12. General Contract Schedule Requirements
13. Prevailing Wage Requirements
14. Critical Dates Requirement for Other Bid Packages
15. Liquidated Damages
16. Required Documentation for Contract Administration
17. Contract Coordination Requirements

1.4 POST BID INTERVIEW DOCUMENTATION

The CONSTRUCTION MANAGER will document the POST BID INTERVIEW on the form attached to this Section. Both the Apparent Low Bidder and the CONSTRUCTION MANAGER are required to sign the POST BID INTERVIEW Documentation. Signatures will be witnessed at the time of signing. POST BID INTERVIEWS will be conducted at the CONSTRUCTION MANAGER jobsite trailer.

Initials: _____ _____
Contractor Construction Manager

COMPTON COMMUNITY COLLEGE DISTRICT

POST BID INTERVIEW FORM

CONSTRUCTION MANAGER FIRM
PCM3, Inc.
Compton Community College District Office
1111 E. Artesia Blvd.
Compton, CA 90221

BIDDER: _____

DATE: _____ TIME: _____ PHONE # _____

I. INTRODUCTIONS: (SIGN IN BELOW)

A. Present

_____ CONTRACTOR	_____ CONTRACTOR
_____	_____
_____	_____
_____ CONSTRUCTION MANAGER	_____ CONSTRUCTION MANAGER

II. PROPOSED CONTRACT:_____

III. PURPOSE OF INTERVIEW IS TO ASSURE:

A.	Contractor acknowledgment of a complete and accurate bid.	Yes	No
B.	Contractor submission of a fair and equitable bid.	Yes	No
C.	Fair comparisons of bid.	Yes	No

Initials: _____ _____
Contractor Construction Manager

IV. CONTRACTUAL REQUIREMENTS:

A.	Do you understand you are a prime contractor?	Yes	No
B.	Can you meet all specified insurance requirements?	Yes	No
C.	You are required to obtain a Performance, and a Labor and Material Bond for 100% of the Contract price	Yes	No
1.	Is this acceptable?	Yes	No
2.	Will you provide bonds as stipulated?	Yes	No
3.	Cost for bond: _____%	Yes	No
4.	Is the cost of the bond in your base bid?	Yes	No
5.	Is your insurance company California licensed?	Yes	No
D.	Acknowledged Receipt of Addenda _____1 _____2 _____3 _____4 _____5		
E.	Acknowledged Receipt of Pre-Bid Clarification Questions	Yes	No
F.	Are any costs for addenda items included in your proposal (if applicable)?	Yes	No

V. SCOPE OF WORK:

A.	You have a complete understanding of your Scope of Work under the proposed Agreement	Yes	No
B.	You have re-reviewed the documents and understand the Scope of the Work. Are there any items that need to be identified or require clarification?	Yes	No

If yes, please identify item.

1. _____
2. _____
3. _____
4. _____
5. _____

	Is (are) the cost(s), as applicable, included in your proposal items?		Yes	No
C.	Review bid alternates (if applicable)	NONE	Yes	No
D.	Are you offering any unsolicited alternates?	NONE	Yes	No

Initials: _____ _____
Contractor Construction Manager

1. _____
2. _____
3. _____

E. Are the plans and specifications clear and understandable to your satisfaction? Yes No

VI. VALUE ENGINEERING: (describe for District Consideration)

1. _____
   _____ Add / Deduct _____
2. _____
   _____ Add / Deduct _____
3. _____
   _____ Add / Deduct _____
4. _____
   _____ Add / Deduct _____

AFFECTED TOTAL $_____

VII. SCHEDULE:

A. Do you acknowledge and agree to the stipulated completion dates and milestones in the Contract? Yes No

1. Will you provide a detailed construction schedule to CONSTRUCTION MANAGER within the required three (3) days, per the Contract? (Section 00700) Yes No
2. Can you expedite the schedule without impact to others? Yes No
3. It is understood the Project schedule is critical. Can you accelerate any and all schedule activities if the requirement occurs? Yes No
   If not, what must change and why? _____
   _____
   _____

Initials: _____ _____
Contractor Construction Manager

B. Identify critical materials, deliveries and dependencies, including Owner Furnished items that could affect the completion of your work. Yes No

1. _____

2. _____

3. _____

C. You have reviewed Section 01 43 80, CONSTRUCTION SCHEDULE and you understand your work must be completed in accordance with the **Master Schedule**. You further understand the District **MAY** assess liquidated damages if you fail to meet the Master Schedule requirements. You further understand delays by you may cause other contractors to be delayed, and that you **WILL** accelerate your work upon written direction by the CONSTRUCTION MANAGER.

CRITICAL DATES

PROJECT COMPLETION

Milestone Dates

Notice to Proceed	TBD
All Submittals received by Construction Manager	25 Days After Notice to Proceed
All Shop Drawings received by Construction Manager	45 Days After Notice to Proceed
Provide Detailed Construction Schedule	15 Days After Notice to Proceed
Mobilize	TBD
Construction Completed by	TBD
Final Cleanup, Punchlist, and Closeout	TBD

You agree that failure to meet the date is just cause for the DISTRICT to assess and retain Liquidated Damages in accordance with the Contract Documents.

VIII. CONTRACTOR COMMENTS / SUGGESTIONS:

1. _____

2. _____

3. _____

4. _____

5. _____

Initials: _____ _____
Contractor Construction Manager

IX. CONTRACTOR

The foregoing information is true and accurate, and I am authorized to sign as an office of the company I am representing.

Company Name _____

Signature: _____ Title: _____

Date: _____

X. CONSTRUCTION MANAGER

Signature: _____ Title: _____

Date: _____

XI. Witness:

Signature: _____

Date: _____

END OF SECTION

Initials: _____ _____
Contractor Construction Manager

CONSTRUCTION PROCEDURE MANUAL

COMPTON COMMUNITY COLLEGE DISTRICT

COMPTON COMMUNITY COLLEGE DISTRICT
Construction Procedures Manual

I. INTRODUCTION

This Construction Procedures Manual has been developed for the Compton Community College District.

The purpose of this Manual is to provide the Owner, the Architect, Engineer, Inspector and Contractors detailed information concerning the specific project requirements and procedures.

This manual delineates lines of authority and responsibility of the team members associated with this Project.

Questions or suggested changes to this manual may be addressed to the Construction Manager, at 1111 E. Artesia Blvd., Compton, CA 90221

SHOULD INCONSISTENCIES OR DISCREPANCIES EXIST BETWEEN THIS MANUAL AND THE CONTRACT DOCUMENTS (INCLUDING THE GENERAL CONDITIONS); THE CONTRACT DOCUMENTS (INCLUDING THE GENERAL CONDITIONS) WILL TAKE PRECEDENCE.

II. PROJECT PROCEDURES

A. COMMUNICATIONS

1. In carrying out the terms of the Contract, the Owner and the Architects/Engineer will interact with the Contractors through the Construction Manager.

2. All correspondence, shop drawings, submittals, RFIs etc. are to be processed and submitted through the Construction Manager.

3. All correspondence, shop drawings, submittals, RFIs etc. shall reference the Project by name and Contract number.

4. The Construction Manager is the point of contact for all Project communications.

B. MEETINGS

1. Pre-Construction Meeting - (Section 01 31 00)*

After award of the Contract, the Construction Manager will schedule a "Pre-Construction Meeting" to be held at a time and location designated by the Construction Manager. **An authorized representative of Contractor MUST attend the "Pre-Construction" meeting**. Minutes of the meeting will be prepared and distributed by the Construction Manager

2. Weekly Project Meeting - (Section 01 31 00)*

a. The Construction Manager will conduct a weekly Project meeting in the on site office.

b. Contractor with crews on site and upcoming work must attend weekly meetings.

c. Persons required to attend the weekly Project meetings include Contractor's supervisory personnel, subcontractor personnel, (as appropriate), the Construction Manager, A/E, and others as requested by the Construction Manager. The Owner or User personnel may attend at any time.

d. The Contractor(s) shall bring any documentation as may be required in order to accomplish a joint review and status of the Project activities.

e. Contractor(s) shall prepare a two week "look ahead" schedule for review at each meeting. The schedule shall be prepared in accordance with the scheduling section of this manual and will be reviewed with the contract schedule at each weekly meeting.

f. Contractor to submit the following 5 construction schedules per specification section 01 01 00 and 01 43 80
    1. Execution of all Sub-Contractor Agreements
    2. Submittal
    3. Material Procurement
    4. Manufacturing
    5. Delivery

3. Special Project Meetings

The Construction Manager may call a Special Project Meeting at any time during the course of the Project. Special Project Meetings, if deemed necessary, shall include representatives of the Contractor(s) and subcontractors as requested in order to provide an adequate line of communication to discuss problems and/or solutions that are common to the Project.

C. SITE RULES

1. The Compton Community College District Campus is Non-Smoking and Drug Free.

2. The Compton Community College District Campus is alcohol free.

3. All personnel are required to wear appropriate protective clothing, work shoes, and safety equipment at all times.

4. All personnel shall restrict their behavior, their language and their demeanor so as to avoid harassment to students and faculty.

5. Violations of Site Rules may result in permanent banning from the Project.

6. Compton Community College District in an occupied facility and occupied site protocol is mandatory.

D. PROJECT DOCUMENTS All Construction Manager Document Control will be administered utilizing Trimble Project Site software.

1. SUBMITTALS - (Specification Section 01 33 00) *

a. Contractor shall submit all shop drawings, samples and product data through the Construction Manager within the time requirements set forth in Specification Section 01 01 00.

b. Every Submittal shall be made to the Construction Manager at the Project site, using the enclosed submittal form. A separate form must be filled out for each submittal. Each separate specification section requires a separate and complete submittal that is project specific. At a minimum, every submittal shall contain the following information and any other information required by the General Conditions:

1. Project Name

2. Contractors Name & Address

3. DSA Application Number _____ and File Number _____ for each project

4. Submittal Number according to the Construction Managers Submittal Log

5. Submittal Date

6. Specification and/or Drawing Reference.

7. Contractor Name and Address

8. Attach List of Items Submitted

9. Contractor to submit 1 hard copy and 1 electronic copy per each specification section.

Each submittal will be complete per each specification section. Incomplete and partial submittals will not be accepted.

* References are to Specification Sections; refer to section for more detailed requirements.

c. **CONTRACTOR WILL STAMP AND SIGN SUBMITTALS, SHOP DRAWINGS, ETC. THAT HE HAS REVIEWED THE ITEMS SUBMITTED, AND CERTIFIES THE ITEMS ARE IN ACCORDANCE WITH THE CONTRACT DOCUMENTS, AND THAT EACH HAS BEEN CHECKED FOR DIMENSIONS AND RELATIONSHIPS WITH WORK OF ALL OTHER CONTRACTORS AND TRADES INVOLVED.**

d. Upon receipt, the Construction Manager will log each submittal. The Construction Manager may reject any submittal if it is, in his or her judgment, incomplete or inadequate. In such case, a copy of the rejected submittal will be returned by the Construction Manager to the Contractor with the reason for rejection cited.

e. All Submittals shall be numbered by the Construction Manager.

f. Upon completion of review of the complete submittal, the Construction Manager will transmit acceptable submittals to the A/E for review and comment.

E. A/E REVIEW COMMENTS

1. All submittals must conform to the approved contract documents.

2. The A/E will review all submittals and, where appropriate, make written commentary. The A/E's comments will be similar to the following:

   a. "NO EXCEPTIONS TAKEN" - the Contractor may proceed with work covered by the submittal if in compliance with the contract documents.

   b. "MAKE CORRECTIONS NOTED" - The Contractor may proceed with the work, provided the Contractor proceeds in accordance with the notes and comments on the submittal.

   c. "REVISE and RESUBMIT" - the Contractor shall NOT begin any work covered by the submittal until a revision or correction to the submittal has been re-submitted, reviewed and returned to the Contractor.

d. "REJECTED" - the Contractor shall not begin any work covered by the submittal until a new submittal has been prepared, submitted and reviewed.

F. SUBMITTAL & SHOP DRAWING QUANTITIES

1. Submittals, Shop Drawings and Product Data shall be submitted in the following minimum quantities:

a.	SAMPLES:	Three or more samples.
b.	SHOP DRAWINGS:	One (1) electronic and one (1) hard copy.
c.	PRODUCT DATA:	One (1) electronic and one (1) hard copy.

G. DISTRIBUTION OF REVIEWED SUBMITTALS

1. SHOP DRAWINGS –
   Construction Manager will provide reviewed shop drawings to the Contractor and to the DSA Project Inspector.

2. PRODUCT DATA –
   Construction Manager will provide reviewed submittals to the Contractor and to the DSA Project Inspector

Fabrication or other work performed in advance of receipt of reviewed drawings, samples or test certifications will be entirely at the Contractor's risk.

H. REQUEST FOR INFORMATION (RFI)

Should the Contractor(s) require clarification or additional information of the plans or specifications, he will direct the request to the Construction Manager on the RFI form as provided by the Construction Manager. Sample forms are in the appendix.

Each RFI will be numbered sequentially. Contractor shall be responsible for maintaining his own "log". The Construction Manager will maintain the Construction Manager's RFI log, and each week, the Construction Manager RFI Log will be distributed & discussed at the weekly meeting.

The RFI shall describe thoroughly, the problem or clarification being requested and a suggested solution. The description provided should be adequate and complete to permit a written response without additional communication with the Contractor. The Contractor shall attach related sketches, information or correspondence which may have been received from subcontractors or vendors on the subject. Each attachment to the RFI shall have the RFI # marked plainly on the attachment pages are to be numbered "Page __of __".

No RFI will be accepted without proper reference to Plan Drawings, Shop Drawings and / or Specification Sections, and all areas completely filled out.

The contractor shall list potential solutions to expedite resolution by the Architect and Owner and the contractor shall insure that all line items in the RFI Form are completely filled out before submitting to the Construction Manager. Contractor will ask a maximum of one (1) question per RFI.

The Construction Manager will review the RFI and will either:

1. Return the RFI to the Contractor for additional information or response.

2. Forward the RFI to the Architect of Record for response, copying the Project Inspector in accordance with the below timelines.

3. Provide the response and return to the Contractor, with copies to the Architect of Record and Project Inspector. RFI's answered by the CM and stamped by the AOR are logged as official RFI's and subject to all of the below conditions.

The processing for a routine RFI shall be as follows:

1. CM will verify all RFI's for format and content prior to any disposition and may return to sender for edit, clarification and completeness.

2. When a Contractor submits an RFI to the CM it will be reviewed. If the RFI is deemed legitimate by the CM it will be immediately transmitted to the Architect of Record.

3. Once the Architect receives the RFI from the CM, he must respond or pass the RFI on to the proper consultant within three (3) days.

(In a Modernization project, the Architect must answer or pass the RFI on to a Consultant within twenty-four (24) hours.)

4. Consultants are given a maximum of seven (7) days to respond or show cause for delay. (For a Modernization Project this period is shortened to three (3) days.)

5. The appropriate recipient of the RFI will endeavor to provide the response as soon as possible within the above time constraints.

6. When the Construction Manager receives a response back from the Architect, the answer should be reviewed and transmitted to the Contractor and Project Inspector as soon as possible.

RFI's requiring critical response timing shall be duly annotated as to the urgency of the response date.

If the RFI review indicates a change or revision is necessary to the Contract Documents, the A/E will prepare appropriate drawings and/or specifications required to define the change or revision either by a CCD or a Bulletin if required.

If the Contractor believes the clarification or direction provided by the response to the RFI will impact the cost or schedule of the Project, he shall provide prompt notification thereof to the Construction Manager in accordance with the General Conditions. Upon notification thereof to the Construction Manager, the Contractor shall prepare an Allowance Usage Request or Proposed Change Order within 30 days, if approved by the District through the Construction Manager, which shall be processed as outlined in the Change Order Procedure of this manual. In the event the Contractor fails to notify the Construction Manager, no consideration will be given to the Contractor for additional costs as outlined in the Change Order Procedure.

See also Project Coordination Section (01 31 00, 1.06 Requests for Information) regarding frivolous Requests for Information.

I. SCHEDULES

The Contractor shall furnish to the Construction Manager any required schedules that addresses the work in his Contract(s) in accordance with the General Conditions. The schedules shall be in a format as approved by the Construction Manager, and as a minimum, shall include, without limitation, the following (see also General Conditions):

1. Detail of activities required for their mobilization and start of construction.

2. Activities of other Contractors which must be completed prior to starting various components of other work.

3. A plan for completion of work in sufficient detail to allow observation and monitoring by the Construction Manager. Any activity longer than five (5) working days shall be broken down into phases of five (5) working days or less in length.

4. List activities which must be complete for succeeding contractors to start their work.

5. Show submittals and shop drawing preparation and review time.

6. Long lead procurement requirements.

7. Include all necessary and required DSA Inspections in Schedule.

The Contractor shall prepare schedules in a Critical Path Method (CPM) format as required by the General Conditions. Contractor will review the logic and duration of activities affecting his work. The Construction Manager will conduct a meeting with Contractor(s) to incorporate revisions and issue the approved construction schedule.

The schedule will become the basis for determining completion of the Project and will be reviewed at each weekly meeting.

Contractor will prepare and submit at each weekly meeting a Short Interval Schedule (SIS) (Two Week Look-Ahead) The SIS (Two Week Look-Ahead) shall be a minimum two (2) week projection of activities currently in progress or to be started within the following two (2) week period (use form within this manual).

The SIS (Two Week Look-Ahead) will be reviewed against the base Contract Schedule each week to evaluate the progress of the work. Contractor shall submit a recovery schedule in the event his work falls behind the approved construction schedule.

J. INSPECTION & TESTING

Contractor shall be responsible for maintaining the necessary licenses required for the completion of the work.

The Owner will pay for State assessed plan check fees and inspection fees, unless otherwise indicated.

Contractor and Subcontractor will be responsible for obtaining and paying for any required City Business licenses.

The DSA Project Inspector will make normal building and code compliance inspections. Contractor will be responsible for compliance with all requirements of applicable codes per the Contract Documents. Contractor shall inform the Construction Manager at least 2 working days prior to scheduling required inspections. Use Inspection Request Form supplied in the appendix of this manual and also complete and submit the required DSA Form 156.

Inspection, testing, and sampling will be performed as specified in the General Conditions and the specific divisions of the Contract Documents. The Owner, through the Construction Manager, will contract for performance of soil, concrete, steel, grout and mortar testing. Review the Contract Documents for Contractor testing and sampling requirements. In all cases where testing is being performed of samples being taken, the Project Inspector, through the IR form, will be given notification pursuant to Contract Document requirements. Contractor shall also timely request special inspections as required by DSA and complete and submit the required DSA verified report forms.

If inspection or testing discloses errors, omissions, inconsistencies, or deficiencies during construction activities, the Contractor will be immediately notified using the Deviation Notice Form. If corrective action is not apparent, the Construction Manager may request the Contractor to propose a corrective action plan.

Where utilities (electric, water, drainage, sewer, gas, etc.) must be disrupted by construction activity, each Contractor shall notify the Construction Manager in writing at least fourteen (14) calendar days prior to the disruption, to be reflected on the 2 Week Look Ahead Schedule and include a logistics plan of the occupied site.

All **INSPECTION REQUESTS** will be channeled through the Construction Manager to the DSA Inspector (PI). The Construction Manager shall log and monitor time, date and subject of all Inspection Requests utilizing an Inspection Log, and maintaining a binder additionally containing copies of above completed form, as well as copies of Inspection Request Response form executed by the PI. Photographs of area or items to be inspected will be taken and kept as part of the permanent daily record of the project.

Inspection log must indicate the title/number of the photos and their permanent file location.

K. FINAL VERIFIED REPORTS are required.

Each Contractor shall submit the required DSA Final Verified Reports to the Construction Manager at the end of construction or as otherwise required by DSA.

Retention may not be paid if Final Verified Reports are not received. Use DSA-6 form supplied in appendix or any updated form from DSA at the completion of the project. The Contractor shall upload the DSA-6 to the DSA Box.

L. SAFETY

Contractor shall have sole and complete responsibility for initiating, maintaining and supervising all safety precautions and programs in connection with this Project. In no case shall the Owner, the Construction Manager, the Architect, the Inspector or their agents, employees or representatives, have either direct or indirect responsibility for the means, methods, techniques, sequences or procedures utilized by the Contractor, or for safety precautions and programs in connection with the work.

Contractor will provide the Construction Manager a copy of his updated safety program prior to commencing the work.

Prior to commencement of work at the site, Contractor must submit a Safety Plan to the District via the Construction Manager per the General Conditions (Specification 00 72 00). Contractor will conform to all OCIP Regulations **where applicable**.

M. CHANGE ORDER AND ALLOWANCE USAGE PROCEDURE
(Specification Section 00 72 00 Article 9)

The Owner, through the Construction Manager, may from time to time direct the Contractor to make changes in the work within the general scope of the Contract. All changes to the Contract will be implemented through written orders or directives prepared by the A/E and issued by the Construction Manager.

When the Construction Manager believes a change order to the construction documents is required that may involve a change in time or cost, he will request the A/E prepare a Bulletin or CCD and issue it to the Construction Manager. The A/E will sequentially number and date each

Bulletin. If the contractor believes a change order is required they will issue an AUR/PCO that fully describes the proposed change(s) to the Contract Documents, including sketches, new drawings, or revised specifications as required. The Construction Manager will maintain a log of all AUR/PCOs issued. The Construction Manager shall number each AUR/PCO. Sample AUR/PCO forms and work sheet are in the appendix.

If the Contractor intends to make claim for a change in the contract time or cost, he must give the Construction Manager written notice per contract documents after the occurrence of the event giving rise to the claim, or lose his rights to the cost recovery of the extra work arising from the claim. (General Conditions Section 00 72 00 Article 9.8).

The Construction Manager will evaluate the Contractor's quotation for the work, using an estimate of time and cost impact prepared by the A/E or the Construction Manager. If the quotation is acceptable to the Construction Manager, the proposal will be forwarded to the Owner and the A/E. If the quotation is judged by the Construction Manager to be not acceptable, he will begin negotiations with the Contractor to come to an agreement as to the time and cost impact.

The Construction Manager reserves the sole right to notify the Contractor when there will be no further negotiations, and when an impasse exists between the Contractor and the Construction Manager and the work is declared to be in dispute.

The Owner and the Architect may issue through the Construction Manager instructions to the contractor to proceed on a time and material basis. The routing procedure will be the same as a change order. If the AUR/PCO directs work to proceed prior to agreement on a lump sum quotation, the Contractor shall prepare an Extra Work Report **each day** for signature by the Construction Manager and/or the Inspector. **Extra Work tickets not signed daily will not be paid for.**

The Construction Manager will review each Allowance Usage Request or Proposed Change Order with the A/E to determine the appropriate DSA approval process and whether the Change Order is a DSA CCD form 140 type A or B Construction Change Document. The Contractor must comply with all DSA requirements for Change Orders and Construction Change Documents.

N. APPLICATION FOR PAYMENT

Draft Application for Payment shall be made by the Contractor on a **monthly** basis for work completed on or before the **25th of each month**.

All Applications for Payment shall contain the approved detailed Schedule of Values submitted by the Contractor at the time of award. Applications shall be submitted on forms provided in the appendix. **No other form will be accepted**.

No later than the 25th of each month, Contractor shall submit a "Draft Pay Request" (pencil copy) to the Construction Manager for review. Only the Schedule of Values need be submitted. The "Draft Pay Request" shall include a detailed Schedule of Values showing percentages of work complete or scheduled to be complete through the end of the month. The Construction Manager, the A/E and Inspector will review and evaluate the "Draft Pay Request". Upon agreement of the amounts due the Contractor, the Contractor will prepare the notarized Application for Payment, and submit one electronic copy of the Application to the Construction Manager on the last working day of the month, for signatures by the Architect and the Inspector. After signatures are obtained, the Construction Manager will submit the Applications to the District for payment. The District will process the Application.

Payment for materials delivered to the Project site but not yet incorporated in the work may be made, **at the discretion of the Owner**. Such materials must be stored at the Project site, properly stacked, crated, boxed, and, if necessary, covered and protected from weather. Documentation of cost shall be provided with the payment request for materials. No payment will be considered without the required documentation. See additional requirements in the General Conditions.

Change Orders, if applicable, shall not be billed until approval of school board is received.

EVERY pay application must be accompanied by a CONDITIONAL Lien Release for the current application, and an UNCONDITIONAL Lien Release for the prior application. All Applications are to be NOTARIZED, and signatures are to be in BLUE ink.

O. PAY ESTIMATE CHECK OFF PROCEDURE (INTERNAL)

1. Verify all Schedule of Values shown on second page agrees with Schedule of Values submitted by Contractor at start of Project.

2. Check all upper details, both pages, are correctly filled in, i.e. Contractor Name and Address, complete Project Name, Architect

Name, pay period dates, and that contract date is shown. (Date of Contract Agreement.)

3. Verify all previous information is correctly transferred from last prior pay application. Verify all math calculations are correct on page two and the correct numbers are transferred to page one. Verify all math on pay application page #1.

4. Verify all board approved Change Orders have been included in the pay application.

5. Verify Contractor signatures and notary signatures and stamp are on page #1.

6. Verify there is a Conditional Lien Release for the current payment request. If there has been a previous pay request, then verify there is also an Unconditional Lien Release for the previous estimate. These releases must be filled out and signed by the Contractor. The District will not pay if the releases are not in order.

7. Verify Preliminary Notice information against amounts billed and Request Lien Releases as necessary.

8. Verification of **As-built drawings update form signed by Project Inspector (PI).**

9. Signed Verification of Certified Payroll Records Submittal to Labor Commissioner Form received.

10. OCIP clearance is obtained – no outstanding issues.

11. Once all of the above is correct, then transfer the complete original to the Construction Manager for signatures by the Architect and the PI. The Architect should be available for signatures, within a reasonable time.

12. After all signatures are obtained, CM will distribute to the Accounting Department for processing.

P. POSTING OF PROJECT DOCUMENTS (PLANS AND SPECIFICATIONS)

1. <u>All Contractors will maintain an up-to-the-day posted set of plans and Specifications for each project at all times.</u> This is essential to the continuity of the project during construction and for archiving

purposes. This "Posted Set" shall not leave the Inspector's Trailer for any reason, and must be kept in a secure location and scrupulously maintained and preserved at all times.

2. Posting must be done within (24) twenty-four hours of the receipt of a completed, signed, change to the Contract Documents.

3. Items that must be posted:

   a. All addendums to the bid set

   b. All Requests for Information (RFI)

   c. All Instructional Bulletins (IB)/Construction Change Documents (CCD)

4. For consistency the following color scheme for posting shall be followed throughout the District:

   a. All pre-bid addendums to the bid set shall be posted on YELLOW paper.

   b. All RFI's will be posted using 50% reduction and PINK paper.

   c. All Instructional Bulletins or CCDs will be posted using 50% reduction and PINK paper.

5. All postings should be sufficiently clear and concise enough to indicate a definitive change to the bid documents. Postings that implement changes on more than one plan sheet or specification page must be posted in the multiple locations or a reference to that posting must be made, sufficient to guide a user to a substantial and correct conclusion.

   Note: Use of 50% reduction is a vehicle for saving space. All postings should be located on the plan sheet or in the Specification Section referred to in the posted document. If frequency of posting is such that more room is needed it is permissible to insert blank sheets into the plans or blank pages into the Specifications. Posting on the reverse of the preceding plan sheet is not advised due to the possibility of replacement sheets.

Q. ITEM OF CHANGE (IOC) LOG TO BE KEPT AND MAINTAINED BY CONSTRUCTION MANAGER and Reviewed at every Construction Meeting.

1. All changes to the Contract Documents are to be logged under separate cover in an Items of Change (IOC) Log and maintained on a continual updated basis.

2. Items in the IOC Log must correspond to items included in the Schedule of Values and be valuated based on given costs or good faith estimates.

3. The IOC Log should include, but be not limited to: Item Number; Date; Description; Budget Revision; checklist for necessary Approvals; and indication of Inclusion in a Change Order.

END OF SECTION

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COMPTON COMMUNITY COLLEGE DISTRICT
Construction Procedures Manual

SUBSTITUTION REQUEST FORM (AFTER BID)
Construction Manager #_____ (For CM Use Only)

DATE:_____ BID PACKAGE:_____

TO:_____

PROJECT: STUDENT HOUSING
SPECIFIED ITEM:

_____
Section Page Paragraph Description

The undersigned requests consideration of the following:

PROPOSED SUBSTITUTION:_____

_____

_____

Attached data includes product description, specifications, drawings, photographs, performance and test data adequate for evaluation of the request. Applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents which the proposed substitution will require for its proper installation.

The undersigned certifies that the following paragraphs and any additional requirements in the General Conditions Article 3.10, unless modified by attachments, are correct:

1. The proposed substitution does not affect dimensions shown on drawings:
2. The undersigned will pay for changes to the building design, including engineering design, detailing, and construction costs caused by the requested substitution.
3. The proposed substitution will have no adverse affect on other trades, the construction schedule, or specified warranty requirements.
4. Maintenance and service parts will be locally available for the proposed substitution.
5. The proposed substitution is submitted within seven (7) calendar days after issuance of the Notice of Intent to Award.

The undersigned further states that the function, appearance, and quality of the proposed substitution are equivalent or superior to the specified item.

Submitted by: _____

Signature _____

Firm _____

Address _____

Remarks _____

Date _____

Telephone _____

Fax: _____ Date: _____

(For Use By The Design Consultant)

___ Accepted ___ Accepted as noted

___ Not Accepted ___ Received too late

Reviewed By _____

_____

_____

_____

COMPTON COMMUNITY COLLEGE DISTRICT

INSPECTION REQUEST

DATE:	**CONTRACTOR:**

SUB-CONTRACTOR/ TRADE: (if any)

DESCRIPTION OF REQUIRED INSPECTION:

INSPECTION LOCATION:	DATE REQUIRED:
	TIME REQUIRED:
PHONE:	

REQUESTED BY:	DATE:
TITLE:	SPECIAL INSTRUCTIONS:
SIGNATURE:	BATCH PLANT INSP. REQ'D: YES NO

INSPECTORS COMMENTS:	
DATE:	SIGNATURE:

SUBMIT TO (CM), 2 WORKING DAYS PRIOR TO DATE & TIME REQUIRED.

DATE & TIME RECEIVED BY **CM**:
CM. PROJECT MANAGER:

cc: CM File

COMPTON COMMUNITY COLLEGE DISTRICT
REQUEST FOR INFORMATION

PCM3 #_____ (For PCM3 Use Only)

(ALL LINE ITEMS MUST BE COMPLETED PRIOR TO SUBMITTAL)

RFI No.
_____ RFI No.

TO: Construction Manager

FROM: _____

EMAIL: _____

PROJECT:

DWG. REF.: _____

Spec. Ref: _____

Trade _____

Date: _____

Description of Problem / Clarification / Information Required:

Drawings attached -

Proposed Solution:

Question By: _____ **Date:** _____

Response: _____

Response By: _____ **Date:** _____

Reviewed By: _____ **Date:** _____

COMPTON COMMUNITY COLLEGE DISTRICT

REQUEST FOR QUOTATION FORM

STUDENT HOUSING PROJECT

RFQ NO.:_____

DATE ____/____/____

TO:

_____

_____

_____

BID PACKAGE NO.:_____

Please submit price quotation for the following work:

_____

_____

_____

_____

_____

_____

_____

_____

_____

(Support Quotation with detailed cost breakdown and back-up materials.)

Reference Document, if any:_____

Price Quotation needed by:_____

Request submitted by:_____ DATE: ___/____/____

Construction Manager.

Parties agree and acknowledge the information in this Request for Quotation is for review purposes only. This Request for Quotation is not a request for, nor an authorization of additional work or an extension of the Contract period.

COMPTON COMMUNITY COLLEGE DISTRICT

ALLOWANCE USAGE REQUEST

CM #_____

STUDENT HOUSING

ALLOWANCE USAGE REQUEST — AUR#_____

TO: _____ DATE ISSUED: _____

FROM: _____ PRICING DUE BY: _____

PROJECT No.: _____ PROJECT NAME: _____

Please submit an itemized quotation for change in the contract sum and time incidental to the proposed modifications to the Contract Documents as described herein. Cost breakdown format shall be as specified including all back up documentation.

Change Item: _____

THIS IS NOT A CHANGE ORDER NOR A DIRECTION TO PROCEED WITH THE WORK DESCRIBED HEREIN.
REFERENCE RFQ#_____DESCRIPTION OF AUR:

REQUESTED BY: A. [ ] Architect B. [ ] DSA Inspector C. [ ] Contractor D. [ ] Owner

COST IMPACT: A. [ ] NONE B. [ ] DEDUCT: $ _____ C. [ ] ADD: $ _____

TIME IMPACT: A. [ ] NONE B. [ ] DEDUCT _____ DAYS C. [ ] ADD: _____ DAYS
Submit justification for time impact per Article 9.5 in the General Conditions 00 72 00

APPROVAL OF THE AUR BY ALL PARTIES LISTED BELOW SERVES AS A NOTICE TO PROCEED.

cc: Contractor: BY: _____

District: BY: _____

Architect/Engineer BY: _____

Project Inspector BY: _____

Construction Manager BY: _____

COMPTON COMMUNITY COLLEGE DISTRICT

POTENTIAL CHANGE ORDER

CM #_____

STUDENT HOUSING

POTENTIAL CHANGE ORDER — PCO#_____

TO: _____ DATE ISSUED: _____

FROM: _____ PRICING DUE BY: _____

PROJECT No.: _____ PROJECT NAME: _____

Please submit an itemized quotation for change in the contract sum and time incidental to the proposed modifications to the Contract Documents as described herein. Cost breakdown format shall be as specified including all back up documentation.

Change Item: _____

THIS IS NOT A CHANGE ORDER NOR A DIRECTION TO PROCEED WITH THE WORK DESCRIBED HEREIN.
REFERENCE RFQ#_____DESCRIPTION OF PCO:

REQUESTED BY: A. [ ] Architect B. [ ] DSA Inspector C. [ ] Contractor D. [ ] Owner

---

COST IMPACT: A. [ ] NONE B. [ ] DEDUCT: $ _____ C. [ ] ADD: $ _____

TIME IMPACT: A. [ ] NONE B. [ ] DEDUCT _____ DAYS C. [ ] ADD: _____ DAYS
Submit justification for time impact per Article 9.5 in the General Conditions 00 72 00

APPROVAL OF THE PCO BY ALL PARTIES LISTED BELOW SERVES AS A NOTICE TO PROCEED.

cc: Contractor: BY: _____

District: BY: _____

Architect/Engineer BY: _____

Project Inspector BY: _____

Construction Manager BY: _____

COMPTON COMMUNITY COLLEGE DISTRICT

Allowance Usage Request/Proposed Change Order
CHANGES AND EXTRAS FORM

The following format shall be used, as applicable by the District and the Contractor to communicate proposed additions and deductions to the Contract. A copy of the Allowance Usage Request and Proposed Change Order form is provided at the end of this Article.

		EXTRA	CREDIT
(a)	Material (attach itemized quantity and unit cost plus sales tax)	_____	_____
(b)	Labor (attach itemized hours and rates)	_____	_____
(c)	Equipment (attach invoices)	_____	_____
(d)	**Subtotal**	_____	_____
(e)	**For Proposed Change Order and Allowance Usage Request:** If Subcontractor performed Work, add Subcontractor's overhead and profit to portions performed by Sub-contractor, not to exceed fifteen percent (15%) of item (d).	_____	_____
(f)	**Subtotal**	_____	_____

		EXTRA	CREDIT
(g)	**For Proposed Change Order:** General Contractor's Overhead and Profit: Not to exceed fifteen percent (15%) of Item (d) if Contractor performed the work. No more than five percent (5%) of Item (f) if Subcontractor performed the work. If work was performed by Contractor and Subcontractors, portions performed by Contractor shall not exceed fifteen percent (15%) if Item (d), and portions performed by Subcontractor shall not exceed five percent (5%) of Item (f)		
	For Allowance Usage Request: Zero (-0-) percent markup per General Conditions Specification Section 00 73 00 paragraph H	_____	_____
(h)	**Subtotal**	_____	_____
(i)	**For Proposed Change Order:** Bond not to exceed one percent (1%) of Item (d)		
	For Allowance Usage Request: Zero (-0-) percent bond per General Conditions Specification Section 00 73 00 paragraph H.	_____	_____
(j)	**TOTAL**	_____	_____
(k)	Date / Time	_____	_____

The undersigned Contractor approves the foregoing Allowance Usage Request or Proposed Change Order as to the changes, if any, and the contract price specified for each item and as to the extension of time allowed, if any, for completion of the entire work on account of said Allowance Usage Request or Proposed Change Order, and agrees to furnish all labor, materials and service and perform all work necessary to complete any additional work specified therein, for the consideration stated herein. It is understood that said Allowance Usage Request or Proposed Change Order shall be effective when approved by the Governing Board of the District.

It is expressly understood that the value of such extra Work or changes, as determined by any of the aforementioned methods, expressly includes any and all of the Contractor's costs and expenses, both direct and indirect, resulting from additional time required on the Project or resulting from delay to the Project. Any costs, expenses, damages or time extensions not included are deemed waived.

The Contractor expressly acknowledges and agrees that any change in the Work performed shall not be deemed to constitute a delay or other basis for claiming additional compensation based on theories including, but not limited to, acceleration, suspension or disruption to the Project.

APPLICATION FOR PAYMENT

SCHEDULE OF VALUES

Schedule of Values Sheet

Application and certificate for payment containing contractor's signed certification, is attached in tabulations below, amounts are stated to the nearest dollar.
Use column 1 on contracts where variable retainage for line items may apply

Application #	
Application Date	
Period To	
Project #	

Contractor Name _____ _____

A	B	C	D	E	F	G		H	I
			Work Completed						
Item #	**Description of Work**	**Scheduled Value**	**From Previous Application (D + E)**	**This Period**	**Materials Stored (Not in D or E)**	**Total Completed & Stored To Date (D +E+F)**	**% (G/C)**	**Balance To Finish (C-G)**	**Retainage (Of Variable Rate)**
1			-	$ -	$ -	$ -	#DIV/0!	$ -	$ -
2			-	$ -	$ -	$ -	#DIV/0!	$ -	$ -
3			-	$ -	$ -	$ -	#DIV/0!	$ -	$ -
4			-	$ -	$ -	$ -	#DIV/0!	$ -	$ -
5			-	$ -	$ -	$ -	#DIV/0!	$ -	$ -
6			-	$ -	$ -	$ -	#DIV/0!	$ -	$ -
7			-	$ -	$ -	$ -	#DIV/0!	$ -	$ -
8			-	$ -	$ -	$ -	#DIV/0!	$ -	$ -
9			-	$ -	$ -	$ -	#DIV/0!	$ -	$ -
10			-	$ -	$ -	$ -	#DIV/0!	$ -	$ -
11			-	$ -	$ -	$ -	#DIV/0!	$ -	$ -
12			-	$ -	$ -	$ -	#DIV/0!	$ -	$ -
13			-	$ -	$ -	$ -	#DIV/0!	$ -	$ -
14			-	$ -	$ -	$ -	#DIV/0!	$ -	$ -
Change Orders (Approved)									
Totals		**$ -**	**$ -**	**$ -**		**$ -**	#DIV/0!	**$ -**	**$ -**

COMPTON COMMUNITY COLLEGE DISTRICT

CONDITIONAL WAIVER AND RELEASE UPON PROGRESS PAYMENT
[Civil Code §8132)]

Upon receipt by the undersigned of a check from _____
(Maker of Check)
in the sum of $_____ Payable to _____
(Amount of Check) (Payee or Payees of Check)
and when the check has been properly endorsed and has been paid by the bank upon which it is drawn, this document shall become effective to release any mechanic's lien, stop notice or bond right the undersigned has on the job of Compton Community College District located at _____ to the following extent.

This release covers a progress payment for labor, services, equipment or materials furnished to _____ through _____
(Your Customer) (Date)
only and does not cover any retention retained before or after the release date; extras furnished before the release date for which payment has not been received; extras or items furnished after the release date. Rights based upon work performed or items furnished under a written change order which has been fully executed by the parties prior to the release date are covered by this release unless specifically reserved by the claimant in this release. This release of any mechanic's lien, stop notice, or bond right shall not otherwise affect the contract rights, including rights between parties to the contract based upon a rescission, abandonment, or breach of the contract, or the right to the undersigned to recover compensation for furnished labor, services, equipment, or material covered by this release if that furnished labor, services, equipment, or material was not compensated by the progress payment.

Before any recipient of this document relies on it, said party should verify evidence of payment to the undersigned.

Dated: _____ Company Name: _____

By: _____
(Title)

NOTE: This form complies with the requirements of Civil Code Section 8132. It is to be used by a party who applies for a progress payment when the progress check has not yet cleared the bank. This release only becomes effective when the check, properly endorsed, has cleared the bank.

USE REVERSE SIDE AS RELEASE FOR INDIVIDUALS PERFORMING LABOR FOR WAGES

§ 484(b) OF THE CALIFORNIA PENAL CODE PROVIDES IN PART AS FOLLOWS:

"Any person who receives money for the purpose of obtaining paying for services, labor, materials or equipment and willfully fails to apply such money for such purpose by wither willfully failing to complete the improvements for which funds were provided or willfully failing to pay for services, labor, materials or equipment provided incident to such construction, and wrongfully diverts the funds to a use other that for which the funds were received, shall be guilty of a public offense and punishable by a fine not exceeding ten thousand dollars ($10,000), or by imprisonment in the state prison, or in the county jail not exceeding one year, or by both such fine and such imprisonment. If the amount diverted is in excess of one thousand dollars ($1,000). If the amount diverted is less than one thousand dollars ($1,000), the person shall be guilty of a misdemeanor."

§484(c) OF THE CALIFORNIA PENAL CODE PROVIDES AS FOLLOWS:

"Any person who submits a false voucher to obtain construction loan funds and does not use the funds for the purpose for which the claim was submitted is guilty of embezzlement."

§206.5 OF THE CALIFORNIA LABOR CODE PROVIDES:

"No employer shall require the execution of any release of any claim or right on account of wages due, or become due, or made as an advance on wages top be earned, unless payment of such wages has been made. Any release required or executed in violation of the provisions of this section shall be null and void as between the employer and the employee and the violation of the provisions of this section shall be a misdemeanor."

§532(e) OF THE CALIFORNIA PENAL CODE PROVIDES AS FOLLOWS:

"Any person who receives money for the purpose of obtaining or paying for services, labor, materials or equipment incident to constructing improvements on real property and willfully rebates any part of the money to or on behalf of anyone contracting with such person for provision of the services, labor, materials or equipment for which the money was given, shall be guilty of a misdemeanor, provided**,** however, that normal trade discount for prompt payment shall not be considered a violation of this section."

COMPTON COMMUNITY COLLEGE DISTRICT

UNCONDITIONAL WAIVER AND RELEASE UPON PROGRESS PAYMENT

Civil Code Section 8134

The undersigned has been paid in and has received a progress payment in the sum of

$_____ for _____
(Amount of Check Written & Numeric)

labor, services, equipment, or material furnished to Compton Community College District on the job of CCCD _____Project and does hereby release pro tanto any mechanics lien, stop notice, or bond right that the undersigned has on the above referenced job to the following extent. This release covers a progress payment for labor, services, equipment, or material furnish to **Compton Community College District** through _____ only and does not cover any retention retained before of (Date/End of Month) after the release date; extras furnished before the release date for which payment has not been received; extras or items furnished after the release date. Rights based upon work performed or items furnished under a written change order which has been fully executed by the parties prior to the release date are covered by this release unless specifically reserved by the claimant in this release. This release of any mechanic's lien, stop notice, or bond right shall not otherwise affect the contact rights including rights between parties to the contract based upon a rescission, abandonment, or breach of the contract, of the right of the undersigned to recover compensation for furnished labor, services equipment, or material covered by this release if that furnished labor, services, equipment, or material was not compensated by the progress payment.

Date: _____

_____ _____
(Company Name)

By: _____
(Signature)

_____ _____
(Print Name) (Title)

NOTICE: **THIS DOCUMENT WAIVES RIGHTS UNCONDITIONALLY AND STATES THAT YOU HAVE BEEN PAID FOR GIVING UP THOSE RIGHTS. THIS DOCUMENT IS ENFORCEABLE AGAINST YOU IF YOU SIGN IT, EVEN IF YOU HAVE NOT BEEN PAID. IF YOU HAVE NOT BEEN PAID, USE A CONDITIONAL RELEASE FORM.**

NOTE: This form of release complies with the requirements of Civil Code Section 8134. It is to be used to release claims to the extent that a progress payment has actually been received by the releasing party.

COMPTON COMMUNITY COLLEGE DISTRICT

CONDITIONAL WAIVER AND RELEASE UPON FINAL PAYMENT
(Civil Code Section 8136)

Upon receipt by the undersigned of a check from _____

(Maker of Check)

in the sum of $ _____

(Amount of Check)

payable to _____

(Payee or Payees of Check)

and when the check has been properly endorsed and has been paid by the bank upon which it is drawn, this document shall become effective to release pro tanto any mechanic's lien, stop notice or bond right the undersigned has on the job of Compton Community College District located at 1111 E. Artesia Blvd., Compton, CA 90221 to the following extent:

This release covers the final payment to the undersigned for all labor, services, equipment, or materials furnished on the _____, except for disputed claims for extra work in the amount of $_____.

DATED:_____ _____

(Company Name)

By: _____

_____

(Title)

NOTE: This form complies with the requirements of Civil Code Section 8136. It is to be used by the party who applies for a final payment when the final payment check has not yet cleared the bank. This release only becomes effective when the check, properly endorsed, has cleared the bank.

UNCONDITIONAL WAIVER AND RELEASE UPON FINAL PAYMENT

{Civil Code Section 8138}

The undersigned has been paid in full for all labor, services, equipment or materials furnished to _____

on the job of _____

located at _____

and does hereby release pro tanto any mechanic's lien, stop notice or bond right, except for disputed claims for extra work in the amount of $_____.

DATED:_____ _____

Company Name

By:_____

Signature

Title _____

NOTICE: **THIS DOCUMENT WAIVES RIGHTS UNCONDITIONALLY AND STATES THAT YOU HAVE BEEN PAID FOR GIVING UP THOSE RIGHTS. THIS DOCUMENT IS ENFORCEABLE AGAINST YOU IF YOU SIGN IT, EVEN IF YOU HAVE NOT BEEN PAID. IF YOU HAVE NOT BEEN PAID, USE A CONDITIONAL RELEASE UPON FINAL PAYMENT FORM.**

NOTE: This form of release complies with the requirements of Civil Code Section 8138. It is to be used to release claims to the extent that a final payment has actually been received by the releasing party.

Compton Community College District
Student Housing

Verification of As-Built Drawing Update

The contractor on the above named project has updated and provided clear notation on the project plans and specifications located in the Project Inspector's trailer of all as-built conditions for Pay Application #_____ through _____.

_____ _____

Date signed Project Inspector Signature

COMPTON COMMUNITY COLLEGE DISTRICT

2-WEEK-LOOK-AHEAD

1. Insert information, including dates
2. Include Contractor Company Name & Bid Package Number below
3. Include Signature below

Items to Schedule: _____

_____

Date: _____Signature: _____

Contractor:_____

COMPTON COMMUNITY COLLEGE DISTRICT

TIME AND MATERIAL WORK ITEM TICKET

PROJECT: _____ PCO/AUR#_____

CONTRACTOR: _____ SHEET# _____ of _____

Reference Document: _____ Submitted for work on: _____

Original Work Date for this Item: _____ Is Work Completed today? _____

Date of Last Work Activity: _____ Date Submitted to CM_____

WORK COMPLETED TODAY:

Location:

LABOR

EMPLOYEE NAME	CLASSIFICATION	Hours Noted	REMARKS
1.			
2.			
3.			
4.			
5.			

MATERIAL

ITEM DESCRIPTION	QTY / UNITS	Hours Noted	REMARKS
1.			
2.			
3.			
4.			
5.			

EQUIPMENT

EQUIPMENT	MAKE & MODEL	Hours Noted	REMARKS	Rented / Owned
1.				
2.				
3.				
4.				
5.				

	SIGNATURES
CONTRACTOR CERTIFICATION: Signature by contractor to certify that all information on this sheet is true and accurate. Contractor also certifies that only the listed labor, material, and equipment listed were used for this item and that no other items are part of this work.	
CM: Verifies hours worked as identified on this sheet only, not acceptance of any cost or schedule impact on behalf of the Owner.	
PI: Verifies hours worked as identified on this sheet only, not acceptance of any cost or schedule impact on behalf of the Owner.	

COMPTON COMMUNITY COLLEGE DISTRICT
1111 E. Artesia Blvd
Compton, California 90221

GUARANTEE

Guarantee for _____. We hereby guarantee that the _____, which we have installed in _____, has been done in accordance with the Contract Documents, including without limitation, the drawings and specifications, and that the work as installed will fulfill the requirements included in the bid documents. The undersigned and its surety agrees to repair or replace any or all such work, together with any other adjacent work, which may be displaced in connection with such replacement, that may prove to be defective in workmanship or material within a period of _____ (__) year(s) from the date of the Notice of Completion of the above-mentioned structure by the Compton Community College District, ordinary wear and tear and unusual abuse or neglect excepted.

In the event the undersigned or its Surety fails to comply with the above-mentioned conditions within a reasonable period of time, as determined by the District, but not later than ten (10) days after being notified in writing by the District or within two (2) business days in the case of an emergency or urgent matter, the undersigned and its surety authorizes the District to proceed to have said defects repaired and made good at the expense of the undersigned and its surety, who will pay the costs and charges therefore upon demand. The undersigned and its surety shall be jointly and severally liable for any costs arising from the District's enforcement of this Guarantee.

GUARANTEE (continued)

Contractor's Company Name

Signature of Contractor

Print Name

Title

Subcontractor's Company Name
(If work performed by subcontractor)

Signature of Subcontractor

Print Name

Title

Representatives to be contacted for service:

Name: _____

Address: _____

Telephone Number: _____

END OF SECTION

DSA

6-C

CONTRACTOR VERIFIED REPORT

This form shall be completed by each contractor having a contract with the owner, in accordance with California Code of Regulations, Title 24, Part 1, Sections 4-343 or 4-220.

School District/Owner:		DSA File #: -
Project Name/School:		DSA App. #: -
Date of Report:	Number of Attached Pages: (*If none, enter zero.*)	DSA 152 Card #(s):
Note that ***DSA approved*** construction documents, referred to below, are those portions of the construction documents, duly approved by the DSA, that contain information related to and affecting the Structural Safety, Fire/Life Safety and Accessibility portions of the project.		*List all inspection card numbers for which this verified report applies.*

COMPLETE SECTIONS 1, 2, 3 & 4 AND PROVIDE ALL REQUIRED DOCUMENTATION

1. CONTRACTOR INFORMATION *(Enter name and check applicable box)*

	Name of Contractor (Company/Firm) Submitting this Report:
☐	Operating as general contractor responsible for all work shown in the *DSA approved* construction documents.
☐	Operating as contractor responsible for part of the work shown in the *DSA approved* construction documents. (*Describe scope of work in the contract.)*

2. REASON FOR FILING THIS VERIFIED REPORT *(Check applicable box)*

☐	**Interim Verified Report:** List affected form DSA 152 Inspection Card Section #(s):
☐	**Final Verified Report:** Construction of all work shown in the *DSA approved* construction documents that is part of my contract is complete.
☐	**Termination of Contract** prior to completion of all work in the contract *(Provide last date of work)*:
☐	**DSA Request** Dated:

3. DEFERRED SUBMITTALS *(Check applicable box)*

☐	This project does not require deferred submittals within the scope of my contract.
☐	All deferred submittals within the scope of my contract are approved by DSA.
☐	The following deferred submittals, within the scope of my contract, are **not approved** by DSA *(Provide list. Attach additional pages if necessary.)*:

4. DEVIATIONS AS OF THE DATE OF THIS REPORT *(Check applicable box)*

☐	All deviation notices pertinent to my contract related to work shown in the *DSA approved* construction documents are resolved.
☐	There are unresolved deviation notices pertinent to my contract and related to work shown in the *DSA approved* construction documents. *(Attach copies)*
☐	There is work pertinent to my contract that is not completed in compliance with the *DSA approved* construction documents. *(Briefly describe. Attach additional pages if necessary.)*

I attest that based on my own personal knowledge (as defined in California Code of Regulations, Title 24, Part 1, Sections 4-336 and 4-214) that, except as marked in Sections 3 and 4, as of the date of this report, the work has been performed and materials have been used and installed, in every material respect, in compliance with the *DSA approved* construction documents. I declare under penalty of perjury that I prepared this report and that all statements are true.

Signature: _____ Date: _____

Print Name: _____ Contractor's License No.: _____

Submit completed form to the DSA Regional Office with construction oversight authority for the project.

☐ DSA OAKLAND	☐ DSA SACRAMENTO	☐ DSA LOS ANGELES	☐ DSA SAN DIEGO
1515 Clay Street, Suite 1201 Oakland, CA 94612	1102 Q Street, Suite 5200 Sacramento, CA 95811	700 N. Alameda Street, Suite 5-500 Los Angeles, CA 90012	10920 Via Frontera Rd., Suite 300 San Diego, CA 92127

VI. CONTRACT CLOSE-OUT

A. Contract close-out involves review of the Contract Documents, drawings, specifications, schedules, and inspection reports to ensure the Contractors have satisfactorily completed the requirements of the Contract Documents (General Conditions Article 9.9). Before release of the retainage, the Contractor must deliver to the Construction Manager the following close-out submittals and documentation: Including, but not limited to, the following (see also General Conditions Article 9.11):

1. Certificates of Inspection as applicable to each bid package

2. Project record documents, including as-built documents (Hard and Electronic per the District Requirements)

3. Operation and Maintenance Manuals - (per Contract Documents)

4. Warranties and Bonds - two wet signed notarized originals that MUST be signed with blue ink

5. Keys and keying schedule

6. Spare parts and materials

7. Statement of completion of all punch list items

8. Affidavit that all payrolls, bills, and indebtedness connected with the work have been paid or satisfied - sworn statement

9. Final waiver of liens

10. Consent of Surety to final payment

11. Final Verified Reports

12. Other data as required by the Construction Manager for assurance of satisfaction of the requirements of the contract documents.

13. In-Service Schedule

14. Commissioning

The A/E will make distribution of the close-out submittals to the Owner with copies to the appropriate project team members.

B. The A/E will draft the Notice of Completion for Board presentation. The District normally files these with the County within ten (10) days of the Board's action.

C. Upon completion and submittal of all contract close-out times, the Contractor shall submit written notice to the Construction Manager that the project is ready for final inspection. Concurrent with the request for final inspection, the Contractor shall prepare and submit a final application for payment, the Construction Manager, in conjunction with the A/E, will issue a final certificate for payment to the Owner recommending final payment. The Owner will make final payment, less outstanding Stop Notices.

END OF SECTION

V. PROJECT / CONTRACT COMPLETION

A. The contracts of certain other Contractors may be complete prior to the overall completion of the project, as determined by the Construction Manager. The entire project is not finally complete until Contractors have completed their work and all equipment and furnishings have been installed, systems tested, and accepted and all notices of completion recorded. The District may occupy all or any part of the project prior to completion, in accordance with the Contract Documents. See General Conditions Article 9.9 for further details regarding project completion and requirements.

END OF SECTION

V. APPENDIX

A. GENERAL FORMS:

1. Daily Construction Job Report
2. Submittal Form
3. Substitution Request Form
4. Inspection Request
5. Request For Information
6. Request For Quotation Form
7. Potential Change Order
8. Change and Extras Form
9. Instruction Sheet for Pay Applications
10. Application and Certification for Payment
11. Schedule of Values Sheet
12. Conditional Waiver And Release Upon Progress Payment
13. Unconditional Waiver And Release Upon Progress Payment
14. Conditional Waiver And Release Upon Final Payment
15. As-Built Verification Form
16. 2-Week-Look-Ahead
17. Time and Material Work Item Ticket
18. Guarantee Form
19. DSA-6 Form

COMPTON COMMUNITY COLLEGE DISTRICT

PROJECT COORDINATION

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED:

A. Each Prime CONTRACTOR shall coordinate his Work and Work of his subcontractors for the Project.

B. Each Prime Contractor shall:

1. Coordinate work of his own employees and suppliers.

2. Expedite his work to assure compliance with schedules.

3. Coordinate his work with that of other Prime Contractors, subcontractors, and work by DISTRICT.

C. Each Prime Contractor shall coordinate his work and the work of his subcontractors with other Prime Contractors on Project.

D. This Prime Contractor understands and will coordinate with Bid Packs 01to ensure proper coordination, scheduling and ensure that the required Fire Watch/Security is well informed and coordinated with the Construction Manager and reviewed at each construction meeting.

1.2 RELATED REQUIREMENTS:

A. The General Conditions of the Contract: Authority and responsibilities of the Contractor and subcontractor.

1.3 CONSTRUCTION ORGANIZATION AND START-UP:

A. The Prime Contractor shall establish on-site lines of authority and communications, and each Contractor shall:

1. Attend pre-construction meeting and mandatory weekly progress meetings.

2. Establish procedures for inter-project communications:

a. Submittals

b. Reports and records

c. Recommendations

d. Coordination drawings
e. Schedules (Critical path method, submitted to CONSTRUCTION MANAGER in accordance with the General Conditions)

f. Resolution of conflicts

3. Interpret Contract Documents:

a. Consult with CONSTRUCTION MANAGER to obtain interpretation from the ARCHITECT.

b. Assist in resolution of questions or conflicts which may arise.

c. Transmit written interpretations to subcontractors and to other concerned parties.

4. Assist in obtaining permits and approvals:

a. Building permits and special permits required for all Work or for temporary facilities.

b. Verify that subcontractors have obtained inspections for all Work through the D.S.A. approved INSPECTOR.

5. Control the use of site:

a. Supervise field engineering and site layout.

b. Allocate space for each subcontractor's use for field offices, sheds, and work and storage areas as approved by the CONSTRUCTION MANAGER.

c. Establish access, traffic and parking allocations and regulations.

d. Monitor use of site during construction.

1.4 GENERAL DUTIES:

A. Construction Schedules - Each Prime Contractor shall:

1. Prepare a detailed schedule of basic operations for all subcontractors.

    a. Each subcontractor shall prepare sub-schedules to comply with critical phases.

2. Monitor schedules as work progresses:

    a. Identify potential variances between scheduled and probable completion dates for each phase.

    b. Recommend to CONSTRUCTION MANAGER adjustments in schedule to meet required completion dates.

    c. Adjust schedules of subcontractors as required.

    d. Document changes in schedule, submit to DISTRICT and ARCHITECT/ENGINEER through the CONSTRUCTION MANAGER and to involved subcontractors.

    e. Upon written notice by CONSTRUCTION MANAGER, PRIME CONTRACTOR shall, within three (3) calendar days, provide a complete recovery schedule, including manpower loading, resource loading, detailing how the PRIME CONTRACTOR and his subcontractors will recover PRIME CONTRACTOR'S original scheduled milestone dates. Recovery schedule shall show overtime, weekends, or multiple shifts as necessary to meet each milestone of the original schedule.

3. Observe Work of each subcontractor to monitor compliance with schedule.

    a. Verify that labor and equipment are adequate for the Work and the schedule.

    b. Confirm that product procurement schedules are adequate.

    c. Confirm that product deliveries are adequate to maintain schedule.

d. Report noncompliance to District D.S.A. approved INSPECTOR, with recommendation for changes.

B. Process Shop Drawings, product data and samples - Each Prime Contractor shall:

1. Prior to submittal to ARCHITECT/ENGINEER, review for compliance with Contract Documents:

a. Field dimensions and clearance dimensions.

b. Relation to available space.

c. Relation to other contracts and to other trades.

d. Effect of any changes on the Work of any other contracts or other trades.

e. Provide written approval that submittals have been approved by Prime Contractor.

C. Review coordination drawings prepared by mechanical and electrical Contractors - Each Prime Contractor shall:

1. Prior to submittal to ARCHITECT/ENGINEER, through the CONSTRUCTION MANAGER, review for compliance with Contract Documents.

2. Resolve conflicts and assure coordination of the Work of, or affected by, mechanical and electrical trades, or by special equipment requirements.

D. Inspection and testing - Each Prime Contractor shall:

1. Inspect Work to assure performance in accordance with requirements of Contract Documents.

2. Bring to ARCHITECT'S/ENGINEER'S attention, through the CONSTRUCTION MANAGER, the need of any special testing and inspections of suspect Work.

3. Reject Work which does not comply with requirements of Contract Documents.

4. Coordinate Testing Laboratory services:

a. Verify that required laboratory personnel are present.

b. Verify that tests are made in accordance with specified standards.

c. Review test reports for compliance with specified criteria.

d. Recommend and administer any required retesting.

E. Monitor the use of temporary utilities - Each Prime Contractor shall verify that adequate services are provided and maintained.

F. Monitor the PRIME CONTRACTOR'S periodic cleaning - Each Prime Contractor shall:

1. Enforce compliance with Specifications.

2. Resolve any conflicts.

G. Arrange for delivery of DISTRICT furnished products - Each Prime Contractor shall:

1. Inspect for condition at delivery.

2. Turn over to appropriate subcontractor, obtain receipt.

H. Changes and substitutions - Each Prime Contractor shall:

1. Recommend necessary or desirable changes to DISTRICT and to ARCHITECT/ENGINEER, through the CONSTRUCTION MANAGER.

2. Review subcontractor's requests for changes and substitutions. Submit recommendations to DISTRICT and to ARCHITECT/ENGINEER through the CONSTRUCTION MANAGER.

3. Assist ARCHITECT/ENGINEER, through the CONSTRUCTION MANAGER, in negotiating Change Orders.

4. Promptly notify all subcontractors of pending changes or substitutions.

1.5 CLOSE-OUT DUTIES:

A. Mechanical and electrical equipment start-up:

1. Coordinate check-out of utilities, operations systems, and equipment.

2. Assist in initial start-up and testing.

3. Record dates of start of operation of systems and equipment.

4. Submit to DISTRICT written notice of beginning of warranty period for equipment put into service.

B. At completion of Work of each Prime Contract, conduct an inspection to assure that:

1. Specified cleaning has been accomplished.

2. Temporary facilities have been removed from site.

C. Substantial Completion:

1. Conduct an inspection to confirm or supplement Prime Contractor's list of work to be completed or corrected.

2. Assist ARCHITECT/ENGINEER, through the CONSTRUCTION MANAGER, in preparation of correction list.

3. Supervise correction and completion of Work as established in Certificate of Substantial Completion.

D. When DISTRICT occupies a portion of Project prior to final completion, coordinate established responsibilities of PRIME CONTRACTOR and DISTRICT.

E. Final Completion:

1. When each Prime Contractor determines that Work is finally complete, conduct an inspection to verify completion of Work, prior to Punchlist.

2. Assist ARCHITECT/ENGINEER, through the CONSTRUCTION MANAGER, in verification of final completion.

F. Administration of Contract Close-out: - Each Prime Contractor shall:

1. Review final submittals and as-builts prior to transmittal.

2. Transmit to ARCHITECT/ENGINEER, through the CONSTRUCTION MANAGER, with recommendations for action.

1.6 REQUEST FOR INFORMATION

A. Each Prime Contractor shall plan, schedule, coordinate and sequence Work so Requests for Information (RFI), if necessary, may be submitted to the Architect/Engineer in a timely manner so as not to delay progress of Work. Submission of and responses to RFI(s) with copies to Owner, shall be transmitted via facsimile (FAX) equipment or via email to designated email addresses.

B. Telephone conversations requesting information shall be confirmed in writing for prompt reply of all RFI(s). Prime Contractor shall coordinate the timing of facsimile (FAX), email and telephone conversations to be made with the Architect's/Engineer's office between the hours of 8:00 a.m. and noon, Monday through Friday.

C. Architect/Engineer shall have the same time period to respond to RFI(s) as "shop drawing review period". When Architect/Engineer responds to an RFI within 5 working days after receipt of RFI but when the response already is contained or included within contract documents, or is based on referenced standards, or is based on established and common construction practices, Contractor shall reimburse the Architect at the following hourly rates:

Principal	$150
Associate Architect/Project Manager	100
Project Architect/Engineer	85
Job Captain	70
Draftsperson	65
Support Staff	45

If RFI requires Architect's/Engineer's Consultant(s) acknowledgement, Prime Contractor shall reimburse consultant(s), at the same hourly rate for consultant's staff; Prime Contractor shall also pay to the Architect, a percentage for overhead and profit to

the consultant's fee, equal to the markup the Prime Contractor adds to "Change Orders".

D. Prime Contractor shall be billed at "Request for Payment" meeting, and payment is due on the 10th day of the following month. If payment is not received by Architect/Engineer by that date, Architect's/Engineer's response to pending RFIs will be delayed by the same number of days as the days the payment check for RFI services is late.

E. No damages for delay due to RFI response beyond allotted time will be allowed, unless Contractor can show that RFI was not foreseeable with proper planning, scheduling, coordination, and sequencing, and the Architect's/Engineer's late response delayed timely purchase or delivery of equipment or material, or limited construction personnel from proceeding with their task(s), within previously listed "Construction Schedule" activity period(s).

1.7 QUALITY ASSURANCE

A. Familiarity with Contract Documents:

1. Prime Contractor and all Subcontractors shall conduct a study necessary to become completely familiar with all requirements. Applicable requirements indicated or described in the Contract Documents, and the publications referred to, are a part of the Work required as though repeated in each such Section.

2. In the event discrepancies or conflicts are encountered, notify the Architect/Engineer immediately. Where there is discrepancy between different parts of the contract documents, including referenced codes and standards, the documents requiring the higher quality, the greater quantity, or the more difficult work shall govern, unless determined otherwise by the Architect.

3. Promptly distribute required information to entities concerned and ensure the needed actions are taken.

B. Reporting: Unless otherwise noted by the Prime Contractor in his transmittals, all of the Prime Contractor's data transmittals to the Architect/Engineer for the Architect's/Engineer's review will be construed as stipulating that the Prime Contractor has thoroughly and completely reviewed and coordinated the data prior to transmittal.

C. Interfacing: It shall be solely the responsibility of each Prime Contractor to make sure that the assigned work completes in a timely manner and that all interfaces are prepared, connected, and function as required.

PART 2 – PRODUCTS – All products will be submitted and approved by the Architect/Engineer prior to purchase and then placement.

PART 3 - EXECUTION

3.1 PLANNING THE WORK

A. By thorough advance planning of activities, coordinate the following in addition to other coordination activities required:

1. Materials, services, and equipment purchasing.

2. Shipping.

3. Receipt and storage at the site.

4. Installation, including interface with related items.

5. Inspection and testing, to the extent required under the Contract.

6. Assistance in initial start-up and operational tests.

7. Completion of the Work, including removal and disposal of Contractor's surplus material and equipment, and final cleaning of structures and sites.

3.2 COORDINATION

A. Coordinate construction activities included under various Sections of these Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections of the Specifications that are dependent upon each other for proper installation connection and operation.

B. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the Work.

3.3 GENERAL INSTALLATION PROVISIONS

A. Coordination methods used by the Prime Contractor are at the Prime Contractor's option, except that the Architect/Engineer may disapprove Work completed by the Prime Contractor or data submitted by the Prime Contractor when, in the Architect's/Engineer's judgment, coordination has been inadequate to ensure the specified quality.

B. Mounting Heights: Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated. Refer questionable mounting height decisions to the Architect for final decision.

END OF SECTION

COMPTON COMMUNITY COLLEGE DISTRICT

ACCELERATION OF WORK

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements for the acceleration of the work by the Contractor.

1. Where work is falling behind the construction schedule and the total project may not be completed by the date for contract completion as adjusted by change orders.

2. Where the District requires the entire project or a portion thereof be completed at a date earlier than the contract completion date as adjusted by change orders.

B. Related Sections

1. Section 01 25 00 - Contract Modifications Procedures

2. Section 01 29 00 - Payment Procedures

3. Section 01 33 00 - Submittals.

C. Construction Completion date as stated in the Agreement shall be the completion dated as revised by all time extensions granted at the time acceleration of the work begins.

1.2 NOTICE TO ACCELERATE WORK

A. If in the judgment of the Architect and School District it becomes necessary at any time to accelerate the work or a portion thereof to increase rate of progress, Contractor when directed in writing, shall increase his construction forces, equipment, hours of work, number of shifts, delivery of materials and provide means to insure timely completion of the project.

1. Any increase in cost to Contractor to accelerate the work progress to meet construction schedules or contract completion dates are the responsibility of the Contractor.

2. Contractor shall not be entitled to additional compensation for additional effort he applies to the work to meet construction schedules or contract completion dates.

3. Overtime hours by Contractor or its Subcontractors are the responsibility of the Contractor and are not grounds for additional compensation.

B. If in the judgment of the Architect/Engineer and School District it become necessary at any time to accelerate the work or a portion thereof be completed at a date earlier than the contract completion date, Contractor when directed in writing, shall increase his construction forces, equipment, hours of work, number of shifts, delivery of materials and provide means to insure an earlier completion date.

1. Architect/Engineer and District shall determine new accelerated completion date.

2. Any increase in the cost to Contractor in compliance which such accelerated completion date shall be adjusted by Change Order.

C. All directives or orders to accelerate the work will be in writing. Any directive or order terminating acceleration of the work will be in writing.

D. Phased Construction: Where the project includes phased construction and portions of the project are to be completed at earlier times than other portions of the contract, the above stated acceleration provisions shall apply to each phase of the construction contract.

1.3 CONTRACTOR RESPONSIBILITIES

A. Contractor shall when so directed by the Architect/Engineer or School District to accelerate the work or portion thereof, deploy Subcontractors, accelerate material deliveries, increase work forces, increase hours of work, provide additional shifts or provide other methods to accelerate progress of the work.

B. Contractor shall within ten (10) calendar days after receiving written notice to accelerate the work, provide in writing to the Architect/Engineer and District specific measures being taken or planned to increase rate of progress along with a revised Construction Schedule. Architect/Engineer may require the Contractor to make adjustments in the plan of action to insure acceleration of the work.

C. Contractor shall continue acceleration of the work until scheduled progress is regained for timely completion of the project. Timely completion shall be understood as the contract completion date, as revised by all time extensions granted at the time acceleration begins.

1.4 REVISED CONSTRUCTION SCHEDULE

A. Critical-Path Acceleration of Work Schedule: Prepare a new revised fully developed, Critical Path Method type Contractor's construction schedule showing an Acceleration of Work Schedule and new completion dates where an earlier completion date is directed. Revised schedule shall show acceleration of work scheduled to increase progress of the work to provide for timely completion of the project.

PART 2 – PRODUCTS - (Not Applicable)

PART 3 – EXECUTION - (Not Applicable)

END OF SECTION

COMPTON COMMUNITY COLLEGE DISTRICT

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: General requirements for the submittal of Shop Drawings, product literature, samples, RFIs, and other data.

1. To ensure that specified products are furnished and installed in accordance with the design intent, procedures have been established for advance submittal of relevant data, and for review and acceptance or rejection of that data by the Architect.

2. Procedures have been established to ensure that Contractor requests for information and clarification are processed efficiently and promptly.

B. Referenced Documents and Sections:

1. Document 00 72 00 - General Conditions.

2. Section 01 45 00 - Quality Control.

3. Section 01 63 00 - Product Substitution Procedures.

C. Substitutions: Requests for substitutions shall be made in accordance with the provisions of, and in a form described in, Section 01 63 00.

1.2 DEFINITIONS

A. Request For Information (RFI): A document submitted by the Contractor requesting clarification of a portion of the Contract Documents, hereinafter referred to as RFI.

1. Proper RFI: An RFI that includes a detailed written statement indicating the specific Drawings or Specification section in need of clarification and the nature of the clarification requested.

B. Improper RFIs: RFIs that are not properly prepared.

1. Improperly prepared RFIs will be processed by the Architect/Engineer at the Architect's/Engineer's standard hourly rate. The Architect will charge the Owner, and such costs will be deducted from monies still due the Contractor.

    a. The Contractor will be notified by the Architect/Engineer prior to the processing of Improper RFIs.

C. Frivolous RFIs: RFIs that request information that is clearly shown on the Contract Documents.

1. Frivolous RFIs may be returned unprocessed. If processed, the Architect may charge the Owner at the Architect's/Engineer's standard hourly rate, and such costs will be deducted from monies due the Contractor.

    a. The Contractor will be notified by the Architect/Engineer prior to the processing of Frivolous RFIs.

1.3 SCHEDULE OF SUBMITTALS

A. Schedules: Furnish required schedules in accordance with the General Conditions listing all items that will be submitted for acceptance-review by the Construction Manager and Architect/Engineer.

1. Include Shop Drawings, manufacturer's literature, test procedures, test results, certificates of compliance, material samples, and special guaranties.

2. Indicate scheduled dates for submitting the above items, projected needs for responses, and procurement dates.

3. Revise and update submittal schedule as required to keep current. Make revised schedules available to the Architect/Engineer for review.

B. For drawings larger than 11 inches by 17 inches, submit two copies of blueline prints, and one reproducible sepia or vellum of each Shop Drawing submittal, or as determined by mutual agreement. One reproducible copy will be returned to Contractor for reproduction and distribution as required.

1. Alternately, provide two sets of plain bond paper copies 11 inches by 17 inches in size.

C. Make submittals in accordance with the General Conditions to allow adequate time for securing necessary acceptances, for revision and resubmittal, for placing orders and securing delivery, and to accommodate the rate of construction progress required under the Contract.

D. Do not begin work requiring submittals until the submittals have been returned with the other professional consultant's stamp indicating review and acceptance.

1. Provide acknowledgement stamp by Contractor signifying review and acceptance of submittal as defined in Article 1.5 - Coordination of Submittals.

E. Submittals with Bid:

1. Elevators: Provide copies of Preventive Maintenance Contract in accordance with Project Manual Elevator Specifications (if any).

1.4 IDENTIFICATION OF SUBMITTALS

A. On submittal forms acceptable to the Architect/Engineer, identify each submittal and resubmittal by including the following information:

1. Name and address of submitter, including name and telephone number of the individual to be contacted for further information.

2. Complete name of Project.

3. Drawing number and Specification Section number to which the submittal applies.

4. Whether submittal is an original or a resubmittal.

5. Date submittal was prepared or revised.

1.5 COORDINATION OF SUBMITTALS

A. General: Fully coordinate materials prior to submittal for review. Include a transmittal form with a signed statement that submittal satisfies the following procedures:

1. Determine and verify field dimensions and other field conditions.

2. Coordinate with work of related trades.

3. Coordinate with the requirements of public agencies having jurisdiction.

4. Secure required approvals from public agencies and signify by stamp, or other legitimate means, that they have been secured.

5. Indicate necessary deviations from the Contract Documents in a clear manner.

B. Grouping of Submittals: Make submittals in groups containing associated items. The Architect reserves the right to reject partial submittals as not complying with provisions of the Contract Documents.

PART 2 - PRODUCTS

2.1 PRODUCT DATA

A. When required by Part 1 - General of the respective Sections, submit manufacturer's printed product data and instructions for products used on the Project. Include catalog cuts, diagrams, and other descriptive material published by the manufacturer, as well as evidence of compliance with safety and performance standards to demonstrate conformance to the specified requirements. Catalog numbers alone will not be acceptable.

1. Include complete lists of materials, illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information proposed for use, giving manufacturer's name, catalog number, and catalog cut for each item, where applicable.

2. When materials, equipment, or fixtures are identified by numeric, alphabetical, or alphanumerical designations,

identify materials, equipment, and fixtures proposed for use with identical designations.

2.2 SHOP DRAWINGS

A. When required by Part 1 - General of the respective Sections for the various portions of the construction, provide special detailed drawings, diagrams, schedules, and other data in amplification of the Contract Documents before proceeding with the work.

1. Refer to Document 00 72 00 - General Conditions for obligations under the Contract regarding Shop Drawings, product data, and samples.

B. Submit Shop Drawings prepared by qualified detailers. Identify details by reference to Contract Drawing sheet and detail numbers and by specification section and article numbers. Provide a blank area approximately 4 inches by 4 inches for Architect's review stamp.

1. Do not use reproductions of Contract Drawings for fabrication or erection drawings.

C. Shop Drawings submitted shall include not less than the following:

1. Dimensioned plans, elevations, and sections locating assembly components in relationship to each other and in relationship to contiguous building structure.

2. Typical and special fabrication and installation details, including details of anchorage to supporting structure.

3. Materials and finishes.

D. Indicate desired deviations from Contract Drawings on Shop Drawings by placing a heavy line around features on which acceptance is requested. Append a note to each deviation specifically requesting acceptance.

1. Contractor is advised that the identification of "desired deviations" will not be construed as a means of requesting substitutions. Make requests for substitutions in accordance with the provisions of Section 01 63 00.

E. Refer to Part 3 - Execution, for additional review documentation procedures.

2.3 SAMPLES

A. When required by Part 1 - General of the respective Sections of the Specifications, submit physical examples of each item which illustrate materials, equipment, or workmanship, and establish standards by which the work will be judged.

B. All products requiring color selection shall be submitted prior to any selection of colors by the Architect/Engineer. Allow sufficient time for color selection of all items so as not to delay construction progress.

2.4 QUALITY CONTROL SUBMITTALS

A. Test Reports: When and as directed by the Architect/Engineer, submit certified laboratory test reports confirming physical characteristics of materials used in the performance of the work. Refer to Section 01 45 00 for general requirements for inspections and tests.

B. Manufacturer's Instructions: Submit manufacturer's current recommended methods of installation, including relevant limitations, safety and environmental cautions, and application rates.

2.5 EQUIPMENT ROOM LAYOUT DRAWINGS

A. Prepare and submit equipment room layout drawings where required by the Contract Drawings and additionally for areas where equipment proposed for use could present interface or space difficulties.

1. Submit room layout drawings within 10 calendar days after receipt of Notice to Proceed in conformance with the requirements specified for Shop Drawings.

2. Include elevations of wall mounted items.

2.6 CERTIFICATES OF COMPLIANCE

A. When required by Part 1 - General of the respective Sections of the Specifications, furnish certificates to demonstrate compliance of materials with specification requirements, including statements of application and extended guaranties, executed in duplicate. Furnish certificates to the Architect at least 10 days prior to delivery of product. Review certificates before submittals are made to ensure

compliance with the specification requirements, and to ensure that the affidavit is properly executed.

1. Furnish certificates relative to flame-resistance for all decorative materials.

B. Furnish certificates signed by an official authorized to act on behalf of the manufacturing company, material supplier, or other third-party entity, as required. Furnish certificates that contain the name and address of the Contractor, the Project name and location, and the quantity and dates of shipment or delivery to which the certificates apply. In the case of copies of laboratory test reports submitted with certificates, furnish test reports which contain the name and address of the testing laboratory and the dates of the tests to which the report applies.

C. Certification will not be construed as relieving the Contractor from furnishing satisfactory material if, after tests are performed on selected samples, the material is found not to meet the specific requirements.

2.7 CONSTRUCTION COST BREAKDOWN

A. Within 10 calendar days after issuance of Notice to Proceed, submit a Construction Cost Breakdown (Schedule of Values) based on final Contract Sum and scope of work for use in evaluating construction progress and certificates of payment.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Check subcontractor-submitted drawings and data, verify field measurements, apply review stamp, and submit to the Architect/Engineer promptly.

1. Indicate on review stamp that Contractor has reviewed subcontractor's submittal for conformance to the specified product and submittal procedures.

2. Disapprove and return to the material supplier, submittals not meeting the requirements of the Contract Documents.

3.2 ARCHITECT'S REVIEW

A. The Architect/Engineer will review, and either accept or reject with reasonable promptness and as outlined in the accepted submittal schedule, data and drawings submitted by the Contractor. The Architect/Engineer will review submittals for conformance with the intent of the design, and for compliance with specific and relevant requirements of the Contract Documents.

1. The Architect/Engineer will reject and return to the Contractor, Shop Drawings and product literature submitted without the Contractor's review stamp.

2. The Architect/Engineer will reject and return to the Contractor, Shop Drawings not thoroughly reviewed by Contractor prior to submittal.

B. The Architect/Engineer is not responsible for delays caused by rejection of Shop Drawings submitted by the Contractor.

C. Review Procedures:

1. Review will not relieve the Contractor from responsibility for errors.

a. Acceptance of submittals shall not be construed as authorizing changes in the Contract Sum or Contract Time, nor shall it be construed as relieving the Contractor of his responsibility for coordination of work with other trades, or interpreted as approving quantities and dimensions.

2. Notations:

a. REVIEWED: Fabrication, manufacture, or construction may proceed.

b. MAKE CORRECTIONS NOTED: Fabrication, manufacture, or construction may proceed providing submittal complies with comments and notations. If, for any reason, Contractor cannot comply with the comments and notations, Contractor shall bring reasons to the attention of the Architect/Engineer promptly. If Contractor cannot comply with the comments and notations, the MAKE CORRECTIONS NOTED becomes REJECTED. The Contractor shall return the revised version of the submittal to the Architect/Engineer when requested to do so.

c. REJECTED: Submittal does not comply with the Contract Documents and fabrication, manufacture, and construction shall not proceed. Submittals stamped REJECTED are not permitted on the job site. Review and re-submit submittal.

3.3 DISTRIBUTION OF SUBMITTALS BY CONTRACTOR

A. After Architect's/Engineer's review, distribute copies of Shop Drawings and product data which carry the Architect's/Engineer's stamp as determined at the pre-construction meeting. If not otherwise determined, distribute one copy to each of the following:

1. Contractor's Project site file.

2. Project record documents file.

3. Subcontractor, supplier, or fabricator.

4. Other prime Contractors, if applicable.

5. Owner's Representative (at Owner's option).

B. Distribute samples as directed.

C. Maintain an up-to-date submittal log.

3.4 CONTRACTOR'S RESPONSIBILITY

A. The Architect's/Engineer's review of submittals or data shall not relieve the Contractor from responsibility for deviations from Contract Drawings or Specifications unless the Contractor has called the Architect's/Engineer's and Owner's attention to such deviations and secured written acceptance, nor shall it relieve him of responsibility for errors in Shop Drawings or other data.

B. In the event the Architect/Engineer rejects a submittal twice for valid reasons, including improper procedures, the Contractor shall accept the responsibility to pay for professional services to cover further processing of the submittal. A flat hourly rate, as agreed upon, shall be paid by the Contractor.

END OF SECTION

COMPTON COMMUNITY COLLEGE DISTRICT

ALTERATION PROJECT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements for Alteration or Modernization Projects for acceptance of existing site conditions, selective demolition, cutting and patching of existing buildings and site improvements, removal and reinstallation of existing materials, wiring and equipment and interface with existing construction.

B. Refer to other Sections for specific requirements and limitations applicable to Alteration or Modernization projects

C. Requirements of this Section apply to Sections in Divisions 2 through 16.

1.2 RELATED SECTIONS

A. Section 01 01 00 - Summary of work.

B. Section 01 73 20 - Cutting and Patching

1.3 ALTERATION PROJECTS GENERAL PROCEDURES

A. Alteration/Modernization projects require that the contractor may need to demolish, cut, alter, expose, modify, repair, replace, reconstruct, patch, reroute, or other construction procedures to interface new construction into existing construction.

B. The Drawings and specifications are not intended to show in detail all Alteration Project Procedures for interface of new construction into existing construction. It is the responsibility of the Contractor to include in the Contract Price Allowances for such Alteration Procedures.

1.4 QUALITY ASSURANCE

A. Matching existing Construction: On Alteration\Modernization projects new materials are to match existing materials for patching and extending work.

B. Determine type and quality of existing materials by inspection and testing. Existing construction shall be used as a standard of quality for new construction unless noted or specified otherwise.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Use materials that are identical to existing materials. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect. Use materials whose installed performance will equal or surpass that of existing materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that selective demolition is complete and areas are ready for installation of new work.

3.2 PREPARATION

A. Cut, move, or remove items as necessary for access to alteration and renovation work. Replace and restore prior to completion.

B. Remove unsuitable material not marked for salvage, such as rotted wood, corroded metals, and deteriorated construction. Replace materials as specified for the affected finish material.

C. Remove debris and abandoned items from area and from concealed spaces.

D. Remove surface finishes to provide for proper installation of new work.

E. Temporarily close openings in exterior surfaces to protect existing improvement from weather, temperature and humidity during construction of new work.

3.3 INSTALLATION

A. Coordinate work of Alteration/Modernization to expedite completion and to accommodate School occupancy of the facility.

B. Remove, cut and patch in a manner to minimize damage to existing facilities and to provide a means of restoring materials and finishes to original conditions.

C. Refinish visible existing surfaces to remain in Alteration/Modernization areas to specified condition for each material, with a neat transition to adjacent finishes.

D. In addition to the specified new equipment, fixtures, wiring, conduit, materials, etc. bring existing systems to full operational conditions before Alteration/Modernization work is completed.

E. Patch, repair and refinish work that was damaged during mechanical, electrical and other modernization work.

3.4 TRANSITIONS

A. Where the removal or addition of walls, ceilings and finishes abuts existing construction, construct a smooth and even transition. Patch new work to existing to match adjacent work in texture and appearance.

B. When existing surfaces are cut so that a smooth transition with new construction is not possible, terminate existing surface along a straight line at a natural line of division, such as a corner change in finish or a joint. Replace existing finish as required for a smooth transition.

C. Trim bottom of existing doors as required to clear new floor finish.

3.5 CONSTRUCTION INTERFERENCE

A. Where existing construction interferes with new construction, such as pipes, conduit, junction boxes, and other existing construction that may be in a location that is not compatible with new construction, contractor is to relocate, move, provide replacement or otherwise remove the construction interference.

B. Contractor is to field verify existing conditions and is not to reply on Existing Record Drawings provided by the School District. Contractor is not to rely on any verbal instructions or verbal locations given by School District Personnel unless given or stated

in writing. Existing Record drawings if provided are for information only and may not indicate the exact existing construction.

3.6 REPAIR OF DAMAGED SURFACES

A. Where removal of partitions, ceilings, walls or finishes results in adjacent spaces becoming damaged, rework floors, walls and ceilings to provide for a smooth plane without break, steps, or bulkheads.

B. Patch or replace portions of existing surfaces which are damaged, lifted, discolored, or showing other imperfections. Repair substrate prior to patching finish.

3.7 FINISHES

A. Finish surfaces as specified in individual Product sections.

B. Finish patches to produce uniform finish and texture over the entire area. When finish cannot be matched, refinish entire surface to nearest joint corner or intersection.

END OF SECTION

COMPTON COMMUNITY COLLEGE DISTRICT

REFERENCES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Requirements for reference materials applicable to contract documents

B. Definitions of abbreviations, terms, and symbols.

C. Establishes edition dates for reference standards found elsewhere in the specifications.

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the General Conditions.

B. Indicated: The term "indicated" refers to graphic representations, notes, or schedules on the Drawings, other paragraphs or schedules in the Specifications, and similar requirements in the Contract Documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used, it is to help the reader locate the reference; no limitation on location is intended. Except as specifically noted.

C. Directed: Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean "directed by the Architect/Engineer," "requested by the Architect/Engineer," and similar phrases. However, no such implied meaning will be interpreted to extend Architect/Engineer responsibility into Contractor's area of construction supervision.

D. Approve: The term "approved," where used in conjunction with the Architect's/Engineer's action on the Contractor's submittals, applications, and requests, is limited to the Architect's/Engineer's duties and responsibilities as stated in General and Supplementary Conditions. In no case will "approval" by the Architect/Engineer be interpreted as a release of the contractor from responsibilities to fulfill requirements of contract documents.

E. Regulation: The term "Regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction,

as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

F. Furnish: The term "furnish" is used to mean "supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations."

G. Install: The term "install" is used to describe operations at project site including the actual "unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations."

H. Provide: The term "provide" means "to furnish and install, complete and ready for the intended use."

I. Installer: An "Installer" is the Contractor or an entity engaged by the Contractor, either as an employee, subcontractor, or sub-subcontractor, for performance of a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.

1. The term "experienced" when used with the term "Installer" means having a minimum of 5 previous Projects similar in size and scope to this Project, being familiar with the precautions required, and having complied with requirements of the authority having jurisdiction.

J. Project Site is the space available to the Contractor for performance of construction activities, either exclusively or in conjunction with others performing other work as part of the Project. The extent of the Project Site is shown on the Drawings and may or may not be identical with the description of the land upon which the Project is to be built.

K. Testing Laboratories: A "testing laboratory" is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.3 REFERENCE STANDARDS

A. Applicability of Standards: Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or

copied directly into the Contract Documents. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Where the date of issue of a referenced standard is not specified, comply with the standard in effect as of bid date or date of Contract Execution, for projects that are not competitively bid.

C. Upon request, the Contractor is required to make available at the job site within a reasonable time a copy of all referenced standards referred to in the Specifications. Standards are to be maintained in the Project Job Site Office Library for use by the Architect/Engineer, School District and School District's inspector for the purpose of establishing requirements applicable to equipment, materials, quality and workmanship.

D. Conflicting Requirements: Where compliance with two or more standards is specified, and the standards establish different or conflicting requirements for minimum quantities or quality levels, refer requirements that are different, but apparently equal, and uncertainties to the Architect for a decision before proceeding.

1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. In complying with these requirements, indicated numeric values are minimum or maximum, as appropriate for the context of the requirements. Refer uncertainties to the Architect for a decision before proceeding.

1.4 ABBREVIATIONS

A. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where such acronyms or abbreviations are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards generating organization, authority having jurisdiction, or other entity applicable to the context of the text provision.

B. Refer to the "Encyclopedia of Associations," published by Gale Research Co., available in most libraries or the Construction

Specifications Institute (CSI) Technical Document TD-2-5 November 1989, entitled "Sources of Construction Information".

PART 2 – PRODUCTS - (Not Applicable)

PART 3 – EXECUTION - (Not Applicable)

END OF SECTION

COMPTON COMMUNITY COLLEGE DISTRICT
1111 E. Artesia Blvd
Compton, California 90221
(310) 900-1600

Student Housing

Work Plan and Milestone Schedule

Task Name	Finish Date
Pre-bid Mandatory Job Walk:	TBD
Bid Opening:	TBD
Notice of Intent to Award:	TBD
Board Approval	TBD
Notice to Proceed	TBD
Start Construction Phase:	TBD
Construction Completion:	TBD
Punchlist/Closeout completion:	TBD

COMPTON COMMUNITY COLLEGE DISTRICT

QUALITY CONTROL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This Section specifies administrative and procedural requirements for quality control services.

B. Quality control services include inspections and tests and related actions including reports, performed by independent agencies, governing authorities, and the Contractor. They do not include Contract enforcement activities performed by the Architect/Engineer.

C. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve the Contractor of responsibility for compliance with Contract Document requirements.

D. Requirements of this Section relate to customized fabrication and installation procedures, not production of standard products.

1. Specific quality control requirements for individual construction activities are specified in the Sections that specify those activities. Those requirements, including inspections and tests, cover production of standard products as well as customized fabrication and installation procedures.

2. Inspections, test and related actions specified are not intended to limit the Contractor's quality control procedures that facilitate compliance with Contract Document requirements.

3. Requirements for the Contractor to provide quality control services required by the Architect/Engineer, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.2 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

A. Inspections and testing required by laws, ordinances, rules, regulations or orders of public authorities: General Conditions.

B. Certification of Products: Respective specification sections.

C. Test, Adjust and Balance of Equipment: Respective specification sections.

1.3 RESPONSIBILITIES

A. The Owner will engage and pay for the services of an independent agency to perform inspections and tests specified as the Owner's responsibilities. Testing agency and project inspector shall have approval of the Division of the State Architect.

1.4 DEFICIENCIES

A. Tests or inspections due to the following will be reimbursed to the Owner by deductive change order.

1. Retesting because of failure of initial samples.

2. Additional costs due to overtime work or extra shifts work because of improper scheduling of work or of delivery of materials by Contractor.

3. Failure to properly notify laboratory.

4. Changes in sources, lots or suppliers of materials after original tests.

5. Changes in methods or materials of construction requested by Contractor that require testing, inspection, or other related services in excess of that required by original design.

6. Concrete mix designs in excess of first successful design for each concrete type.

7. Overtime or extra shift work requiring overtime work by Owner's Inspector.

8. This contractor will have the sole responsibility of coordinating the Schedule with the Construction Manager for Owner/General Contractor, Bid Package 01, provided Fire Watch.

1.5 TESTS

A. Selection of the material required to be tested shall be the responsibility of the laboratory or the Owner's representative and not selected by the Contractor.

B. The Contractor shall notify the Owner's representative a sufficient time in advance of the manufacture of material to be supplied by him under the Contract Documents, which must be tested, in order that the Owner may arrange for the testing of material at the source of supply.

C. Any material shipped by the Contractor from the source of supply prior to satisfactory testing and inspection or prior to the receipt of notice from said representative that testing and inspection will not be required shall not be incorporated in the work.

D. Duties of the Testing Agency: The independent testing agency engaged to perform inspections, sampling and testing of materials and construction specified in individual Specification Sections shall cooperate with the Architect/Engineer and Contractor in performance of its duties, and is to provide qualified personnel to perform required inspections and tests.

1. Notify the Architect/Engineer and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.

2. The agency is not authorized to release, revoke, alter or enlarge requirements of the Contract Documents, or approve or accept any portion of the Work.

3. The agency shall not perform any duties of the Contractor.

E. Perform specified instructions, sampling and testing of materials and methods of construction:

1. Comply with specified standards; ASTM, other recognized authorities, and as specified.

2. Ascertain compliance with requirements of Contract Documents.

3. Comply with requirements of Title 24, Part I, Sec. 4-333.

F. Coordination: The Contractor and each agency engaged to perform inspections, tests, Fire Watch and similar services shall coordinate the sequence of activities to accommodate required services with a minimum of delay. In addition the Contractor and each agency shall coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.

1.6 SUBMITTALS

A. Promptly submit copies of reports of inspections and tests mill analysis, concrete mix designs and certifications per applicable sections of the specifications.

1. Comply with requirements of Division of State Architect testing and inspection requirements.

2. One copy of all test reports shall be forwarded to the Division of the State Architect by the testing agency. Such reports shall include all tests made, regardless of whether such tests indicated that the material is satisfactory or unsatisfactory. Samples taken but not tested shall also be reported. The reports shall show that the material or materials were sampled and tested in accordance with the requirements of Title 24, CCR and with the approved specifications. Test reports shall show the specified design strength. They shall also state definitely whether or not the material or materials tested comply with requirements.

3. Verification of Test Reports: Each testing agency shall submit to the Office of the State Architect a verified report in duplicate covering all of the tests which are required to be made by the agency during the progress of the project. Such report shall be furnished each time that work on the project is suspended, covering the tests up to that time, and at the completion of the project, covering all tests.

4. Submit one copy of all test reports to:

a. Owner

b. Architect/Engineer

c. Structural Engineer

d. Contractor

e. Inspector

f. Division of the State Architect (DSA)

g. Submit verification of test reports to DSA per Title 24, Part 1, CCR, Sec. 4-336.

1.7 QUALITY ASSURANCE

A. All tests and inspection required by the Division of the State Architect are to be conducted in strict accordance with requirements of Title 24, CCR.

B. Contractor shall comply with all Project Inspection Card requirements (DSA Form 152), DSA PR 13-01 and 13-02, and all related DSA required inspection and testing requirements.

1.8 INSPECTION BY THE SCHOOL DISTRICT

A. The School District and its representative shall at all times have access for the purpose of inspection to all parts of the work and to the shops wherein the work is in preparation, and the Contractor shall at all times maintain proper facilities and provide safe access for such inspection.

B. The School District shall have the right to reject materials and workmanship which are defective, or to require their correction. Rejected workmanship shall be satisfactorily corrected and rejected materials shall be removed from the premises without charge to the School District. If the Contractor does not correct such rejected work within a reasonable time, fixed by written notice, the School District may correct same and charge the expense to the Contractor.

C. Should it be considered necessary or advisable by the School District at any time before final acceptance of the entire work to make an examination of work already completed by removing or tearing out the same, the Contractor shall on request promptly furnish all necessary facilities, labor and materials. If such work is found to be defective in any respect due to fault of the Contractor or his subcontractor, he shall defray all expenses of such examinations and of satisfactory reconstruction. If, however, such work is found to meet the requirements of the Contract, the additional cost of labor and materials necessarily involved in the examination and replacement shall be allowed the Contractor.

D. District to provide an Inspector employed by the District in accordance with the requirements of the California Code of Regulations, Title 24, to be assigned to the work. His duties are specifically defined in Title 24, Part I, Sec. 4-342. The work of construction in all stages of progress shall be subject to the personal continuous observation of the Inspector. He shall have free access to any or all parts of the work at any time. The contractor shall furnish the Inspector reasonable facilities for obtaining such information as may be necessary to keep him fully informed respecting the progress and manner of the work and the character of the materials. Inspection of the work shall not relieve Contractor from any obligation to fulfill this Contract.

1.9 WORK BY DISTRICT'S INSPECTORS

A. General inspection of construction.

B. Concrete slump tests.

C. Concrete cylinder samples.

D. Cement samples and tests.

E. Reinforcing Steel sample and test, (#5 and larger).

F. Continuous inspection of Structural Concrete placement.

G. Structural Steel sample and test.

H. Continuous inspection of welds, (shop and field).

1.10 CONTRACTOR'S RESPONSIBILITIES

A. Cooperate with laboratory personnel, provide access to work, to manufacturer's operations.

B. Provide to laboratory, selected preliminary representative samples of materials to be tested, in required quantities.

C. Furnish casual labor and facilities:

1. To provide access to work to be tested.

2. To obtain and handle samples at the site.

3. To facilitate inspections and tests.

4. For laboratory's exclusive use for storage and curing of test samples.

D. Notify laboratory sufficiently in advance of operations to allow for his assignment of personnel and scheduling of tests. Per Specification Section 1305, the contractor will provide an updated 2 Week Look Ahead to ensure proper and timely scheduling.

PART 2 - PRODUCTS - (Not Applicable)

PART 3 - EXECUTION

3.1 MISCELLANEOUS TESTS AND INSPECTIONS

A. Soil and Compaction Testing and Inspection: Performed by soils engineer employed and paid by the School District.

B. Roofing Inspection: As specified in Section "Built-Up Roofing".

C. Moisture and Bond Tests for resilient flooring and non-breathing floor surface materials. Performed by Independent Testing Agency and paid for by the School District.

D. Special Tests: Special tests requested by School District, Architect or Division of the State Architect will be paid for by the School District, except that if such tests fail, the costs for failed tests and additional retesting shall be deducted from the Contract Price by Change Order.

3.2 SCHEDULE OF TESTS, INSPECTIONS AND METHODS

A. Foundations (Chapter 18A):

1. Earth Fill Compaction: 1802A

B. Concrete (Chapter 19A):

1. Materials:

a. Portland Cement Tests: 1929A.1

b. Concrete Aggregates: 1903A.3

c. Reinforcing Bars: 1903A.5, 1929A.2

d. Batch Plant Inspection and Tests: 1929A.4

2. Concrete Quality:

a. Proportions of Concrete: 1905A.2.3, 1905A.3.1.1, 1905A.3.3.2, 1905A.4

b. Strength Tests of Concrete: 1905A.6

c. Splitting of Tensile Test 1905A.1.5

3. Concrete Inspection:

a. Job Site Inspection: 1905A.7

b. Batch Plant or Weighmaster Inspection: 1929A.4

C. Structural Steel (Chapter 22A):

1. Materials:

a. Structural Steel, Cold-Formed Steel: 2203A.3

b. Structural Steel Construction: 2203A.2

2. Inspection and tests of Structural Steel:

a. Tests of Structural and Cold Formed Steel: 2231A.1

b. Tests of End-Welded studs (Nelson Studs): 2231A.3

c. Welding Inspection: 2231A.5

d. High Strength Bolts: 2231A.2

D. Wood (Chapter 23A):

1. Materials:

a. Lumber and Plywood Grading: 2303A.1. 2303A.2

b. Glue-Laminated Member testing: 2337A.1

Note: Chapters and Articles refer to 1997 UBC and 1998 Title 24 Part 2, California Building Code (CBC), 1998

3.3 REPAIR AND PROTECTION

A. General: upon completion of inspection, testing, sample-taking and similar services, repair damaged construction and restore substrates and finishes to eliminate deficiencies, including deficiencies in visual qualities of exposed finishes. Comply with Contract Document requirements for "Cutting and Patching".

B. Protect construction exposed by or for quality control service activities, and protect repaired construction.

C. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing or similar service.

END OF SECTION

SECTION 014525 - QUALITY REQUIREMENTS – MODULAR UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-control services required by Architect, Owner, Commissioning Authority, Construction Manager, or authorities having jurisdiction are not limited by provisions of this Section.

C. Related Sections:

1. Section 01 21 00 "Allowances" for testing and inspecting allowances.
2. Section 01 73 00 "Execution" for repair and restoration of construction disturbed by testing and inspecting activities.
3. Divisions 02 through 49 Sections for specific test and inspection requirements.

1.3 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with requirements. Services do not include contract enforcement activities performed by Architect or Construction Manager.

C. Mockups: Full-size physical assemblies that are constructed on-site, unless indicated otherwise. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. Laboratory Mockups: Full-size physical assemblies constructed at testing facility to verify performance characteristics.
2. Factory Mockups: Full-size physical assemblies constructed at factory to verify aesthetic and performance characteristics.
3. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on Project site, consisting of multiple products, assemblies, and subassemblies.
4. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes, doors, windows, millwork, casework, specialties, furnishings and equipment, and lighting.

D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria. Agency shall be in-state DSA Certified LEA inspector.

E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements. Agency shall be in-state DSA Certified LEA inspector.

F. Source Quality-Control Testing: Tests and inspections that are performed at the source (e.g., plant, mill, factory, or shop).

G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work. Agency shall be in-state DSA Certified LEA inspector.

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency. Agency shall be in-state DSA Certified LEA inspector.

I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

K. Professional Engineer: Engineer currently licensed to practice in the State of California.

1.4 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 ACTION SUBMITTALS

A. Shop Drawings: For integrated exterior laboratory and factory mockups, provide plans, sections, and elevations, indicating materials and size of mockup construction.

1. Indicate manufacturer and model number of individual components.
2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

1.6 INFORMATIONAL SUBMITTALS

A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.

B. Qualification Data: For Contractor's quality-control personnel.

C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:

1. Seismic-force-resisting system, designated seismic system, or component listed in the designated seismic system quality-assurance plan prepared by Architect.
2. Main wind-force-resisting system or a wind-resisting component listed in the wind-force-resisting system quality-assurance plan prepared by Architect.

D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Description of test and inspection.
3. Identification of applicable standards.
4. Identification of test and inspection methods.
5. Number of tests and inspections required.
6. Time schedule or time span for tests and inspections.
7. Entity responsible for performing tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

F. Testing Agency and Inspection Reports: Prepare and submit certified written reports that include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Ambient conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

G. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

H. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

I. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.7 RESIDENTIAL UNIT MODULES QUALITY ASSURANCE PLAN

A. Manufacturer Qualifications: A firm having a minimum of 5 years successful experience performing custom fabrication and erection of hospitality or residential unit module work comparable to that shown and specified, in not less than three projects of similar scope to the satisfaction of the Architect, and maintains an organized quality control and testing program, and who retains facilities with sufficient capacity and quality to produce the required panels without causing delay to the project. The residential unit module work includes, but is not necessarily limited to, the following:

1. All preparation for residential unit module work, including but not limited to, coordinated submittals, design application of integral sealants, joint fillers and flashings and gaskets, and sample installations as specified.
2. Fabrication and installation of residential unit modules.
3. All insulation in conjunction with above. All anchors, supports, inserts, and fasteners for the above, design, fabrication and installation of same.
4. All sealants and joint fillers in conjunction with the above.
5. All flashings in conjunction with above.
6. The residential unit module installer shall be responsible for the residential unit module from the point of delivery, including all costs related to breakage after delivery.

B. Factory Mockups: Full-size physical assemblies that are constructed at the factory. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples.

Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. Factory Mockups of Residential Modules: Full-size physical assemblies constructed at testing facility to verify performance characteristics. Each type of residential module unit to be built at factory for review and approval by Architect.

    a. If located more than 100 miles (160 km) from Project Site, provide travel arrangements for Owner and Architect to visit the factory after fabrication of the mockup is complete. Travel expenses, paid by the Contractor, include the following:

        1) Airfare: Round-trip from Los Angeles Airport to nearest airport to the testing laboratory.
        2) Ground Transportation: From time of arrival at destination to time of departure.

    3) Hotel Accommodations: If overnight stay is required, provide separate rooms for Owner and Architect in minimum three-star hotel.

C. Testing laboratories shall be specifically qualified, and AAMA accredited, to conduct field performance tests required by these specifications and acceptable to the Owner and the Architect.

1. Pre-Test Meeting: Prior to the start of construction of the field erected test assembly, and at the Architect's direction, meet to review methods and sequence of the construction of the assembly. The meeting shall include the Architect, the Contractor, and the subcontractor awarded the residential unit module Work, related subcontractors, the testing and inspection agent, and any other subcontractors whose work requires coordination with this work. Include in the meeting individual foremen who will be supervising the construction of the final Work on the Project.
2. Testing: Conduct tests of each specified test assembly under the direction of the Owners Independent Testing and Inspection Agency in the presence of the Architect, the Contractor, various component manufacturers and fabricators and the Installer for each specified system to be tested. Proceed with testing only after acceptance of the detailed outline of test procedure.

D. Field Testing

1. Test the residential unit module sample installation erected to the building in accordance with the specified field test methods. Conduct the testing of the sample installation under the direction of the testing laboratory in the presence of the Owner, Architect, the Contractor, various component manufacturers and fabricators and the installer for each specified system incorporated in the sample installation.

2. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to 10, 50, and 75-percent completion.

    a. Field Test for Water Leakage:

        1) Water Spray Test with Static Air Pressure Difference: ASTM E1105 and AAMA 503-92 conducted at a Uniform Static Test Pressure of 12 lbf/sq. ft. (600 Pa).
        2) Correct all deficiencies observed as a result of this test.

E. Preconstruction Sealant Compatibility and Adhesion Testing: Test results confirming compatibility and adhesion are mandatory for all concealed and exposed sealant materials in contact with exterior window framing, metal panels, other sealants, flashings, metal framing, and shims prior to full size sample installation construction. Refer to Section 07 92 00, Joint Sealants for specific testing requirements, and anticipated lead time necessary to perform testing.

G. Sample Installations: Construct sample installations of the final residential unit modules where shown on the drawings.

1. General: Sample installations will be used as a standard for judging acceptability of work for the Project. Replace unsatisfactory work as directed. Maintain sample installations during construction as a standard for judging acceptability of the residential unit module work. Properly finished, maintained, and performing sample installations shall be retained as a portion of the completed work.
2. Size: Provide full sized sample installations to the extent indicated on the drawings, or if not indicated, as directed by the Architect. Sample installations shall be built on site complete with all glass, aluminum framing, adjacent cladding materials, anchors, connections, flashings, sealants, and joint fillers as accepted on the final shop drawings. Do not take special precautions or use techniques that do not represent those to be used on the work.

H. Meetings and Coordination:

1. Pre-Installation Meeting: Prior to the installation of the residential unit module work, a meeting shall be held at the project site to review installation procedures and coordination with other work. The meeting shall include the respective Residential Unit Module Subcontractor, Contractor, Owner, Architect, and representatives of other trades affected by the work.

I. Testing:

1. Owner Testing: The Owner may engage an Independent Testing and Inspection Agency acceptable to the Architect to verify the adequacy of the residential unit module quality control. The Testing Agency shall perform the testing and inspection requirements, interpret them, evaluate the results for compliance with the specifications, and report the findings to the Owner, Architect, and the Contractor.
2. Owners Testing and Inspection Program:

    a. The Owners Testing and Inspection Agency shall perform all tests herein specified and any additional tests as may be required including all shop and

field work and submit reports to the Owner and the Architect.

b. The Owners Testing and Inspection Agency shall perform a full time inspection while the residential unit module erection is in process as well as periodic shop inspection.

c. Visual inspection shall also note the following:

1) Discrepancies in dimensional tolerances of the connection assembly and any corrective procedures.

2) Observation of installation of flashing and backpanning.

3. Contractors Responsibilities:

a. Provide a complete set of shop and erection shop drawings.

b. Furnish casual labor required to facilitate testing.

c. Provide cutting lists, order lists, material bills, shipping bills, and mill test reports.

d. Information as to time and place of shipment of material to shops.

e. Representative sample pieces requested for testing.

f. Provide proper facilities, including scaffolding, temporary work platforms, hoisting facilities, etc., for inspection of the work in the shop and field.

g. Each bolting crew and welder shall be assigned an identifying symbol or mark and all shop and field connections shall be so identified so that inspector can refer back to the crew or person making the connection.

h. The Contractor shall be responsible for the expense of testing, inspection, and corrective measures for work complying with the following:

1) Work not evidencing compliance with this specification.

i. Testing to verify the adequacy of the work done without proper notice, without proper supervision or contrary to standard construction practice.

1.8 CONTRACTOR'S QUALITY-CONTROL PLAN

A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.

B. Quality-Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.

1. Project quality-control manager shall not have other Project responsibilities.

C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.

D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:

1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.
2. Special inspections required by authorities having jurisdiction and indicated on the "Statement of Special Inspections."
3. Owner-performed tests and inspections indicated in the Contract Documents, including tests and inspections indicated to be performed by the Commissioning Authority.

E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.

F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.9 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Fabricator Qualifications: A firm experienced and expert in producing products similar to those indicated for this Project and with a three-year record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a three-year record of successful in-service performance.

E. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a five-year record of successful in-service performance.

F. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent

to those indicated for this Project.

G. Professional Engineer Qualifications: A professional engineer who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or products that are similar to those indicated for this Project in material, design, and extent.

H. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirement for specialists shall not supersede building codes and similar regulations governing the Work, nor interfere with local trade-union jurisdictional settlements and similar conventions.

I. Testing Agency Qualifications: An NRTL, an NVLAP-accredited, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented by ASTM E 329, and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities..

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:

a. Provide test specimens and assemblies representative of proposed products and construction.
b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
d. Fabricate and install test assemblies and mockups using installers who will perform the same tasks for Project.
e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
f. When testing is complete, remove test specimens, assemblies, and mockups, and laboratory mockups; do not reuse products on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect and Commissioning Authority, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish specified in individual Sections, to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect or Construction Manager.
2. Notify Architect and Construction Manager seven days in advance of dates and times when mockups will be constructed.
3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.
4. Demonstrate the proposed range of aesthetic effects and workmanship.
5. Obtain Architect's and Construction Manager's approval of mockups before starting work, fabrication, or construction.

    a. Allow seven days for initial review and each re-review of each mockup.

6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
7. Demolish and remove mockups when directed, unless otherwise indicated.

L. Integrated Exterior Mockups: Construct integrated exterior mockup according to approved Shop Drawings and with location as indicated on Drawings. Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections, along with supporting materials.

1. Engineering for mockup structural support and foundation is by Contractor.

M. Room Mockups: Construct room mockups incorporating required materials and assemblies, finished according to requirements. Provide required lighting and additional lighting where required to enable Architect to evaluate quality of the Work. Provide room mockups of the following rooms:

1. Refer to Owner for required room mock-ups.

N. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Specification Sections in Divisions 02 through 33.

1. If located more than 100 miles (160 km) from Project Site, provide travel arrangements for Owner and Architect, to visit the laboratory during testing. Travel expenses, paid by the Contractor, include the following:

    a. Airfare: Round-trip from Los Angeles to nearest airport to the testing laboratory.
    b. Ground Transportation: From time of arrival at destination to time of departure.
    c. Hotel Accommodations: If overnight stay is required, provide separate rooms for Owner and Architect in minimum three-star hotel.

O. Factory Mockups: Construct assemblies at fabrication plant prior to shipment to the Project site as specified in individual Sections in Divisions 02 through 33.

1. If located more than 100 miles (160 km) from Project Site, provide travel arrangements for Owner and Architect to visit the factory after fabrication of the mockup is complete. Travel expenses, paid by the Contractor, include the following:

a. Airfare: Round-trip from Los Angeles Airport to nearest airport to the testing laboratory.
b. Ground Transportation: From time of arrival at destination to time of departure.
c. Hotel Accommodations: If overnight stay is required, provide separate rooms for Owner and Architect in minimum three-star hotel.

1.10 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of the types of testing and inspecting they are engaged to perform.
2. Payment for these services will be made from testing and inspecting allowances, as authorized by Change Orders.
3. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not..

1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.

a. Contractor shall not employ the same entity engaged by Owner, unless agreed to in writing by Owner.

3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
7. Provide quality assurance and control services required due to changes in the

Work proposed by or made by the Contractor.

8. Provide quality control services for Work done contrary to the Contract Documents, without prior notice, when so specified, or without proper supervision.
9. Overtime expenses and schedule delays accruing as a result of executing quality control services shall be the Contactor's responsibility and shall not be charged to the Owner.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 01 33 00 "Submittal Procedures."

D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that revised or replaced Work that failed to comply with requirements established by the Contract Documents. Architect retains the right to require the use of a different testing agency for retesting ad reinspecting.

F. Testing Agency Responsibilities: Cooperate with Architect, Commissioning Authority, Construction Manager, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect, Commissioning Authority, Construction Manager, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.
7. Attend Project progress meetings as requested by Architect or Construction Manager.

G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field-curing of test samples.
5. Delivery of samples to testing agencies or arranging for pick-up of test samples after normal business hours.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit schedule concurrently with Contractor's Construction Schedule as specified in Section 01 32 00 "Construction Progress Documentation."

1. Distribution: Distribute schedule to Owner, Architect, Commissioning Authority, Construction Manager, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.11 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner will engage a qualified testing agency and/or special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.
2. Notifying Architect, Commissioning Authority, Construction Manager, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect and Commissioning Authority, through Construction Manager, with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial

Completion, which includes a list of unresolved deficiencies.

5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's, Commissioning Authority's, and Construction Manager's reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for Section 01 73 00 "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

COMPTON COMMUNITY COLLEGE DISTRICT

PRODUCT OPTIONS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This Section establishes procedures for specified product options.

B. The intent of this section is to insure that specified product options exceed or equal the quality of the specified products and are furnished and installed in accordance with the design intent.

C. This Section does not apply to any substitution requests that should have been made at time of bid in accordance with the Instructions to Bidders and the bid documents. **The District can reject any requests for substitution in its sole discretion if the Contractor did not submit a request at the time of bid in accordance with the Instructions to Bidders and the bid documents**.

1.2 RELATED SECTIONS

A. Information for Bidders

B. Instructions to Bidders

C. General and Supplementary Conditions

D. Section 01 25 00- Contract Modification Procedures

E. Section 01 33 00 - Submittal Procedures

F. Section 01 63 00 - Product Substitution Procedures

1.3 PRODUCT OPTIONS

A. Where product options are included in the specifications sections and are specified by naming more than one, or several acceptable products or manufacturers, select any product or manufacturer listed.

1. Where more than one manufacturer or product is listed in the specifications and only one manufacturer or product is specified in detail with model numbers and features, the one specified in detail shall be considered the standard of quality required for all manufacturers or products listed.

B. Where product options are included in the specifications and they are followed by an "or equal " or "approved equal" or equal meeting a specified standard, review and approval by the Architect/Engineer and School District is required for Contractor-proposed equal items. Procedures specified in Section 01630 are to be followed.

C. For items specified only by Reference Standards, select any item meeting standards.

D. Performance Specifications: For items specified by performance requirements, select any item meeting the performance standards specified.

E. Descriptive Specifications: When specifications describe a product or assembly, listing exact components and characteristics, without the use of a brand or trade name, provide a product or assembly that contains the components and characteristics specified.

F. Compliance with Standards Specifications: When specifications only require compliance with a Code, Regulation or Voluntary Standard, Provide products that comply with the specified Codes, Regulations or Standards.

G. Submit request, as required for substitution, for any item or manufacturer not specifically named in the specifications on the Substitution Request Form enclosed with the Bidding Documents.

1. Architect/Engineer and School District will determine acceptability of proposed substitutions.

2. The Compton Community College District has a Resolution: No. 2009-10-21 and 2015-16-50 for the Designation of Specific Material, Product, or Service for numerous District Standard product and systems. (see attached resolutions for details).

PART 2 – PRODUCTS - (Not Applicable)

PART 3 – EXECUTION - (Not Applicable)

END OF SECTION

COMPTON COMMUNITY COLLEGE DISTRICT

PRODUCT SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This Section establishes procedures for Contractor submittal of substitutions. This Section does not apply to any substitution requests that should have been made at time of bid in accordance with the Instructions to Bidders and the bid documents. **The District can reject any requests for substitution in its sole discretion if the Contractor did not submit a request at the time of bid in accordance with the Instructions to Bidders and the bid documents.**

B. This Section provides procedures for review and compliance with Public Contract Code section 3400 for the "or equal" clause allowing bidders to furnish any equal material, product, thing or service. Or equal items proposed by bidders are considered substitutions and are subject to approval of the Architect and School District. Burden of proof for "Or Equals" is the responsibility of the Contractor.

C. The intent of this section is to insure that proposed substitutions exceed or equal the quality of the specified products and are furnished and installed in accordance with the Contract Documents.

1.2 RELATED SECTIONS

A. Information for Bidders

B. General and Supplementary Conditions

C. Section 01 62 00 - Product Options

D. Section 01 25 00- Contract Modification Procedures

1.3 SUBSTITUTIONS

A. Substitution requests are to be submitted by Generals Contractors Only. Requests submitted by Subcontractors, Material Suppliers, Manufacturers and other interested parties, other than General Contractors, will not be considered. Submit requests on the attached **SUBSTITUTION REQUEST FORM (AFTER BID)** in

section 1305. **Substitution requests will only be considered for an "or equal" product specifically listed in the technical specifications for this project. No other substitutions will be considered.** (ie if Carrier AC units are used on plans and specifications say "Carrier, Trane or York" – Trane or York would be considered as a substitution.)

B. Comply with provisions of Articles for Substitutions in the Information for Bidders, General Conditions and any modifications to these documents provided in the Supplementary Conditions.

C. Tabulate products by specification section number and title.

D. Submit separate request for each substitution. Support each request with the information and documents below and any other requirements in the General Conditions Article 3.10.:

1. Complete data substantiating compliance of proposed substitution with requirements stated in Contract Documents:

    a. Product identification, including manufacturer's name and address.

    b. Manufacturer's literature; identify:

        i. Product description.

        ii. Reference standards.

        iii. Performance and test data.

        iv. Fire resistance and fire ratings.

    c. Samples, as applicable.

    d. Name and address of similar projects on which product has been used, and date of each installation.

2. Itemized comparison of the proposed substitution with product specified; list significant variations.

3. Any effect the substitution may have on other trade contracts.

4. List of changes required in other work or products.

5. Accurate cost data comparing proposed substitution with product specified.

   a. Amount of any change in cost.

6. Designation of required license fees or royalties.

7. Designation of availability of maintenance services, sources of replacement materials.

8. Comparison of physical size and weight with product specified.

9. Comparison of physical shape and available finishes.

E. Substitutions will not be considered for acceptance when:

1. They are indicated or implied on shop drawings or product data submittals and where not approved in compliance with the General Conditions and this section.

2. Substitution request procedures included in this Section, the Information for Bidders, and in the General and Supplementary Conditions are not complied with by the Contractor.

3. The School District has determined that compatibility, standardization, technological sophistication, service and uniformity are necessary with regard to technological and certain safety items across the Schools in the District.

4. The request for substitution, as determined by the District, should have been submitted at the time of bid in accordance with the Instructions to Bidders and the bid documents.

F. Substitute products shall not be installed in the construction without written acceptance of the Architect and School District.

G. Architect and School District will determine acceptability of proposed substitutions prior to awarding of the Contract. Substitutions may be approved after award of the Contract only where the following conditions exist and only at the School District's sole discretion:

1. Specified item has been discontinued or is not unavailable to meet project schedule.

2. The School District requested the Substitution.

3. Substitution will reduce the Contract Amount and Contract Time (Credit Back to the District) without reducing quality.

1.4 CONTRACTOR'S SUBSTITUTION CERTIFICATION

A. In making formal request for substitution contractor certifies that:

1. He has investigated proposed product and has determined that it is equal to or superior in all respects to that specified.

2. He will provide same warranties or bonds for substitution as for product specified.

3. He will coordinate installation of accepted substitution into the work, and will make such changes as may be required for the work to be complete in all respects including modification of the work of other trades.

4. He waives claims for additional costs caused by substitution which may subsequently become apparent.

5. Substituted material is similar in physical appearance, size and weight and will install with the same opening and attachments.

6. Substituted material has the same or better fire rating and fire resistive qualities, including flame spread, smoke developed, UL tested and listing.

7. Meets all requirement set forth in the General Conditions Article 3.10.

1.5 ARCHITECT'S/ENGINEER'S DUTIES

A. Review contractor's request for substitutions with reasonable promptness.

B. Consult with District and provide notification to contractor, in writing, of decision to accept or reject requested substitution.

1.6 AVAILABILITY OF SPECIFIED ITEMS

A. Verify prior to bidding that all specified and substituted items will be available in time for installation during orderly and timely progress of the work.

B. In the event specified items will not be available, notify the Architect prior to receipt of bids.

C. Cost of delays because of non-availability of specified items, when such delays could have been avoided by the Contractor, will be back-charged as necessary and shall not be borne by the Architect or School District.

1.7 SUBSTITUTION WARRANTY REQUIREMENTS

A. Submit with the substitution request an executed Substitution Warranty. The Form is provided at the end of this Section. This form shall apply to substitutions submitted for acceptance prior to bid, prior to award of contract and for substitutions required after contract has been executed.

B. The Contractor is to warrant, in writing on company letterhead, that the substituted items are to perform as specified, and assume complete responsibility for the same. This includes responsibility and costs required for modifications to building, other materials, or equipment, and any additional coordination with work of other trades. The Contractor if required or requested by the Architect or School District shall pay for testing, of Substitution proposed.

PART 2 – PRODUCTS - (Not Applicable)

PART 3 – EXECUTION - (Not Applicable)

END OF SECTION

COMPTON COMMUNITY COLLEGE DISTRICT

CLEANING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Cleaning throughout the construction period and final project cleaning prior to the acceptance tour.

B. Related Work Described Elsewhere: In addition to standards specified herein, comply with requirements for cleaning as described in other sections of these Specifications.

1.2 QUALITY ASSURANCE

A. Inspection: Conduct daily inspection, and more often if necessary, to verify that requirements of cleanliness are being met.

B. Codes and Standards: In addition to the requirements specified herein, comply with pertinent requirements of authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 CLEANING MATERIALS AND EQUIPMENT

A. Provide required personnel, equipment, and materials needed to maintain the specified standard of cleanliness.

2.2 COMPATIBILITY

A. Use cleaning materials and equipment that are compatible with the surfaces being cleaned, as recommended by the manufacturer of the material to be cleaned.

PART 3 - EXECUTION

3.1 PROGRESS CLEANING

A. General:

1. Retain stored items in an orderly arrangement allowing maximum access, not impeding drainage or traffic, and providing the required protection of materials.

2. Do not allow the accumulation of scrap, debris, waste materials, and other items not required for construction of this work. Debris

shall be removed from the site and disposed of in a lawful manner. Disposal receipts of dump tickets shall be furnished to Architect/Engineer upon request.

3. At least twice each month, and more often if necessary, remove scrap, debris, and waste material from the job site.

4. Provide adequate storage for items awaiting removal from the job site, observing requirements for fire protection and protection of the ecology.

B. Site:

1. Daily, and more often if necessary, inspect the site and pick up all scrap, debris, and waste material. Remove items to the place designated for their storage. Combustible waste shall be removed from the site. Flammable waste shall be kept in sealed metal containers until removed from the site.

2. Weekly, and more often if necessary, inspect arrangements of materials stored on the site; restack, tidy, or otherwise service arrangements to meet the requirements specified above.

3. Maintain the site in a neat and orderly condition.

C. Structures:

1. Daily, and more often if necessary, inspect the structures and pick up scrap, debris, and waste material. Remove items to the place designated for their storage.

2. Daily, and more often if necessary, sweep interior spaces clean.

   a. “Clean”, for the purpose of this subparagraph, shall be interpreted as meaning free from dust and other materials capable of being removed by use of reasonable effort and a handheld broom, i.e., “broom-clean”.

3. As required preparatory to installation of succeeding materials, clean the structures of pertinent portions thereof to the degree of cleanliness recommended by the manufacturer of the succeeding material, using equipment and materials required to achieve the required cleanliness.

4. Following the installation of finish floor materials, clean the finish floor daily, and more often if necessary, and while work is being performed in the space in which finish materials have been installed.

a. "Clean", for the purpose of this subparagraph, shall be interpreted as meaning free from foreign material that, in the opinion of the Architect, may be injurious to the finish floor material, i.e., "vacuum- clean".

3.2 FINAL CLEANING

A. Definition: Except as otherwise specifically provided, "clean", for the purpose of the Article, shall be interpreted as meaning the level of cleanliness generally provided by skilled cleaners using commercial quality building maintenance equipment and materials, i.e., "scrub and polish clean".

B. General: Prior to completion of the work, remove from the job site all tools, surplus materials, equipment, scrap, debris, and waste and conduct final progress cleaning as described above.

C. Site: Unless otherwise specifically directed by the Architect, water and broom clean paved areas on the site and public paved areas directly adjacent to the site. Remove resultant debris.

D. Structures:

1. Exterior: In areas affected by the work under this contract, visually inspect exterior surfaces and remove traces of soil, waste material, smudges, and other foreign matter. Remove traces of splashed material from adjacent surfaces. If necessary to achieve a uniform degree of exterior cleanliness, hose down the exterior of the structure.

   In the event of stubborn stains not removable with water, the Architect may require light sandblasting or other cleaning at no additional cost to the Owner.

2. Interior: In areas affected by the work under this contract, visually inspect interior surfaces and remove traces of soil, waste material, smudges, and other foreign matter. Remove traces of splashed materials from adjacent surfaces. Remove paint drippings, spots, stains, and dirt from finished surfaces. Use only the cleaning materials and equipment instructed by the manufacturer of the surface material.

3. Glass: Clean glass inside and outside.

4. Polished surfaces: On surfaces requiring the routine application or buffed polish, apply the polish recommended by the manufacturer of the material being polished. Glossy surfaces shall be cleaned and shined as intended by the manufacturer.

E. Timing: Schedule final cleaning as accepted by the Architect to enable the Owner to accept a completely clean project.

3.3 CLEANING DURING OWNER'S OCCUPANCY

A. Should the Owner occupy the work or any portion thereof prior to its completion by the Contractor and acceptance by the Owner, responsibilities for interim and final cleaning of the occupied spaces shall be determined by the Architect in accordance with the General Conditions of the Contract.

END OF SECTION

COMPTON COMMUNITY COLLEGE DISTRICT

FIELD ENGINEERING

PART 1 - GENERAL

1.1 SUMMARY

A. General: This Section specifies administrative and procedural requirements for field engineering services, including, but not necessarily limited to, the following:

1. Land survey Work.

2. Civil engineering services.

3. Structural engineering services.

1.2 RELATED SECTIONS

A. Section 01 33 00 - Submittals

B. Section 31 00 00 - Earthwork

1.3 SUBMITTALS

A. Certificates: Submit a certificate signed by the Land Surveyor or Professional Engineer certifying that the location and elevation of improvements comply with the Contract Documents. These Surveys and updated “As-Builts” will be submitted with every pay application for review and acceptance by the Engineer and Inspector of Record.

B. Submittal Copies of final as built property survey.

C. Project Record Documents: Submit a record of Work performed and record survey data as required under provisions of Sections "Submittals", "Project Closeout", and Specification Number 01 78 20 – “Project Record Documents”.

1.4 QUALITY ASSURANCE

A. Surveyor: Engage a Registered Land Surveyor registered in the State where the project is located, to perform land surveying services required.

B. Engineer: Engage a Professional Engineer of the discipline required, registered in the state of California, in which the Project is located, to perform required engineering services.

PART 2 – PRODUCTS - (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. The District will identify existing control points and property line corner stakes.

B. Verify layout information shown on the Drawings, in relation to the property survey and existing benchmarks before preceding to layout the Work. Locate and protect existing benchmarks and control points. Preserve permanent reference points (if any) during construction.

1. Do not change or relocate benchmarks or control points without prior written approval. Promptly report lost or destroyed reference points, or requirements to relocate reference points because of necessary changes in grades or locations.

2. Promptly replace lost or destroyed project control points. Base replacements on the original survey control points.

C. Establish and maintain a minimum of two permanent benchmarks on the site, referenced to data established by survey control points.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

D. Existing utilities and equipment: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning site work, investigate and verify the existence and location of underground utilities and other construction. Contact underground service alert at 1(800) 422-4133 before start of construction.

1. Prior to construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer and water service piping.

3.2 PERFORMANCE

A. Working from lines and levels established by the survey, establish benchmarks and markers to set lines and levels at each story of construction and elsewhere as needed to properly locate each element of the Project. Calculate and measure required dimensions within indicated or recognized tolerances. Do not scale Drawings to determine dimensions.

1. Advise entities engaged in construction activities, of marked lines and levels provided for their use.

2. As construction proceeds, check every major element for line, level and plumb.

B. Surveyor's Log: Maintain a surveyor's log of control and other survey Work. Make this log available for reference.

1. Record deviations from required lines and levels, and advise the Architect when deviations that exceed indicated or recognized tolerances are detected. On Project Record Drawings, record deviations that are accepted and not corrected.

2. On completion of foundation walls, major site improvements, and other Work requiring field engineering services, prepare a certified survey showing dimensions, locations, angles and elevations of construction and site work.

C. Site Improvements: Locate and lay out site improvements, including pavements, stakes for grading, fill and topsoil placement, utility slopes and invert elevations by instrumentation and similar appropriate means.

D. Building Lines and Levels: Locate and lay out batter boards for structures, building foundations, column grids and locations, floor levels and control lines and levels required for mechanical and electrical Work.

E. Existing Utilities: Furnish information necessary to adjust, move or relocate existing structures, utility poles, lines, services or other appurtenances located in, or affected by construction. Coordinate with local authorities having jurisdiction.

F. Final Property Survey: Before Substantial Completion, prepare a final property survey showing significant features (real property) for the Project. Include on the survey a certification, signed by the Surveyor, to the effect that principal metes, bounds, lines and levels of the Project are accurately positioned as shown on the survey.

END OF SECTION

COMPTON COMMUNITY COLLEGE DISTRICT

CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements for cutting and patching, and interface of new work into existing construction and with work being performed under other contracts provided by the School District.

B. Refer to other Sections for specific requirements and limitations applicable to cutting and patching individual parts of the work.

1. Requirements of this Section apply to Sections in Divisions 2 through 16.

1.2 RELATED SECTIONS

A. Section 01 01 00 - Summary of work (Scope of Work).

B. Section 03 30 00 - Cast-in-place Concrete

C. Division 2 through 16 Sections

1.3 SUBMITTALS

A. Cutting and Patching Proposal: Approval of procedures for cutting and patching is required before proceeding, submit a proposal describing procedures well in advance of the time cutting and patching will be performed and request approval to proceed. Include the following information, as applicable, in the proposal:

1. Describe the extent of cutting and patching required and how it is to be performed.

2. Indicate dates when cutting and patching is to be performed.

3. List utilities that will be disturbed or affected, including those that will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.

4. Refer to Structural Drawing for locations where cutting and patching involves addition of reinforcement to structural

elements. Do not damage or weaken existing structural elements.

5. Approval by the Architect/Engineer to proceed with cutting and patching does not waive the Architect's right to later require complete removal and replacement of a part of the work found to be unsatisfactory.

1.4 QUALITY ASSURANCE

A. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces, in a manner that would, in the Architect's/Engineer's opinion, reduce the building's aesthetic qualities, or result in visual evidence of cutting and patching. Remove and replace work cut and patched in a visually unsatisfactory manner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Use materials that are identical to existing materials. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect. Use materials whose installed performance will equal or surpass that of existing materials.

PART 3 - EXECUTION

3.1 INSPECTION

A. Before cutting existing surfaces, examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed. Take corrective action before proceeding, if unsafe or unsatisfactory conditions are encountered.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of work to be cut.

B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse

weather conditions for portions of the Project that might be exposed during cutting and patching operations.

C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Take all precautions necessary to avoid cutting existing pipe, electrical wire and conduit or ductwork serving the building.

3.3 PERFORMANCE

A. General: Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.

1. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.

2. Where patching occurs in a smooth painted surface, extend final paint coat over entire surface containing the patch, after the patched area has received primer and second coat.

3. Cut, patch, point-up and repair plaster to accommodate other construction and to repair cracks, dents and imperfections.

4. Cut, patch, restore and repair all gypsum board wall and ceiling surfaces where new pipes, equipment, clocks, switches, conduit, ducts and any new construction items that would damage or cut existing surfaces.

5. Cut patch and repair existing concrete and asphalt paving where new utility lines are installed across existing paving and under existing concrete floor slabs. Site verify extent of cutting and patching required. All existing site improvements may not be indicated on the site plan and floor plans.

6. Cut existing walls, floors, ceilings and roofs or other parts of building structure to accommodate new ducts, conduits and piping, patch and repair existing.

7. Patch existing floors, walls, roofs and ceilings where existing ducts, conduit, equipment, water, gas, sewer, windows, doors etc. that are not used or removed and are not to be

replaced. This is considered part of required general patching and is part of the contract and will not be shown in detail on the Contract drawings. Field verify with existing site and building construction for patching required.

3.4 CLEANING

A. Thoroughly clean areas and spaces where cutting and patching is performed or used as access. Remove completely paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged areas to their original condition.

END OF SECTION

COMPTON COMMUNITY COLLEGE DISTRICT

WARRANTIES, GUARANTIES AND BONDS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. This Section specifies general requirements for written warranties, guaranties and bonds required by the Contract Documents.

B. Submittal to, and approval by, the District of the warranties, guaranties and bonds are prerequisites to final payment under the Contract.

1.2 RELATED WORK

A. Related work specified elsewhere:

1. General Conditions –Section 00 72 00 Article 13

2. Contract Close-out - Section 01 77 00

1.3 TIME PERIOD

A. Deliver manufacturers' warranties, guaranties and bonds required by Contract Documents, with District named as beneficiary. For equipment and machinery, or components thereof, bearing a manufacturer's warranty or guaranty that extends for a longer time period than the Contractor's warranty and guaranty, deliver manufacturer's warranties or guaranties in same manner.

1.4 FORM

A. Written warranties and guaranties, excepting manufacturer's standard printed warranties and guaranties shall be submitted on the Contractor's, Subcontractors, material suppliers', or manufacturers' own letterhead, addressed to District. Warranties and guaranties shall be submitted in duplicate, and in the form shown on the following page, signed by all pertinent parties and by Contractor in every case, with modifications as approved by District to suit the conditions pertaining to the warranty or guaranty.

1.5 SUBMITTAL

A. The Contractor shall collect and assemble written warranties and guaranties from all subs, material suppliers and manufacturers into a bound booklet form, and deliver the bound books to Architect/Engineer for delivery to the District's attorney for final review and approval.

B. Submit required warranty/guaranty on letterhead of Contractor responsible for each type of Work in accordance with attached sample form.

C. The contractor will ensure that the Manufacturers will be scheduled in a timely manner to ensure that the start of the warranty period is well documented.

END OF SECTION

COMPTON COMMUNITY COLLEGE DISTRICT

CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Comply with requirements stated in Conditions of the Contract and in Specifications for administrative procedures in closing out the work.

B. Related Requirements in Other Parts of the Project Manual:

1. Fiscal provisions, legal submittals and additional administrative requirements: Conditions of the Contract.

C. Comply with requirements set forth in General Conditions Article 9.

1.2 SUBSTANTIAL COMPLETION

A. When Contractor considers the work is substantially complete as defined in the General Conditions, he shall submit to Architect/Engineer:

1. A written notice that the work, or designated portion thereof, is substantially complete.

2. A list of items to be completed or corrected.

3. Complete start-up testing of systems, and instruction of the Owner's operating and maintenance personnel. Discontinue or change over and remove temporary facilities from the site, along with construction tools, mock-ups, and similar elements.

B. When Architect/Engineer concurs that the work is substantially complete, he will:

1. Prepare a letter of Substantial Completion accompanied by Contractor's list of items to be completed or corrected, as verified and amended by the Architect.

2. Submit the Certificate to Owner and Contractor for their written acceptance of the responsibilities assigned to them.

1.3 FINAL INSPECTION

A. When Contractor considers the work is complete, he shall submit written certification that:

1. Contract Documents have been reviewed.

2. Work has been inspected for compliance with Contract Documents.

3. Work has been completed in accordance with Contract Documents.

4. Equipment and systems have been tested in the presence of the Owner's representative and are operational.

5. Work is completed and ready for final inspection.

6. The Architect's/Engineer's final inspection list of items to be completed or corrected, has been completed or otherwise resolved for acceptance, and the list has been endorsed and dated by the Architect/Engineer.

7. Submit consent of surety to final payment.

8. Submit a final liquidated damages settlement statement.

9. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

B. Architect/Engineer will make an inspection to verify the status of completion with reasonable promptness after receipt of such certification.

C. When the Architect/Engineer finds that the work is acceptable under the Contract Documents, he shall request the Contractor to make closeout submittals.

1.4 RECORD DOCUMENT SUBMITTALS

A. General: Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Architect's reference during normal working hours.

B. Record Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings.

Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately; where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

1. Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the Work.

2. Mark new information that is important to the Owner, but was not shown on Contract Drawings or Shop Drawings.

3. Note related Change Order numbers where applicable.

4. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set per Specification 01 78 20 Project Record Documents.

C. Record Specifications: Maintain one complete copy of the Project Manual, including addenda, and one copy of other written construction documents such as Change Orders and modifications issued in printed form during construction. Mark these documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications. Give particular attention to substitutions, selection of options and similar information on elements that are concealed or cannot otherwise be readily discerned later by direct observation. Note related record drawing information and Product Data.

1.5 CLOSEOUT SUBMITTALS

A. Submit the following, where applicable, in accordance with the General Conditions and Specifications:

1. Project record documents.

2. Operation and maintenance data.

3. Warranties, guarantees and bonds.

4. Keys and keying schedule.

5. Spare parts and extra stock.

6. Other items as required by the Specifications.

B. Deliver Certificate of Compliance and Test Report as follows:

1. Sterilization of water systems.

2. Testing of sewer systems.

3. Testing of hot and cold water systems.

4. Testing of gas system.

5. Testing of lighting, power and alarm systems.

6. Testing of HVAC equipment and exhaust fans.

1.6 FINAL APPLICATION FOR PAYMENT

A. Contractor shall submit the final Application for Payment in accordance with procedures and requirements stated in the Conditions of the Contract.

PART 2 – PRODUCTS - (Not Applicable)

PART 3 - EXECUTION

3.1 CLOSEOUT PROCEDURES

A. Operating and Maintenance Instructions: Arrange for each installer of equipment that requires regular maintenance to meet with the Owner's personnel to provide instruction in proper operation and maintenance. If installers are not experienced in procedures, provide instruction by manufacturer's representatives. Include a detailed review of the following items:

1. Maintenance manuals.

2. Record documents.

3. Spare parts and materials.

4. Tools.

5. Identification systems.

6. Control sequences.

7. Hazards.

8. Cleaning.

9. Warranties and bonds.

10. Maintenance agreements and similar continuing commitments.

B. As part of instruction for operating equipment, demonstrate the following procedures:

1. Start-up.

2. Shutdown.

3. Emergency operations.

4. Noise and vibration adjustments.

5. Safety procedures.

6. Economy and efficiency adjustments.

7. Effective energy utilization.

3.2 FINAL CLEANING

A. General: General cleaning during construction is required by the General Conditions and included in Section "Temporary Facilities".

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.

1. Complete the following cleaning operations before requesting inspection for Final Completion.

a. Remove labels that are not permanent labels.

b. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compound and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.

c. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films and similar foreign substances. Restore reflective surfaces to their original reflective condition. Leave concrete floors broom clean. Vacuum carpeted surfaces.

d. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.

e. Clean the site, including landscape development areas, of rubbish, litter and other foreign substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth even-textured surface.

C. Pest Control: Engage an experienced exterminator to make a final inspection, and rid the Project of rodents, insects and other pests.

D. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction.

E. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful or dangerous materials into drainage systems. Remove waste materials from the site and dispose of in a lawful manner.

1. Where extra materials of value remaining after completion of associated Work have become the Owner's property, arrange for disposition of these materials as directed.

END OF SECTION

COMPTON COMMUNITY COLLEGE DISTRICT

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Maintain at the site for the School District, one record copy of:

1. Drawings
2. Specifications
3. Addenda
4. Change Orders and other Modifications to the Contract
5. Architect/Engineer written instructions
6. Approved Shop Drawings, Product Data and Samples.
7. Field Test Records
8. Construction Photographs.

1.2 RELATED SECTIONS

A. General Conditions – 00 72 00

B. Section 01 31 00 - Project Coordination

C. Section 01 33 00 - Submittals

D. Section 01 72 20 – Field Engineering

E. Section 01 77 00 – Closeout Procedures

1.3 MAINTENANCE OF DOCUMENTS AND SAMPLES

A. Store documents and samples in Contractor's field office apart from documents used for construction.

1. Provide files and racks for storage of documents.
2. Provide locked cabinet or secure storage space for storage of samples.

B. File documents and samples in accordance with CSI/CSC Master Format.

C. Maintain documents in a clean, dry legible condition and in good order. Do not use record documents for construction purposes.

D. Make documents and samples available at all times for inspection by School District.

1.4 MARKING DEVICES

A. Provide felt-tip marking pens for recording information in the color code designated by Owner.

1.5 RECORDING

A. Label each document "PROJECT RECORD" in neat, large printed letters.

B. Record information concurrently with construction progress. Do not conceal any work until required information is recorded.

C. Drawings: Legibly mark to record actual construction:

1. Depth of various elements of foundation in relation to finish first floor datum.

2. Horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

3. Location of internal utilities and appurtenances concealed in the construction, referenced to visible and accessible features of the structure.

4. Field changes of dimension and detail.

5. Changes made by Addenda, Supplemental Instruction Construction Change Directive or by Change Order.

6. Details not on original contract drawings.

7. Revisions to electrical circuitry and locations of electrical Devices and equipment

8. Identify each record drawing with the written designation of "RECORD DRAWING" in a prominent location.

D. Specifications and Contract Document Modifications: Legibly mark each Section to record:

1. Manufacturer, trade name, catalog number, and Supplier of each Product and item of equipment actually installed.

2. Supplier and Installer's name and contact information.

3. Changes made by Addenda, Supplemental Instructions, and Construction Change Directive or by Change Order.

E. Record Digital Data Files: Immediately before inspection for Substantial Completion, review marked-up record prints with Architect/Engineer, Construction Manager and Project Inspector. When authorized, prepare a full set of corrected digital data files of the Contract Drawings as follows:

1. Format: Same digital data software program, version, and operating system as the original Contract Drawings.

2. Format: Annotated PDF electronic file with comment function enabled.

3. Incorporate changes and additional information previously marked on record prints. Delete, redraw and add new details and notations where applicable.

4. Refer instances of uncertainty to Architect/Engineer (through Construction Manager) for resolution.

5. Architect/Engineer will furnish Contractor one set of digital files of the Contract Drawings, complete on same set, with all Addenda, clarifying Request for Information, Instruction Bulletins, Construction Change Documents, or any other changes, for use in recording information. Digital files shall be in AutoCAD (latest version) and PDF format.

    a. Refer to section 01 33 00 "Submittal Procedures" for requirements related to use of architect's/engineer's digital data files.
    b. Architect/Engineer will provide data file layer information. Record mark-ups in separate layers.

F. Record Drawings Labeling: Provide Hard copy and Digital copy (in PDF format) as follows:

1. Provide a Flash Drive for all Digital Record Drawing submittals with a letter of transmittal describing all contents and date of contents on the Flash Drive.

2. Provide a folder in the Digital submittal labeled in capital letters naming the project i.e. CCC-051 PUBLIC SAFETY BUILDING.

3. Provide sub-folders labeled in capital letters with the category and date of the as-builts i.e. CCC-051 PUBLIC SAFETY BUILDING – AS-BUILTS (CONTRACTORS NAME).

4. Provide separate files in sub-folders labeled with drawing number and description i.e. FA0.0 Title.

5. Submit documents to Architect/Engineer (through the Construction Manager) with claim for final Application for Payment.

6. Final 5% retention will be held until as-builts are complete.

1.6 SUBMITTALS

A. At the completion of the Project, deliver Record Documents to the Compton Community College District (through the Construction Manager). Architect/Engineer shall review documents for compliance with requirements as described above.

B. Accompany submittal with transmittal letter in duplicate, containing:

1. Date

2. Project title and number

3. Contractor's name and address

4. Title and number of each Record Document

5. Signature of Contractor or his authorized representative

C. Prior to the date of Substantial Completion the Contractor is to meet with the architect/engineer to determine which Samples maintained

during construction are to be transferred to the School District. Dispose of all samples not be saved.

PART 2 – PRODUCTS - (Not Applicable)

PART 3 – EXECUTION - (Not Applicable)

END OF SECTION

COMPTON COMMUNITY COLLEGE DISTRICT

OPERATING AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements for operating and maintenance manuals including the following:

1. Preparation and submittal of operating and maintenance manuals for building operating systems and/or equipment.

2. Instruction of the School District's operating personnel in operation and maintenance of building systems and equipment.

B. Special operating and maintenance data requirements for specific pieces of equipment or building operating systems are included in the appropriate Sections of Divisions 2 through 16.

1. 2 QUALITY ASSURANCE

A. Maintenance Manual Preparation: In preparation of Maintenance Manuals, use personnel thoroughly trained and experienced in operation and maintenance of the equipment or system involved.

1. Where written instructions are required, use personnel skilled in technical writing to the extent necessary for communication of essential data.

2. Where Drawings or diagrams are required, use draftsmen capable of preparing Drawings clearly in an understandable format.

B. Instructions for the School District's Personnel: For instruction of the School District's operating and maintenance personnel, use experienced instructors thoroughly trained and experienced in the operation and maintenance of the building equipment or system involved.

1.3 SUBMITTALS

A. Submittal Schedule: Comply with the following schedule for submittal of operating and maintenance manuals.

1. Before Substantial Completion, when each installation that requires submittal of operating and maintenance manuals is nominally complete, submit two draft copies of each manual to the Architect/Engineer for review. Include a complete index or table of contents of each manual.

B. Form of Submittal: Prepare operating and maintenance manuals in the form of an instructional manual for use by the Owner's operating personnel. Organize into suitable sets of manageable size. Where possible, assemble instructions for similar equipment into a single binder.

1. Binders: For each manual, provide heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, in thickness necessary to accommodate contents, sized to receive 8-1/2" by 11" paper. Provide a clear plastic sleeve on the spine, to hold labels describing the contents. Provide pockets in the covers to receive folded sheets.

a. Where two or more binders are necessary to accommodate data, correlate data in each binder into related groupings in accordance with the Project Manual table of contents. Cross-reference other binders where necessary to provide essential information for proper operation or maintenance of the piece of equipment or system.

b. Identify each binder on the front and spine, with the typed or printed title "OPERATION AND MAINTENANCE MANUAL", Project title or name, and subject matter covered. Indicate the volume number for multiple volume sets of manuals.

2. Protective Plastic Jackets: Provide protective transparent plastic jackets designed to enclose diagnostic software for computerized electronic equipment.

3. Text Material: Where written material is required as part of the manual use the manufacturer's standard printed material, or if it is not available, specially prepared data, neatly typewritten, on 8-1/2" by 11", 20 pound white bond paper.

4. Drawings: Where drawings or diagrams are required as part of the manual, provide reinforced punched binder tabs on the drawings and bind in with the text.

a. Where oversize drawings are necessary, fold the drawings to the same size as the text pages and use as a fold-out.

b. If drawings are too large to be used practically as a fold- out, place the drawing, neatly folded, in the front or rear pocket of the binder. Insert a typewritten page indicating the drawing title, description of contents and drawing location at the appropriate location in the manual.

1.04 MANUAL CONTENT

A. In each manual include information specified in the individual Specification Section, and the following information for each major component of building equipment and its controls:

1. General system or equipment description.

2. Design factors and assumptions.

3. Copies of applicable Shop Drawings and Product Data.

4. System or equipment identification, including:

a. Name of manufacturer.

b. Model number.

c. Serial number of each component.

5. Operating instructions.

6. Emergency instructions.

7. Wiring diagrams.

8. Inspection and test procedures.

9. Maintenance procedures and schedules.

10. Precautions against improper use and maintenance.

11. Copies of warranties.

12. Repair instructions including spare parts listing.

13. Sources of required maintenance materials and related services.

14. Manual Index.

B. Organize each manual into separate Sections for each piece of related equipment. As a minimum each manual shall contain a title page, a table of contents, copies of Product Data, supplemented by drawings and written text, and copies of each warranty, bond and service Contract issued.

1. Title Page: Provide a title page in a transparent plastic envelope as the first sheet of each manual. Provide the following information:

a. Subject matter covered by the manual.

b. Name and address of the Project.

c. Date of submittal.

d. Name, address, and telephone number of the Contractor.

e. Name and address of the Architect;

f. Cross reference to related systems in other operating and maintenance manuals.

2. Table of Contents: After the Title Page, include a typewritten table of contents for each volume.

3. General information: Provide a general information Section immediately following the Table of Contents, listing each product included in the manual, identified by product name. Under each product, list the name, address, and telephone number of the Subcontractor or installer, and the maintenance contractor. Clearly delineate the extent of responsibility of each of these entities. In addition, list a local source for replacement parts and equipment.

4. Product Data: Where manufacturer's standard printed data is included in the manuals, include only sheets that are pertinent to the part or product installed. Mark each sheet to identify each part or product included in the installation.

5. Written Text: Where manufacturer's standard printed data is not available, and information is necessary for proper operation and maintenance of equipment or systems, or it is necessary to provide additional information to supplement data included in the manual, prepare written text to provide necessary information. Organize the text in a consistent format under separate headings for different procedures. Where necessary, provide a logical sequence of instruction for each operating or maintenance procedure.

6. Drawings: Provide specially prepared drawings where necessary to supplement manufacturer's printed data to illustrate the relationship of component parts of equipment or systems, or to provide control or flow diagrams. Coordinate these drawings with information contained in Project Record Drawings to assure correct illustration of the completed installation.

7. Warranties, Bonds and Service Contracts: Provide a copy of each warranty, bond or service contract in the appropriate manual for the information of the Owner's operating personnel. Provide written data outlining procedures to be followed in the event of product failure. List circumstances and conditions that would affect validity of the warranty or bond.

1.05 MATERIAL AND FINISHES MAINTENANCE MANUAL

A. Architectural Products: Provide manufacturer's data and instructions on care and maintenance of architectural products, including applied materials and finishes.

1. Care and Maintenance Instructions: Provide information on care and maintenance, including manufacturer's recommendations for types of cleaning agents to be used and methods of cleaning. Provide information regarding cleaning agents and methods that could prove detrimental to the product. Include manufacturer's recommended schedule for cleaning and maintenance.

B. Moisture-Protection and Weather-Exposed Products: Provide complete manufacturer's data with instructions on inspection, maintenance and repair of products exposed to the weather or designed for moisture-protection purposes.

1.06 EQUIPMENT AND SYSTEMS MAINTENANCE MANUAL

A. Manufacturer's Information: For each manufacturer of a component part or piece of equipment provide the following:

1. Printed operating and maintenance instructions.

2. Assembly drawings and diagrams required for maintenance.

3. List of items recommended to be stocked as spare parts.

B. Maintenance Procedures: Provide information detailing essential maintenance procedures, including the following:

1. Routine operations.

2. Trouble-shooting guide.

3. Disassembly, repair and reassembly

4. Alignment, adjusting and checking.

C. Operating Procedures: Provide information on equipment and system operating procedures, including the following:

1. Start-up procedures.

2. Equipment or system break-in.

3. Routine and normal operating instructions.

4. Regulation and control procedures.

5. Instructions on stopping.

6. Shut-down and emergency instructions.

7. Summer and winter operating instructions.

8. Required sequences for electric or electronic systems.

9. Special operating Instructions.

D. Servicing Schedule: Provide a schedule of routine servicing and lubrication requirements, including a list of required lubricants for equipment with moving parts.

E. Controls: Provide a description of the sequence of operation and as-installed control diagrams by the control manufacturer for systems requiring controls.

F. Coordination Drawings: Provide each Contractor's Coordination Drawings.

1. Provide as-installed color-coded piping diagrams, where required for identification.

G. Valve Tags: Provide charts of valve tag numbers, with the location and function of each valve.

H. Circuit Directories: For electric and electronic systems, provide complete circuit directories of panel boards, including the following:

1. Electric service.

2. Controls.

3. Communication.

1.07 INSTRUCTIONS TO SCHOOL DISTRICT PERSONNEL

A. Prior to final inspection, instruct School District personnel in operation, adjustment, and maintenance of products, equipment and systems. Provide instruction at mutually agreed upon times.

1. For equipment that requires seasonal operation, provide similar instruction during other seasons.

2. Use operation and maintenance manuals for each piece of equipment or system as the basis of instruction. Review contents in detail to explain all aspects of operation and maintenance.

PART 2 – PRODUCTS - (Not Applicable)

PART 3 – EXECUTION - (Not Applicable)

END OF SECTION

COMPTON COMMUNITY COLLEGE DISTRICT

COMMISSIONING

PART 1 – GENERAL

1.1 SUMMARY

A. Commissioning is a process for validating and documenting that the facility and its systems are constructed and perform in conformity with the Contract Documents.

B. The objective of the commissioning process is to verify that the performance of the facility and its systems meet or exceed the design intent.

C. Commissioning includes special facility start-up processes used to bring the facility to a fully operational state, free of deficiencies in an efficient and timely manner

D. Training on related systems and equipment operation and maintenance shall be scheduled to commence only after start-up is complete and systems are verified to be 100% complete and functional.

1.2 DESCRIPTION

A. The following applies to all Contract Documents

1. Contractor Startup: Sub-phase of Contractor's work ending with Acceptance of Work, during which Contractor performs a pre-planned program of activities including starting, testing, inspecting, adjusting balancing, correcting deficiencies and other similar activities.

    a. The Construction Manager, Architect/Engineer, Consultants and the DSA Inspector of Record (IOR) shall be present to observe, inspect and identify deficiencies in Building Systems Operations.

2. The completion of startup means the entire Construction Project including startup and fine tuning has been performed to the requirements of the Contract Documents and is verified in writing by the Construction Manager, Architect/Engineer and the Consultants.

3. Fine Tuning: Fine tuning is the responsibility of Contractors after District occupancy and ending one year after District occupancy. During this time the Contractor is responsible for optimizing systems and correcting deficiencies arising under normal operating conditions.

   a. Includes a period after occupancy where systems are optimized under "live" operating conditions and any outstanding construction deficiencies are corrected.

   b. Fine Tuning shall extend from date of District occupancy to one year after occupancy.

1.3 RELATED SECTIONS – (Not Applicable)

1.4 DEFINITION OF TERMS

A. Contractor's Pre-Commissioning Checklists: Includes installation and start-up items as specified to be completed by the appropriate contractors prior to operational verification through the functional testing process.

B. Installation Verification Process: Includes the on-site inspection and review of related system components for conformance to Contract Documents. The Contractor shall verify systems readiness for functional testing procedures prior to the start of functional testing. Deficiencies will be documented by the Inspector for future resolution.

C. Functional Performance Testing Process: Includes the documented testing of system parameters, under actual or simulated operating conditions. Final performance commissioning of systems will begin only after the appropriate Contractor certifies that systems are 100% complete and ready for functional testing. The contractors will be required to schedule, coordinate and perform device tests, calibration and functional performance test procedures.

D. Deficiencies and Resolutions List: Includes a list of noted deficiencies discovered as a result of the commissioning process. This list also includes the current disposition of issues, and the date of final resolution as confirmed by the Construction Manager and Inspector. Deficiencies are defined as those issues where products execution or performance does not satisfy the Project Contract Documents and/or the design intent.

1.5 COMMISSIONING SCHEDULE

A. Provide schedules for Contractor Start-Up work.

B. Incorporate in overall construction schedule.

C. Contractor's activities, which will be performed as specified under Fine Tuning, shall be completed within one year from date of occupancy by the District.

1.6 SUBMITTALS

A. Submit Draft and Final Contractor Start-up Forms as described in this Section. Submit Draft Report for Construction Manager and Architect's review and comment prior to Final Submission.

B. Prepare and submit one copy of report form to be used in preparation of system reports for:

1. Each mechanical system as required

2. Each Electrical & low voltage system as required.

C. Each System Report shall be submitted including the following:

1. Project Name

2. Name of System

3. Manufacturer's equipment start-up reports.

4. Systems' testing, balancing, and adjusting reports.

5. Equipment Report Forms shall include the following: Project name, name of equipment, starting and testing procedures to be performed and observations and test results to be recorded.

1.7 COMMISSIONING DUTIES AND RESPONSIBILITIES

A. Contractors Duties and Responsibilities:

1. Assure the participation and cooperation of Subcontractors and Suppliers under their jurisdictions as required to complete the commissioning process.

2. Complete Commissioning Report Forms. Reports are to be completed in a neat easily readable condition.

3. Complete the respective start-up and check out procedures and insure readiness of equipment and systems prior to the start of the functional performance testing.

   Written confirmation of system readiness for performance testing is required.

4. Provide qualified representatives for the functional performance commissioning process.

5. Assure that all subcontractors, suppliers, test and balance, controls, etc. include in there respective contracts cost necessary to participate in and complete the commissioning process.

B. Duties and responsibilities of others for Commissioning:

1. The commissioning process requires the active participation of the Construction Manager, School District, Mechanical Engineer, Electrical Engineer, and any other related Consultants on the project.

1.8 SYSTEM FAILURES

A. After a second failure of a system to successfully meet the criteria as set for in the functional performance testing process, the contractor shall reimburse the School District for cost associated with any additional retesting required due to uncorrected deficiencies. Costs shall include salary, benefits, overhead, travel costs and per diem lodging costs if applicable.

PART 2 – PRODUCTS - (Not Applicable)

PART 3 – EXECUTION - (Not Applicable)

END OF SECTION

Compton College
Student Housing

Increment 2 - Part 1

1111 E. Artesia Blvd., Compton, CA 90221

Specifications

DSA SUBMITTAL

VOLUME 3

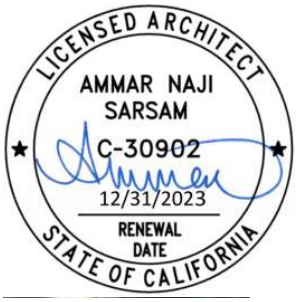
April 17, 2023

HPI architecture

ARCHITECT

HPI Architecture
115 22nd Street
Newport Beach, CA 92663
Tel. (949) 675-6442
Fax: (949) 675-4543

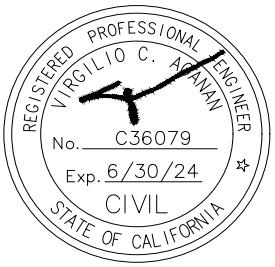
Contacts: Ammar Sarsam, Principal



CIVIL ENGINEER

VCA ENGINEERS, INC.
1041 S. Garfield Ave. #210
Alhambra, CA 91801
Tel. (323) 729-6098
Fax: (323) 729-6043

Contact: Virgil Aoanan



LANDSCAPE ARCHITECT

RLA
8841 Research Drive, Suite 200
Irvine, CA 92618
Tel. (949) 387-1323

Contact: TRAVIS EBBERT

STRUCTURAL ENGINEER

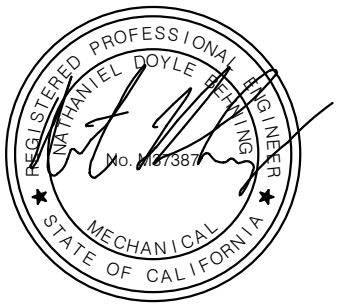
JOHN A. MARTIN & ASSOCIATES (JAMA)
950 S. Grand Ave. Ste. 400
Los Angeles, CA 90015
Tel. (213) 483-6490

Contact: Shane Fitzgerald

MECHANICAL/PLUMBING

P2S, Inc.
5000 East Spring Street, 8th Floor
Long Beach, California 90815
Tel. (562) 497-2999

Contact: Nate Behning

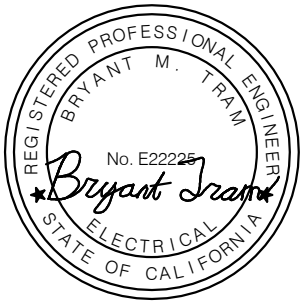


SIGND: 03/22/2023

ELECTRICAL, FIRE ALARM, TECHNOLOGY (DATA/SECURITY/AV), & SOLAR

P2S, Inc.
5000 East Spring Street, 8th Floor
Long Beach, California 90815
Tel. (562) 497-2999

Contact: Bryant Tram



SIGND: 03/22/2023

FIRE PROTECTION ENGINEER

P2S, Inc.
5000 East Spring Street, 8th Floor
Long Beach, California 90815
Tel. (562) 497-2999

Contact: Andres Jimenez

SIGND: 03/22/2023

STUDENT HOUSING
INCREMENT 02
Compton College

VOLUME 3 TABLE OF CONTENTS

TABLE OF CONTENTS CONTINUES IN VOLUME 4.

SECTION 032000 - CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Reinforcing steel for cast-in-place concrete.

B. Supports and accessories for steel reinforcement.

1.2 RELATED SECTIONS

A. Section 033000 - Cast-in-Place Concrete.

1.3 REFERENCES

A. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International.

B. ACI 318 - Building Code Requirements For Reinforced Concrete and Commentary; American Concrete Institute International.

C. ACI SP-66 - ACI Detailing Manual; American Concrete Institute International.

D. ASTM A184/A184M - Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement.; 2019

E. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2018e1

F. ASTM A704/A704M - Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement; 2019e1

G. ASTM A706/A706M - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement; 2016

H. ASTM A996/A996M - Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement; 2016

I. ASTM A1064/A1064M – Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2018a

J. AWS D1.4 - Structural Welding Code - Reinforcing Steel; American Welding Society.

K. CRSI (DA4) - Manual of Standard Practice; Concrete Reinforcing Steel Institute.

L. CRSI (P1) - Placing Reinforcing Bars; Concrete Reinforcing Steel Institute.

1.4 SUBMITTALS

A. Shop Drawings: Only when deviations are made from the contract documents, submit shop drawings under Division 1 provisions with deviations clearly identified. Drawings without deviations or when not specifically requested by the SEOR will be received and filed for record only, no checking will be performed.

1. When provided, indicate sizes, spacings, locations and quantities of reinforcing steel, wire fabric, bending and cutting schedules, splicing, stirrup spacing, supporting and spacing devices.

B. Manufacturer's Certificate: Certify that reinforcing steel and accessories supplied for this project meet or exceed specified requirements.

C. Reports: Submit certified copies of mill test report of reinforcement materials analysis, indicate physical and chemical analysis.

D. Welders Certificates: Submit certifications for welders employed on the project, verifying AWS qualifications with the previous 12 months, as applicable to welding of reinforcement.

1.5 QUALITY ASSURANCE

A. Perform work of this section in accordance with CRSI (DA4), CRSI (P1), ACI 301, and ACI SP-66.

1.6 AIR QUALITY REQUIREMENTS

A. Comply with the requirements of Division 01 as they are applicable to the work of this section, and as though they are repeated verbatim herein.

PART 2 - PRODUCTS

2.1 REINFORCEMENT

A. Reinforcing Steel: ASTM A615/A615M Grade 60 (420).

1. Deformed billet-steel bars.
2. Unfinished.

B. Reinforcing Steel: ASTM A706/A706M, deformed low-alloy steel bars.

1. Unfinished.

C. Steel Welded Wire Reinforcement: ASTM A1064/A1064M, plain type.

1. Welded Wire Mat Reinforcing: mesh size and gage as indicated on drawings.

D. Steel Welded Wire Reinforcement: ASTM A1064/A1064M, deformed type.

1. Flat Sheets.
2. Mesh Size and Wire Gage: As indicated on drawings.

E. Reinforcement Accessories:

1. Tie Wire: Annealed, minimum 16 gage acceptable patented system.
2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement, including load bearing pad on bottom to prevent vapor barrier puncture.
3. Provide stainless steel, plastic, or plastic coated steel components for placement within 1 ½" of weathering surfaces.

2.2 FABRICATION

A. Fabricate concrete reinforcing in accordance with CRSI (DA4) - Manual of Standard Practice.

B. Welding of reinforcement is permitted only with the specific approval of SEOR and DSA. Perform welding in accordance with AWS D1.4.

C. Obtain approval from the SEOR and DSA for additional reinforcing splices not indicated on drawings.

PART 3 - EXECUTION

3.1 PLACEMENT

A. Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.

B. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.

C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with concrete placement.

D. Do not displace or damage vapor barrier.

E. Accommodate placement of formed openings.

F. Bond and ground all reinforcement to requirements of Section 260526.

3.2 FIELD QUALITY CONTROL

A. An independent testing agency, as specified in Section 014000, will inspect installed reinforcement for conformance to contract documents before concrete placement.

END OF SECTION

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 WORK INCLUDES:

A. Cast in place structural concrete.

B. Non-structural concrete.

1.2 RELATED SECTIONS:

A. Section 032000 - Concrete Reinforcement.

1.3 REFERENCES

A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; American Concrete Institute International.

B. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International.

C. ACI 302.1R - Guide for Concrete Floor and Slab Construction; American Concrete Institute International.

D. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute International.

E. ACI 305R - Hot Weather Concreting; American Concrete Institute International.

F. ACI 306R - Cold Weather Concreting; American Concrete Institute International.

G. ACI 308R - Guide to External Curing Concrete; American Concrete Institute International.

H. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; American Concrete Institute International.

I. ASTM C33 - Standard Specification for Concrete Aggregate; 2018.

J. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2018

K. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2019a

L. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2015a

M. ASTM C150 - Standard Specification for Portland Cement; 2019a

N. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2016

O. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2016

P. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete; 2016a

Q. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2019

R. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2017

S. ASTM C595 - Standard Specification for Blended Hydraulic Cement

T. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2015

U. ASTM C685/C685M – Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 2017

V. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 2019

W. ASTM C989 - Standard Specification for Slag Cement for Use in Concrete and Mortars

X. ASTM C1059 - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 2013

Y. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2017

Z. ASTM E1155/E1155M - Standard Test Method for Determining F(F) Floor Flatness and F(L) Floor Levelness Numbers; 2014

AA. ASTM C1157 - Standard Performance Specification for Hydraulic Cement

BB. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures

CC. ASTM C1581 - Standard Test Method for Determining Age at Cracking and Induced Tensile Stress Characteristics of Mortar and Concrete under Restrained Shrinkage

DD. ASTM 1602 - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete

1.4 DEFINITIONS

A. Severe Exposure: Concrete which is in contact with moisture or deicing salts, such as pavements, sidewalks, parking garage floors, etc.

B. Moderate Exposure: Concrete which is occasionally exposed to moisture, such as exterior walls, beams, girders, and slabs not in contact with soil, etc.

1.5 SUBMITTALS

A. General: Submit in accordance with Section 013300.

B. Shop Drawings: Submit drawings locating slab-on-grade construction joints, control joints, and isolation joints.

C. Product Data: Submit product data for proprietary products.

D. Mix Designs:

1. Submit proposed concrete mix designs for each class or use at least 30 days prior to required delivery including:
   a. Mixture Identification by class
   b. Specified compressive strength, $f'c$, that is applicable for the class
   c. Specified exposure class that is applicable for the class
   d. Documentation of strength test records of similar class of concrete used to establish standard deviation in accordance with ACI 318, when test records exist
   e. Required average compressive strength, $f'cr$, for each class of concrete
   f. Documentation of $f'cr$ of proposed mixture(s) and test age
   g. Strength of concrete at other ages for stages of construction, when specified
   h. w/cm of proposed concrete mixtures, when specified
   i. Intended placement method
   j. Slump or slump flow
   k. Air content of concrete assigned to Exposure Category F
   l. Density, when specified
   m. Documentation supporting other specified requirements of concrete mixtures
   n. Nominal maximum aggregate size or Size number
   o. Type and information about the ingredient materials proposed for use including:
      1) Cementitious Materials
      2) Aggregates (including individual and combined gradations, source, and characteristics)
      3) Admixtures
      4) Water
      5) Fibers, color pigments, and other additions
2. Mixes shall be prepared by a professional engineer licensed in the state in which the project is located.

E. Test Reports: Submit aggregate and concrete mix test reports from independent testing laboratory as required by Division 1.

1.6 QUALITY ASSURANCE

A. Certifications:

1. Submit material certification for admixtures and aggregates, certifying their compliance with specifications.
2. Submit certified mill test reports for each lot of cement.

B. Perform work of this section in accordance with ACI 301 and ACI 318.

C. Acquire cement from same source and aggregate from same source for entire project.

D. Follow recommendations of ACI 305R for concreting during hot weather.

E. Follow recommendations of ACI 306R for concreting during cold weather.

1.7 PRE-INSTALLATION CONFERENCE

A. Conduct pre-installation conference in accordance with Section 013100.

1.8 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with requirements of Section 016000.

B. Deliver packaged products to site in manufacturer's sealed and labeled containers; inspect to verify compliance with specified requirements.

C. Label containers to indicate manufacturer's name, product name, date of manufacture, and instructions for use.

D. Store liquid materials in tightly covered containers in well ventilated area at ambient temperatures recommended by manufacturer. Store dry materials on raised platforms and cover to prevent moisture damage. Maintain containers in clean condition, free of foreign materials and residue with labels in legible condition.

E. Take precautionary measures to prevent fire hazards and spontaneous combustion.

1.9 AIR QUALITY REQUIREMENTS

A. Comply with the requirements of Section 014100 as they are applicable to the work of this section, and as though they are repeated verbatim therein.

PART 2 – PRODUCTS

2.1 REINFORCEMENT

A. Comply with the requirements of Section 032000.

2.2 CONCRETE MATERIALS

A. Cementitious Material:

1. Hydraulic Cement: ASTM C150, ASTM C595, or ASTM C1157. Type as indicated in the structural drawings.
   a. Air-entraining Portland cement, as defined by ASTM C150, is prohibited.
2. Fly Ash or Natural Pozzolan: ASTM C618
3. Slag Cement: ASTM C989
4. Silica Fume: ASTM C1240

B. Aggregate:

1. Coarse Aggregate:
   a. ASTM C33 for normal weight aggregate.
2. Fine Aggregate: ASTM C33
3. Exposed Aggregate: To match Architect's sample.

C. Water: ASTM C1602

D. Admixtures:

1. Calcium chloride, thiocyanates, or admixtures containing more than 0.05 percent chloride ions are not permitted unless approved by Architect.
2. Air Entraining: ASTM C260.
3. Water-reducing: ASTM C494, Type A.
4. High Range Water-reducing (Superplasticizer): ASTM C494, Type F or Type G.
5. Water-reducing, Non-corrosive, Non-chloride Accelerator:
   a. ASTM C494, Type C or E.
   b. Submit long term non-corrosive test data from independent testing laboratory using accelerated test method such as electrical potential measure.
6. Water-reducing, Retarding, Hydration Control: ASTM C494, Type B or D.
7. Shrinkage-Reducing, Workability-Retaining, Viscosity Modifying, Alkali-Silica Reaction Inhibiting: ASTM C494, Type S
8. Chemical Corrosion Inhibitor: ASTM C1581
9. Admixtures with no standard (ASTM or other) designation shall be used with the permission of the engineer of record when its use for specific properties is required.

2.3 CURING MATERIALS

A. Sheet Curing Materials: ASTM C171; white opaque polyethylene film, white polyethylene coated burlap sheeting, or regular waterproof paper.

B. Water Based Acrylic Curing/Sealing Compounds:

1. ASTM C1315, Type I, Class A, VOC compliant, free of natural or petroleum waxes. Dries clear with low gloss sheen.
2. Liquid, membrane forming, minimum 30 percent acrylic resin solids, allowing maximum moisture loss in 72 hours of 0.08 lb./sq. ft.
3. Compatible with subsequent coatings and toppings.
4. Acceptable Products:
   a. Super Diamond Clear VOX, Euclid Chemical Company, Cleveland, OH.
   b. Dress & Seal WB 30, L&M Construction Chemicals, Inc., Omaha, NE.
   c. VOCOMP 30, W. R. Meadows, Inc., Elgin, IL.

C. Chemical Curing Compounds:

1. Penetrating liquid, non-film forming, solution of sodium, potassium, and meta silicate compounds.
2. Compatible with subsequent coatings and toppings.
3. Acceptable Products:
   a. L&M Cure, L&M Construction Chemicals, Inc., Omaha, NE.
   b. Eucosil, Euclid Chemical Company, Cleveland, OH.
   c. Sonosil, Sonneborn Building Products, Shakopee, MN.
   d. Dust-Gard, W. R. Meadows, Inc., Elgin, IL.

D. Evaporation Retardants:

1. Eucofilm, Euclid Chemical Co., Cleveland, OH.
2. E-Con, L&M Construction Chemicals, Inc., Omaha, NE.
3. Confilm, Master Builders, Inc., Cleveland, OH OBJ

2.4 PATCHING AND REPAIR MATERIALS

A. Epoxy Adhesive:

1. 100 percent solids, two component material suitable for use on dry or damp surfaces, conforming to ASTM C881.
2. Acceptable Products and Manufacturers:
   a. Concresive Liquid LPL, Master Builders, Inc., Cleveland, OH.
   b. Sikadur Hi-Mod 32, Sika Corporation, Lyndhurst, NJ.
   c. Euco 452 or 620 System, Euclid Chemical Company, Cleveland, OH.

B. Patching Compound:

1. Polymer modified cementitious mortar.
2. Acceptable Products and Manufacturers:
   a. Thin Coat, Concrete Coat, or Verticoat, Euclid Chemical Company, Cleveland, OH.
   b. Duratop, L&M Construction Chemicals, Inc., Omaha, NE.
   c. Sikatop 121, 122, or 123, Sika Corporation, Lyndhurst, NJ.

C. Patching Mortar:

1. Comprised of same materials and approximately same proportions as used for surrounding concrete, except with coarse aggregate omitted.
2. Consisting of not more than 1 part cement to 2-1/2 parts sand.
3. Substitute white Portland cement for portion of gray Portland cement to match color of surrounding exposed concrete.
4. Limit mixing water to no more than necessary for handling and placing. Maximum water/cement ratio of 0.50.

2.5 CONCRETE MIXES

A. Mix Design:

1. Submit design mixes for each type and class of concrete based on laboratory trial batch method or field experience methods described in ACI-318, Chapter 26.
2. If trial batch method is used, employ an independent testing agency acceptable to SEOR and DSA for preparing and reporting proposed mix designs. Mix designs are to be prepared by a professional engineer licensed in the State of California. Contractor employed testing agency shall not be same firm as Owner employed testing agency.
3. Use concrete of approved mix designs only.
4. The proportioning of ingredients shall provide a concrete readily worked into forms and around reinforcement under conditions of placement to be employed, without segregation or excessive bleeding.
5. Do not place concrete until design mix for that class and type of concrete is reviewed by Architect.
6. Indicate locations in structure where each mix design is to be used.
7. Identify each mix design with code number which will be used on batch tickets.

B. Design Compressive Strengths: As indicated on Structural Drawings.

1. Normal Weight Concrete:
   a. Compressive strength, when tested in accordance with ASTM C39/C39M, strength at 7 days shall be at least 60% of the minimum required 28-day strength unless noted otherwise on drawings.

C. Maximum Size of Coarse Aggregate:

1. 1/5 narrowest dimension between form sides.
2. 1/3 depth of slabs.
3. 3/4 of minimum clear distance between reinforcing bars, wires, or bundles of bars.
4. 1 inch maximum for normal weight concrete.

D. Admixtures:

1. Only use admixtures which have been tested and approved in mix designs.
2. Air entraining Admixture:
   a. Use in concrete exposed to freezing and thawing at any time during construction or in completed structure.
   b. Use in concrete placed at ambient temperatures below 40 degrees F.
   c. Tolerance on air content as delivered: Plus or minus 1-1/2 percent.
3. Conform to air content requirements indicated on Drawings.

E. Maximum water-soluble chloride ion concentrations in hardened concrete at ages from 28 to 42 days contributed from all ingredients, expressed as percent by weight of cement as follows:

1. Concrete over galvanized deck: 0.06 percent.
2. Concrete exposed to chloride in service: 0.15 percent.
3. Other concrete: 1.00 percent.

F. Shrinkage Tests:

1. Prior to placing any concrete for walls or horizontal surfaces, a trial batch of each mix design of structural concrete shall be prepared using the aggregates, cement, and admixture (if any) proposed for the project. From each trial batch at least 3 specimens for determining drying shrinkage shall be prepared. The drying shrinkage specimens shall be a 4" x 4" x 11" prisms fabricated, cured, dried, and measured in accordance with the requirements of Tentative Method of Test for Length Change of Cement Mortar and Concrete, ASTM C157. The measurements shall be made and reported separately for 7 and 28 days of drying after 7 days of moist curing. The effective gage length of the specimens shall be 10", and except for the foundation concrete, the average drying shrinkage at 35 days shall not exceed .045%.
2. Previous Test: Ready-mixed concrete manufacturer may furnish certified test reports from approved Testing Laboratory as proof of meeting shrinkage requirements, provided aggregate used and concrete covered by such test report conform to mix design approved for use on this project. Method used, use an independent testing facility acceptable to Architect for preparing and reporting proposed mix designs.

G. Use accelerating admixtures in cold weather only when approved by architect. Use of admixtures will not relax cold weather placement requirements.

2.6 MIXING

A. Ready-Mix Concrete:

1. Comply with ASTM C94/C94M.
2. Before using trucks for batching, mixing, and transporting concrete, thoroughly cleans trucks and equipment of materials capable of contaminating concrete.

3. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C94 is required.
4. When air temperature is between 85 degrees F and 90 degrees F, reduce mixing and delivery time from 90 minutes to 75 minutes, and when air temperature is above 90 degrees F, reduce mixing and delivery time to 60 minutes.
5. Do not add water to ready-mix concrete at Project site except when slump is below specified limits and total water does not exceed the design water-cement ratio; inject added water into mixer and mix thoroughly before discharging.

B. Provide certificate signed by authorized official of supplier with each load of concrete stating following:

1. Time truck left plant.
2. Mix of concrete, identify with code number of mix design.
3. Amount of water and cement in mix.
4. Amount and type of admixtures.
5. Amount of water added at project site.
6. Time truck is unloaded at project site.

C. Truck mixers without batch tickets will be rejected.

D. Retain certificates at Project site. Submit to Architect for review upon request.

2.7 PRODUCTION

A. Ready Mixed Normal Weight Concrete

1. Except as otherwise provided in these specifications, ready mixed concrete shall be batched, mixed, and transported in accordance with ASTM C94 “Specification for Ready Mixed Concrete.”

B. Mixing Water Control

1. Concrete which arrives at the jobsite with slump below that specified for placement may be adjusted by the addition of water to increase slump, provided the maximum slump is not exceeded and the maximum water content of the design mix is not exceeded. Following any such water addition, the concrete shall be mixed at mixing speed for at least 30 revolutions of the drum.
2. After adjustment is made to the proper slump, the concrete shall be discharged as long as it retains its placeability without the further addition of water.
3. Concrete shall be placed within one and one half hours after mixer is charged in average conditions. Time shall be reduced to one hour during hot weather concreting.

2.8 SOURCE QUALITY CONTROL

A. Testing will be performed under the provisions of Section 014500, except as otherwise specified.

B. Independent Testing Laboratory, approved by Architect/SEOR and employed by Contractor, is responsible for:

1. Testing aggregate as follows at start of work and whenever change in aggregate source occurs:
   a. Gradation and fineness modulus: ASTM C136.

b. Specific gravity: ASTM C127 for coarse aggregate, ASTM C128 for fine aggregate.
c. Organic impurities: ASTM C40.
d. Effect of organic impurities on strength: ASTM C87 for effect of organic impurities on strength.
e. Potential reactivity of aggregate: ASTM C295, petrographic examination.
f. Soundness: ASTM C88.
g. Reports of tests conducted on aggregates from the same source within the past 12 months will be acceptable.

2. Testing concrete mixes as follows at start of work and whenever change in materials source occurs:
   a. Prepare mix designs, test concrete strength, and report results if trial batch method is used to establish design mix proportions. Mix design shall be reviewed, approved, sealed, and stamped by a Licensed Professional Engineer in the state where the project is located.

C. Independent Testing Laboratory, employed by Owner, is responsible for observing and evaluating the following at batch plant at start of Work and at other times as requested by the Architect, unless the batch plant has a current National Ready Mix (or other approved agency's) certification:

1. Condition of batching equipment.
2. Conformance with design mix proportions.
3. Storage of materials.
4. Mixing equipment.
5. Mixing and transporting equipment.
6. Other testing to verify compliance if requested by Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions and proceed with Work in accordance with Section 017300.

B. Verify forms, reinforcement, anchors, plates, joint materials, vapor retarder and other items to be cast into concrete are accurately placed and held securely.

C. Verify forms are free of debris and water.

D. Verify excavations are free of loose material and water.

3.2 TESTING

A. Concrete materials and operations shall be tested and inspected for compliance with the specifications and requirements.

3.3 TESTING AGENCY

A. The testing agency shall be designated by the owner. Ample time shall be allowed for preliminary tests as required prior to concreting operations.

B. All testing agency personnel shall meet the requirements of ASTM E329, "Recommended Practice of Inspecting and Testing Agencies for Concrete and Steel in Construction."

C. All testing agency personnel shall have the knowledge and ability to perform the necessary tests equivalent to the minimum guideline for Certification of Concrete Field-Testing Technicians, Grade 1 in accordance with ACI CP-2.

3.4 DUTIES AND SERVICES

A. The duties and responsibilities of the testing agency and the contractor and services to be performed by each are as designated in ACI 301, Section 1.6, “Specifications for Structural Concrete for Buildings.”

3.5 EVALUATION AND ACCEPTANCE

A. Test results of standard cylinders, molded, cured, and tested according to ASTM C31 and C39 should be evaluated separately for each concrete mix according to ACI 214, “Recommended Practice for Evaluation of Concrete Compression Test Results of Field Concrete.”

B. The criteria for acceptance of concrete shall be as detailed in ACI 318, Chapter 26.12, “Evaluation and Acceptance of Concrete” or as per ASTM C94, Section 18 “Strength” and Section 19 “Failure to Meet Strength Requirements.”

3.6 PREPARATION

A. Construction Joints:

1. Clean previously placed concrete of laitance.
2. Clean reinforcement and accessories of mortar from previous concrete placement operations.
3. Apply bonding agent in accordance with manufacturer's recommendations.
4. Moisten surface of previously placed concrete.

3.7 PLACEMENT

A. Place concrete according to ACI 301 and 304R, except as modified and supplemented on Drawings or in this Section.

B. Notify Architect and Owner's testing laboratory minimum of 48 hours prior to commencement of placing operations.

C. Cold Weather Concreting:

1. Comply with requirements of ACI 306.1.
2. Do not place concrete when ambient air temperature is expected to fall below 40 degrees F within 24 hours, except with prior written approval of SEOR.
3. Remove frost, ice, and snow from formwork, reinforcing, and accessories prior to placing concrete.
4. Do not place concrete foundations, footings, or slabs on frozen ground.
5. Limit concrete temperature at time of discharge to 55 degrees F for sections less than 12 inches in any dimension and to 50 degrees F for other sections.

D. Hot Weather Concreting:

1. Comply with requirements of ACI 305R when ambient air temperature exceeds 75 degrees F.

2. Use water-reducing, retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions to extend setting time to limits specified as approved by Architect.
3. Cool aggregates, cool mixing water, substitute ice for part of mixing water, or take other measures to limit concrete temperature at time of discharge to 90 degrees F.
4. Cover reinforcing steel and steel forms with water soaked burlap or use fog spray to limit temperature of steel to 120 degrees F immediately prior to concrete placement.
5. Use evaporation retardant between finishing passes.

E. At time of placement, provide concrete temperature between 50 degrees F and 90 degrees F.

F. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.

G. Repair underslab vapor retarder damaged during placement of concrete reinforcing. Repair with vapor retarder material; lap over damaged areas minimum 6 inches and seal watertight.

H. Separate slabs on grade from vertical surfaces with joint filler.

I. Place joint filler in floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

J. Extend joint filler from bottom of slab to within 1/2 inch of finished slab surface. Conform to Division 07 for finish joint sealer requirements.

K. Install joint devices in accordance with manufacturer's instructions.

L. Install construction joint devices in coordination with floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

M. Install joint device anchors for expansion joint assemblies specified in Division 07. Maintain correct position to allow joint cover to be flush with floor and wall finish.

N. Apply sealants in joint devices in accordance with Division 07.

O. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

P. Place concrete continuously between predetermined expansion, control, and construction joints.

Q. Do not interrupt successive placement; do not permit cold joints to occur.

R. Place floor slabs in pattern indicated.

S. Saw cut joints within 12 hours of finishing concrete.

T. Screed floors level, maintaining surface flatness of maximum one-fourth inch in 10 ft.

U. Maintain surfaces receiving concrete at approximately same temperature as concrete being placed.

V. Maintain surface of hardened concrete below 100 degrees F.

W. Convey concrete from mixer to place of deposit by method that will prevent segregation or loss of material, and that will not require addition of water to produce desired slump at point of placement. Do not use supported reinforcing as runway base for concrete conveying equipment.

X. Depositing:

1. Deposit concrete as nearly as practicable to its final location.
2. Place concrete continuously between construction joints.
3. Deposit concrete in layers not exceeding 24 inches in depth.
4. Avoid inclined layers.
5. Place each layer while preceding layer is still plastic.
6. Do not allow free fall of concrete to exceed 4 feet. Do not allow free fall of concrete containing high-range water reducing admixture to exceed 10 feet.
7. Drop concrete in vertical direction, not at incline.
8. Place beams, girders, haunches, brackets, column capitals, and drop panels monolithic with slab system unless otherwise indicated.
9. Do not cast beams, girders, and slabs supported on columns and walls until concrete in supporting element is no longer plastic, minimum of 2 hours.
10. If forms and reinforcing above level of concrete already in place become coated with accumulations of hardened or partially hardened concrete, remove accumulations before proceeding.
11. Place concrete without displacing reinforcing and accessories.

Y. Consolidation:

1. Vibrate concrete to eliminate formation of surface air voids, honeycombs, and sand streaks.
2. Use mechanical, internal vibrators with proper frequency, rpm, and spud size. Select spud for size and spacing of reinforcement and clearance to formwork. Supplement vibration by hand-spading, rodding, or tamping.
3. Insert and withdraw vibrator vertically at spacing not to exceed 1-1/2 times radius of action of vibrator, maximum of 24-inch centers.
4. Insert vibrators into placed layer and at least 6 inches into preceding layer.
5. Do not allow vibrator to touch form face or embedded items.
6. Do not use mechanical vibration for slabs less than 4 inches thick. Use hand spading and tamping in these locations.

Z. Placing Concrete Slabs:

1. Deposit and consolidate concrete slabs in continuous operation, in single layer, within limits of construction joints, until placing of panel or section is completed.
2. Bring slab surfaces to correct level with straightedge and strike-off.
3. Use bull floats, highway straight edges, or darbies to produce smooth surface, free of humps or hollows before bleed water appears on surface.
4. Do not disturb slab surfaces prior to beginning finishing operations.
   a.

AA. Curbs and Equipment Pads:

1. Form curbs and equipment pads in areas indicated.
2. Placement on same day:
   a. Place and consolidate base slab.
   b. Screed to elevation to allow for curb/pad thickness.

c. After bleed water has disappeared and surface will support worker's weight without indentation, place curb/pad concrete mixture, compact, and float.

3. Placement after one day:
   a. Place and consolidate base slab.
   b. Brush partially set surface with wire broom to remove laitance and scratch surface.
   c. Cure base slab at least three days.
   d. Immediately, prior to placing curb/pad concrete, clean base slab and dampen surface.
   e. Scrub bonding grout into base slab surface, or apply bonding agent in accordance with manufacturer’s recommendations.
   f. Place curb/pad concrete before grout has set or dried, compact and float.
4. Finish interior curbs and pads by stripping forms while concrete is still green and steel trowel surfaces to hard, dense finish with corners, intersections and terminations slightly rounded.

3.8 DEPOSITING

A. Concrete shall be continuously deposited. When continuous placement is not possible, construction joints shall be located as approved by the SEOR. Concrete shall be deposited as close to its final point of placement as possible.

B. Concrete shall be consolidated by vibration, spading, rodding or forking. Work concrete around reinforcements, embedded items and into corners. Eliminate all air or rock pockets and other causes of honeycombing, pitting or planes of weakness.

C. Internal vibration shall have a minimum frequency with amplitude to consolidate the concrete effectively. See ACI 309, "Recommended Practice for Consolidation of Concrete."

1. Vibrators shall be operated by experienced and competent workmen.
2. Use of vibrators to transport concrete shall not be allowed.
3. Vibrators shall be vertically inserted every 18 inches for 5 to 15 seconds and then withdrawn.

3.9 FINISHING

A. General: Provide finishes at specified locations, unless indicated otherwise.

B. Finishing Formed Surfaces:

1. Rough Form Finish:
   a. Leave surfaces with texture imparted by forms, except patch tie holes and defects.
   b. Remove fins and other projections exceeding 1/4 inch in height.
   c. Locations: Concrete surfaces not exposed to view.
2. Smooth Form Finish:
   a. Provide smooth, hard, uniform surface with minimum number of seams.
   b. Repair and patch defective areas, fill tie holes, remove fins and other projections completely. [Leave tie holes unfilled where indicated on Drawings.]
   c. Locations: Exposed concrete surfaces or concrete surfaces designated to receive coatings applied directly to concrete, such as waterproofing, dampproofing, plaster, painting, and other similar applied finishes.
3. Smooth Rubbed Finish:
   a. Provide smooth rubbed finish to newly hardened concrete, which has already received smooth form finish, not later than one day after form removal.

b. Moisten concrete surfaces and rub with carborundum brick or other abrasive device until uniform color and texture is produced.
c. Do not use cement grout other than cement paste drawn from concrete by rubbing process.
d. Locations: Where scheduled or indicated on Drawings.

C. Finishes for Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces, strike-off smooth and finish with texture matching adjacent formed surfaces.

D. Slab Finishes:

1. Float Finish:
   a. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating.
   b. Begin floating when surface water has disappeared and when concrete has stiffened sufficiently to permit operation of power-driven floats.
   c. Cut down high spots and fill low spots.
   d. Immediately after leveling, re-float surface to uniform, sandy texture and a F_F20/F_L17 tolerance.
2. Trowel Finish:
   a. After float finish, follow by power troweling and then hand troweling.
   b. Begin final troweling when surface produces ringing sound as trowel is moved over surface.
   c. Finish surface free of trowel marks, uniform in texture and appearance, and to F_F25/F_L20 elevated slab tolerance.
   d. Grind surface smooth to remove defects which may telegraph through applied finish.

E. Construction and Control Joints in Slab-on-grade:

1. Construction joints to coincide with planned control joint pattern.
2. Provide joints in at column lines and as indicated on Drawings.
3. Tooling Control Joints and Construction Joints:
   a. Slabs Exposed to View: Tool joints after finishing slab.
   b. Concealed Slabs:
      1) Provide joints immediately after final finishing.
      2) Use dry-cut sawing system (Soft-Cut) to depth of 1 inch unless noted otherwise; without dislodging aggregates by sawing. Complete sawing no later than two hours after finishing at each control joint location.

3.10 CURING

A. General:

1. Comply with ACI-308, except as modified or supplemented.
2. Start immediately after placing and finishing concrete.
3. Protect from premature drying, temperature extremes, temperature variations, rain, flowing water, and mechanical injury.
4. Cure continuously, without allowing to dry, for minimum period required for hydration of cement and hardening of concrete.
5. Maintain temperature of concrete above 50 degrees F for curing period.
6. Minimum Length of Curing Period:
   a. High Early Strength Concrete: 3 days.
   b. Other Concrete: 7 days.

B. Acceptable Curing Methods:

1. Concrete to receive Waterproofing, Dampproofing, or Membrane Roofing: Moist curing, moisture-retaining sheet covering, or chemical curing compounds.
2. Concrete to receive Hardeners or Sealers: Moist curing, moisture-retaining sheet covering, dissipating resin compounds, or chemical curing compounds; acceptable to manufacturer of hardener or sealer.
3. Concrete to receive Cement Setting Beds, Bonded Toppings: Moist curing, moisture-retaining sheet covering, or chemical curing compounds.
4. Concrete to receive Adhered Finishes: Moist curing, moisture-retaining sheet covering, acrylic curing/sealing compounds, dissipating resin compounds, or chemical curing compounds; acceptable to manufacturer of applied finish.
5. Cast-in-place Parking Structure Slabs: Moist curing, or dissipating resin compounds.
6. Concrete exposed to Direct Sun when Ambient Temperature Exceeds 75 degrees F: Where permitted, use white pigmented liquid compounds.
7. Other Concrete: Moist curing, moisture-retaining sheet covering, liquid membrane-forming compounds, or chemical curing compounds.

C. Acceptable Curing Procedures:

1. Moist Curing Unformed Surfaces:
   a. Ponding: Maintain 100 percent coverage of water continuously.
   b. Fog Spraying or Sprinkling: Maintain continuously moist with nozzles or sprayers.
   c. Fabric Mats: Cover surfaces with wet burlap or other absorptive material which will not discolor concrete; keep continuously wet.
   d. Sand: Minimum 2-inch-thick layer, kept continuously saturated with water, free from deleterious materials which would stain concrete.
2. Sheet Curing Unformed Surfaces:
   a. Wet surface of concrete with fine spray of water prior to applying sheet.
   b. Immediately cover surface with polyethylene sheeting, waterproof paper, or burlap-polyethylene sheet.
   c. Lap edges of sheeting minimum of 12 inches.
   d. Repair damaged sheet.
   e. Ballast sheet to prevent movement and blow-off.
3. Liquid Membrane-forming Compound Curing of Unformed Surfaces:
   a. Apply in accordance with manufacturer's recommendations.
   b. Protect surfaces from foot and vehicular traffic.
   c. Curing compounds used must be compatible with adhesives used in setting carpet, resilient tile or sheeting flooring, and other similar finishes.
4. Curing Formed Surfaces:
   a. Keep forms continuously moist.
   b. Loosen forms for vertical surfaces to allow curing water to run between concrete and forms.
   c. If forms are removed prior to end of curing period, continue curing with any of methods described for unformed surfaces.
5. Curing of surfaces which are moist cured for first 24 hours may be cured by other acceptable methods for remaining curing period provided they are not allowed to become dry.

3.11 FIELD QUALITY CONTROL

A. Field testing will be performed under the provisions of Section 014500.

B. Independent testing laboratory, employed by Owner, is responsible for:

1. Sampling Fresh Concrete: ASTM C172, sample at point of placement from end of pipe for concrete conveyed by pumping methods, sample at the truck for concrete not pumped; if water is added at Project site, obtain another sample for testing.
2. Concrete Temperature: Test each time slump and air content is tested and each time set of compressive strength test specimens is made.
3. Slump: ASTM C143; one test from first truck at point of discharge each day, one test each time set of compressive strength test specimens is made, and when change in consistency occurs.
4. Air Content of Plastic Mix:
    a. For Normal Weight, Air Entrained Concrete: ASTM C231, pressure method or ASTM C173, volumetric method.
    b. Make one test each time a set of compressive strength test specimens is made.
5. Compressive Strength Tests:
    a. Make and cure test specimens in accordance with ASTM C31, from concrete sampled at point of placement from end of pipe for concrete conveyed by pumping methods, sampled at the truck for concrete not pumped.
    b. Make one set of 4 test cylinder specimens for every 150 cubic yards (50 cubic yards for DSA and OSHPD), or for every 5000 square feet of slabs and walls, or fraction thereof, of each class of concrete, with at least one set for each class each day.
    c. Test cylinders in accordance with ASTM C39, 1 at 7 days for information, and 2 at 28 days for acceptance. Retain one untested cylinder for later testing if required.
    d. When frequency of testing will provide less than five strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches, or from each batch if fewer than 5 are used.
6. Environmental Conditions:
    a. When ambient air temperature falls below 40 degrees F, record maximum and minimum air temperature in each 24 hour period; record air temperature inside protective enclosure; record minimum temperature of surface of hardened concrete.
    b. When ambient air temperature rises above 85 degrees F, record maximum and minimum air temperature in each 24 hour period; record minimum relative humidity; record maximum wind velocity, and record maximum temperature of surface of hardened concrete.
7. Observe conveying, placement and consolidation of concrete for conformance to Specifications.
8. Observe condition of formed surfaces upon removal of formwork prior to repair of surface defects and observe repair of surface defects.
9. Observe curing procedures for conformance with Specifications, record dates of concrete placement, start of preliminary curing, start of final curing, end of curing period.
10. Observe Preparations for Placement of Concrete:
    a. Inspect handling, conveying, and placing equipment, inspect vibrating and compacting equipment.
    b. Inspect preparation of construction, expansion, and isolation joints.
11. Observe preparations for protection from hot weather, cold weather, sun, and rain and preparations for curing.
12. Observations of Concrete Mixing:
    a. Monitor and record amount of water added at Project site.
    b. Observe minimum and maximum mixing times.
13. Other Inspections:
    a. Grouting under base plates.
    b. Grouting anchor bolts and reinforcing steel in hardened concrete.
14. Test for Water Soluble Chloride Ion Content in Hardened Concrete:
    a. Test in accordance with procedure described in FHWA Report No. FHWA RD-77-85.
    b. Make one test for each set of compressive strength test specimens.

c. Test may be waived by Architect upon written request from Contractor after review of concrete design mix has been made.

15. Verify slab flatness and levelness within 72 hours of placement for each slab finish at slab-on-grade and framed slabs in accordance with ASTM E1155. Perform minimum of two tests for each slab and finish; one at initial pour and second randomly chosen by testing laboratory.

C. Evaluation and Acceptance of Concrete:

1. Strength Test: Defined as average strength of two 28-day cylinder tests from each set of cylinders.
2. Acceptance Criteria Based on Strength Tests: Strength level of individual class of concrete is considered satisfactory if both:
   a. Average of three consecutive strength test results equal or exceed required design compressive strength, and
   b. No individual strength test results fall below required design compressive strength by more than 500 psi.
3. Acceptance Criteria Based on Field Tests:
   a. Core Tests: Where strength tests indicate concrete of deficient strength, obtain and test cores in accordance with ASTM C42, ACI 318 and ACI-301, at locations directed by Architect.
   b. Strength level of concrete in area represented by core test is considered adequate if complies with the requirements of ACI 318.
   c. Fill core holes with low slump concrete or patching mortar used to repair surface defects.
4. Revise concrete mix proportions, curing procedures and protection as necessary to provide concrete conforming to Specifications.

D. Acceptance of Structure:

1. Acceptance of structure for dimensional tolerances, appearance, and strength will be based on ACI-301, Section 1.7.
2. Remove and replace concrete which does not meet acceptance criteria.

3.12 PATCHING AND REPAIRING DEFECTIVE CONCRETE

A. General:

1. Rewettable bonding agent may be used only in areas not subject to wet conditions.
2. Patching compound may only be used for concrete not exposed to view.

B. Repairing Formed Surfaces:

1. Surface Defects Requiring Repair:
   a. Color and texture irregularities.
   b. Honeycomb, air bubbles, rock pockets, and spalls.
   c. Fins, burrs and other surface projections.
   d. Cracks.
   e. Stains and other discolorations that cannot be removed by cleaning.
2. Patch defective areas and tie holes immediately after removal of forms.
3. Cut out honeycomb, rock pockets, and voids over 1/4 inch down to solid concrete but not less than 1 inch depth.
4. Make edges of cuts perpendicular to concrete surface.

5. Clean and dampen area including 6 inches of surrounding surface with water.
6. Apply bonding grout by brushing into surface, after surface water has evaporated.
7. Place patching mortar or patching compound before grout has set or dried.
8. Compact patching material in place and strike off slightly higher than surrounding surface.
9. Finish after minimum of one hour to match surrounding surface.
10. Flush out form tie holes, fill with patching mortar, patching compound, or precast cement cone plugs secured in place with bonding compound.
11. Cure repair areas by same methods as surrounding concrete or keep continuously damp for 7 days.

C. Repairing Unformed Surfaces:

1. Surface Defects Requiring Repair:
   a. Fine crazing cracks.
   b. Cracks larger than 0.012 inch wide or cracks which penetrate to reinforcing.
   c. Cracks penetrating completely through non-reinforced sections.
   d. Spalling, popouts, honeycomb, and rock pockets.
   e. High and low areas in slabs.
2. Correct high areas in hardened concrete by grinding after concrete has cured at least 14 days.
3. Correct high and low areas during, or immediately after, completion of initial floating operations by cutting high areas and by placing fresh concrete in low areas.
4. Repair defective areas, except isolated random cracks and single holes not exceeding 1 inch diameter, by cutting out and replacing with patching mortar or patching compound.
   a. Remove defective areas to sound concrete with clean, square cuts.
   b. Dampen concrete surfaces in contact with patching material and apply bonding grout by brushing into surface, after surface water has disappeared.
   c. Place patching mortar or patching compound before grout has set or dried.
   d. Compact and finish to blend with adjacent finished concrete.
   e. Cure in same manner as adjacent concrete.
5. Repair isolated random cracks and single holes not over 1 inch diameter with patching mortar.
   a. Groove top of cracks and cut out holes to sound concrete and clean area.
   b. Dampen cleaned surfaces and apply bonding grout by brushing into surface, after surface water has disappeared.
   c. Place patching material before bonding grout is set or dry.
   d. Compact in place and finish to match adjacent concrete.
   e. Keep patched area continuously moist for not less than 72 hours.

D. Structural Repairs: Contractor shall propose materials, methods, and procedures to the Architect for review and approval prior to proceed with structural repairs.

3.13 PROTECTION

A. Protect finished work in accordance with Section 017300.

B. Protect concrete from construction traffic, weather, or mechanical damage for 14 days after placing.

C. Provide raised runways for traffic areas.

D. Protect concrete from staining.

END OF SECTION

SECTION 033001 - CAST-IN-PLACE CONCRETE FOR LANDSCAPE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

B. Related Sections:

1. Section 321313 “Concrete Paving” for surface finish.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1. That do not contain Portland cement replacements.

B. Design Mixtures: For each concrete mixture.

C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement.

D. Samples: Provide a 3’ tall x 3’ long x 8” wide job site sample of each site wall finish specified, for review and approval by Owner’s Representative prior to installation. Sample shall represent final appearance of the site wall, including construction joints and any stain, sealer or other surface applications. Provide additional samples until finish is considered acceptable by the Owner’s Representative, at no additional cost to the Owner. The approved sample shall serve as a standard of appearance for the final work to be produced and shall remain on site until all site walls have been reviewed and approved by the Owner’s Representative.

1.3 INFORMATIONAL SUBMITTALS

A. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly and support of formwork.

B. Material certificates.

C. Material test reports.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

B. Testing Agency Qualifications: An independent agency, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

2.2 STEEL REINFORCEMENT

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 25 percent.

B. Reinforcing Bars: ASTM A 615/A 615M, deformed.

1. Galvanized Reinforcing Bars: ASTM A 767/A 767M, Class I zinc coated after fabrication and bending.
2. Epoxy-Coated Reinforcing Bars: ASTM A 775/A 775M, epoxy coated, with less than 2 percent damaged coating in each 12-inch bar length.

C. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.

D. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.

E. Galvanized-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from galvanized-steel wire into flat sheets.

F. Epoxy-Coated Welded Wire Reinforcement: ASTM A 884/A 884M, Class A coated, Type 1, deformed steel.

G. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice."

2.3 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, gray.
2. Blended Hydraulic Cement: ASTM C 595, cement.

B. Normal-Weight Aggregates: ASTM C 33, graded.

1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Lightweight Aggregate: ASTM C 330, 1/2 inch nominal maximum aggregate size.

D. Water: ASTM C 94/C 94M and potable.

2.4 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.5 FIBER REINFORCEMENT

A. Synthetic Micro-Fiber: Fibrillated polypropylene micro-fibers engineered and designed for use in concrete, complying with ASTM C 1116/C 1116M, Type III, 1/2 to 1-1/2 inches long.

2.6 WATERSTOPS

A. Flexible Rubber Waterstops: CE CRD-C 513, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

B. Chemically Resistant Flexible Waterstops: Thermoplastic elastomer rubber waterstops, for embedding in concrete to prevent passage of fluids through joints; resistant to oils, solvents, and chemicals. Factory fabricate corners, intersections, and directional changes.

C. Flexible PVC Waterstops: CE CRD-C 572, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

D. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch.

E. Self-Expanding Rubber Strip Waterstops: Manufactured rectangular or trapezoidal strip, bentonite-free hydrophilic polymer modified chloroprene rubber, for adhesive bonding to concrete, 3/8 by 3/4 inch.

2.7 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.

B. Sheet Vapor Retarder: Polyethylene sheet, ASTM D 4397, not less than 10 millimeters thick.

2.8 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz. /sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating.

G. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

1. VOC Content: Curing and sealing compounds shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

H. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

1. VOC Content: Curing and sealing compounds shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.9 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 4819, light weight polyethylene closed-cell expansion joint filler.

2.10 CONCRETE MIXTURES

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

B. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of Portland cement, which would otherwise be used, by not less than 40 percent.

C. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

D. Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 3000 psi at 28 days, unless otherwise indicated on the contract drawings.
2. Maximum Water-Cementitious Materials Ratio: 0.50.
3. Slump Limit: 4 inches, plus or minus 1 inch.
4. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
5. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size.
6. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.
7. Synthetic Micro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than 1.0 pound /cubic yards.

E. Proportion structural lightweight concrete mixture as follows:

1. Minimum Compressive Strength: 5000 psi at 28 days, unless otherwise indicated on the contract drawings.
2. Calculated Equilibrium Unit Weight: 115 lb. /cubic feet, plus or minus 3 pound /cubic feet, as determined by ASTM C 567.
3. Slump Limit: 4 inches, plus or minus 1 inch.
4. Air Content: 6 percent, plus or minus 2 percent at point of delivery for nominal maximum aggregate size greater than 3/8 inch.
5. Air Content: 7 percent, plus or minus 2 percent at point of delivery for nominal maximum aggregate size 3/8 inch or less.

6. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.
7. Synthetic Micro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than 1.0 pound /cubic yard.

2.11 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.12 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.

1. When air temperature is between 85 and 90 degrees F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 degrees F, reduce mixing and delivery time to 60 minutes.

2.13 ACCESSORIES

A. Pre-emergent Herbicide: Surflan.

B. Integral Color (Non-immersion Conditions: Davis Concrete Color or approved equal.

C. Chemical Surface Retarder: ‘Top-Cast’ by Grace Construction Products.

D. Liquid Surface Sealer: ‘HLQ-125 by Sinak Corporation.

E. Patch Bond: Weld-Crete.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Chamfer or radius exterior corners and edges of permanently exposed concrete.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.3 VAPOR RETARDERS

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.4 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.5 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

C. Waterstops: Install in construction joints and at other joints indicated according to manufacturer's written instructions.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

C. Cold-Weather Placement: Comply with ACI 306.1.

D. Hot-Weather Placement: Comply with ACI 301.

3.7 CONCRETE FINISHING

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part Portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white Portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part Portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white Portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

D. Related Unformed Surfaces: At tops of walls, steps, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

E. See plan for finishes and finish locations.

3.8 CONCRETE PROTECTION, CURING AND SEALING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 pound/square foot x height before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Concrete surface sealer: All concrete paving shall be sealed with a clear penetrating concrete sealer. If efflorescence or alkali-staining is evident after the concrete has cured, lightly wash the surface with a mild muriatic acid solution (usually a 10:1

dilution) that has been thoroughly rinsed with water and cleaned with diluted Lithochrome Floor Cleaner by L.M. Scofield, or approved equal. Rinse again and dry thoroughly. After concrete mix has cured for at least one month, the concrete surface shall be thoroughly washed with fresh, clean water. After surface is thoroughly dried, apply 'HLQ-125' as manufactured by SINAK Corporation, or approved equal, per manufacturer's specifications.

3.9 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

3.10 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

END OF SECTION

SECTION 033400-CONCRETE FLOOR FINISHES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes: Liquid floor treatments.

B. Related Sections include Division 03 Section "Cast-in-Place Concrete" for general building applications of concrete.

1.3 REFERENCES

A. American Society for Testing and Materials:

1. ASTM-C779, Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces.
2. ASTM G23-81, Ultraviolet Light & Water Spray.
3. ASTM C805, Impact Strength.

B. American Concrete Institute: ACI 302.1R-15, Guide for Concrete Floor and Slab Construction.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include the following:

1. Special concrete finishes manufacturer's specifications and test data.
2. Special concrete finishes describing products provided, giving manufacturer’s name, and product name for the specified material to be provided under this section.
3. Special concrete finishes manufacturer's recommended installation procedures; which when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the work.
4. Special concrete finishes technical data sheet giving descriptive data, curing time, and application requirements.

B. Test Reports: Certified test reports, prepared by an independent testing laboratory, confirming compliance with specified performance criteria.

C. Qualification Data: For product manufacturer.

D. Qualification Data: For installer. Data to include references from five, similar completed projects.

E. Maintenance Data: Submit manufacturer's instructions for maintenance of installed work, including methods and frequency recommended for maintaining optimum condition under intended use. Instructions should contain precautions against cleaning products and methods, which may be detrimental to finishes and performance.

1.5 QUALITY ASSURANCE

A. Product Manufacturer's Qualifications: Manufacturer of product in use for not less than five years, with successfully completed installations during that period.

B. Installer Qualifications: Certified by product manufacturer as being familiar with proper procedures and installation requirements required by the manufacturer.

C. Source Limitations: Obtain material of the same brand from the same manufacturer's plant.

D. Mockups: Apply finish at location indicated to demonstrate surface finish, floor treatments, and standard of workmanship. Mockup to be installed using the same Installer personnel who will perform work. Approved mockup may become part of the completed Work if undisturbed at time of Substantial Completion. Comply with the following:

1. Apply mock-up of finish to demonstrate typical joints, surface finish, color variation (if any), and standard of workmanship including patching technique.
2. Build mock-up approximately 50 square feet at location as directed by Architect.
3. If Architect determines that mock-up do not meet requirements, demolish and remove from the site and cast others until mock-ups are approved.
4. Maintain mock-up during construction in an undisturbed condition as a standard for judging the completed work.

E. Protection:

1. Diaper all hydraulic powered equipment to avoid staining of the concrete.
2. Do not park vehicles on inside slab. If necessary to complete their scope of work, place drop cloths under vehicles at all times.
3. Do not use pipe cutting machines on the inside floor slab.
4. Do not be place or store metals on interior slab to.
5. Avoid contact of acids and acidic detergents with slab.
6. Protect slab at all times.

1.6 PERFORMANCE REQUIREMENTS

A. Static Coefficient of Friction: For concrete surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028 (under wet conditions):

1. Level Surfaces: Minimum 0.6.
2. Step Treads: Minimum 0.6.
3. Ramp Surfaces: Minimum 0.8

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver the products in original, unopened containers, seals unbroken, with legible manufacturer's identification and information.

B. Store products in conditions recommended by manufacturer.

C. Dispense special concrete finish material from factory numbered and sealed containers. Maintain record of container numbers.

1.8 PROJECT CONDITIONS

A. Environmental Conditions: Maintain an ambient temperature of between 50^{o} and 90^{o} F during application and at least 48 hours after application.

B. Comply with manufacturers written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting topping performance.

C. Close areas to traffic during floor application and after application, for time period recommended in writing by manufacturer.

D. Protection: Precautions shall be taken to avoid damage or contamination of any surfaces near the work zone. Protect completed work from moisture or contamination.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

A. Cementitious Material: Refer to Division 03 Section "Cast-in-Place Concrete" for concrete materials, accessories, installation, and finishing:

2.2 LIQUID FLOOR FINISHES

A. VOC Content: Liquid floor treatments shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.

1. Products: Provide one of the following:

a. ChemMasters; Chemisil Plus.
b. Meadows, W. R., Inc.; LIQUI-HARD.
c. Or equal.

2. Location: Provide where indicated in “Materials and Color Schedule” on Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine areas and conditions under which work will be performed and identify conditions detrimental to proper and timely completion of work. Do not proceed until unsatisfactory conditions have been corrected.

B. Compliance with Manufacturer’s Instructions: Obtain, understand, and comply with the current versions of the manufacturer’s technical data sheets and installation instructions.

3.2 PREPARATION

A. General:

1. Newly placed concrete shall be sufficiently cured to allow concrete to become reactive; minimum number of days as recommended by product manufacturer, but not less than 28 days.
2. Do not use liquid curing materials. Cure concrete flatwork with new, unwrinkled, non-staining, high quality curing paper. Do not overlap curing paper.
3. Prepare substrate surfaces in accordance with product manufacturer’s written recommendations. Prepare concrete surface to remove all contaminants and provide a sound concrete surface free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants.

4. Comply with manufacturer's written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation and other conditions affecting the floor finish.

3.3 INSTALLATION, LIQUID FLOOR FINISHES

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.

1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
2. Do not apply to concrete that is less than seven days' old.
3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

3.4 INSTALLATION, JOINTS

A. Sawed Joints: Form joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks. Depth: 1/4-inch below elevation of polished surface.

3.5 PROTECTION OF FLOOR FINISHES

A. Protect floor finishes from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by floor treatments installer.

B. Protective Cover: Product: EZ Cover, or equal. Do not apply tape materials directly to polished concrete surface.

END OF SECTION

SECTION 042114- THIN BRICK VENEER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following: Thin brick veneer, including weather barrier, metal lath, and mortar, of the following types of thin veneer applications: Adhered to exterior sheathing framed exterior walls.

B. Related Sections include the following:

1. Division 6 Section “Sheathing” for fluid-applied air barrier.
2. Division 7 Section “Sheet Metal Flashing and Trim.
3. Division 7 Section “Joint Sealants”.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: Manufacturer’s complete line of colors, in patterns specified.

C. Brick Samples for Verification: For each color, grade, finish, and variety of brick required.

D. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, sources of supply, and other information as required to identify materials used. Include mix proportions for mortar and source of aggregates.

E. Manufacturer’s complete installation instructions.

1.4 QUALITY ASSURANCE

A. Applicable California Building Codes: 1405.9 Adhered masonry veneer. Adhered masonry veneer shall comply with the applicable requirements in Section 1405.9.1 and Sections 6.1 and 6.3 of ACI 530/ASCE 5/TMS 402 (Building Code Requirements for Masonry Structures, referred to as Masonry Standards Joint Committee Code, or MSJC).

B. Installer Qualifications: An installer who employs experienced brick installers who are skilled in installing brick veneer assemblies similar in material, design, and extent to those indicated for this Project and whose projects have a record of successful in service performance.

C. Source Limitations for brick veneer: Obtain each variety of brick, regardless of finish, from a single manufacturer with resources to provide materials of consistent quality in appearance and physical properties.

D. Source Limitations for Mortar Materials: Obtain ingredients of a uniform quality for each mortar component from a single manufacturer and each aggregate from one source or producer.

E. Mockups: Build mockup wall to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.

1. Build mockups for each type of brick veneer assembly in sizes approximately 48 inches long by 48 inches high by full thickness, including face and backup. Provide outside corner return approximately 24 inches long. Include reveal and trim pieces.
2. Protect accepted mockups from the elements with weather resistant membrane.
3. Approval of mockups is for color, texture, and blending of brick; relationship of mortar and sealant colors to brick colors; tooling of joints; and aesthetic qualities of workmanship.
4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.

F. Preinstallation Conference: Conduct conference at Project site.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

B. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.6 PROJECT CONDITIONS \

A. Protection of Brick Veneer Assemblies: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed brick veneer assemblies when construction is not in progress.

B. Stain Prevention: Immediately remove mortar and soil to prevent them from staining the face of brick veneer assemblies.

1. Protect base of walls from rain splashed mud and mortar splatter by coverings spread on the ground and over the wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at end of each day to prevent rain from splashing mortar and dirt on completed brick veneer assemblies.

C. Cold Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace brick veneer assemblies damaged by frost or freezing conditions. Cold Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

D. Warm-Weather Requirements: Protect mortar scratch coat against uneven and excessive evaporation and from strong flows of dry air, both natural and artificial. Apply and cure mortar as required by climatic and job conditions to prevent dry out during cure period. Provide suitable coverings, moist curing, barriers to deflect sunlight and wind, or combinations of these, as required.

E. Exterior Brick Work: Do not apply mortar scratch coat when ambient temperature is below 40 deg F.

F. Protect materials from rain, moisture, and freezing temperatures prior to, during, and for 48 hours after completion of work.

G. Allow no construction activity on opposite side of wall during installation and for 48 hours after completion of work.

1.7 WARRANTY

A. Special Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace thin brick veneer that fails in materials within specified warranty period. Material failures include manufacturing defects. Material Warranty Period: 5 years.

B. Special Installer's Warranty: 2 years.

PART 2 - PRODUCTS

2.1 WALL SYSTEM

A. Basis of Design: Subject to compliance with requirement, provide TABS Wall Systems, LLC composite wall system incorporating thin brick.

2.2 BRICK MANUFACTURERS

A. Thin Brick, Basis of Design: Subject to compliance with requirements, provide product manufactured by Endicott Thin Brick, LLC., to match brick veneer used on adjacent campus buildings. Comply with the following:

1. Material Standard: Thin Brick: ASTM C 1088, Type TBX or TBS, tested in accordance with ASTM C67.
2. Sizes: Modular 2-1/4 by 7 -5/8 by 1/2 inch.
3. Color: As selected by Architect from manufacturer's full range.
4. Trim Units: Manufacturer's standard corner, edge, transition, and termination brick units as required to complete installation.

2.3 WEATHER-RESISTANT BARRIER

A. Fluid-applied air barrier: Comply with requirements of Division 6 Section "Sheathing".

2.4 MORTAR MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I or Type II, except Type III may be used for cold-weather construction; natural color or white cement may be used as required to produce mortar color indicated.

B. Mortar Cement: ASTM C1329/C1329M.

C. Masonry Cement: ASTM C91/C91M.

D. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C979/C979M. Use only pigments with a record of satisfactory performance in masonry mortar.

E. Colored Portland Cement-Lime Mix: Packaged blend of portland cement, hydrated lime, and mortar pigments. Mix produces color indicated or, if not indicated, as selected from manufacturer's standard colors. Pigments do not exceed 10 percent of portland cement by weight.

F. Aggregate: ASTM C144 For pointing mortar, use aggregate graded with 100 percent passing No. 16 sieve.

G. Latex Additive: Acrylic-resin or styrene-butadiene-rubber water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement mortar bed, and not containing a retarder.

H. Water: Potable.

2.5 METAL LATH

A. Expanded-Metal Lath: ASTM C847, cold-rolled carbon-steel sheet with ASTM A653/A653M, G60, hot-dip galvanized-zinc coating. Diamond-Mesh Lath: Self-furring], 3.4 lb/sq. yd..

2.6 MISCELLANEOUS MATERIALS

A. Bonding Compound: ASTM C932.

B. Fasteners for Attaching Metal Lath to Substrates: ASTM C1063.

2.7 FLASHINGS

A. Stainless Steel: ASTM A 666, Type 304, soft temper; 26 gage (0.45 mm) thick; finish 2B to 2D.

2.8 ACCESSORIES

A. Joint Filler: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self expanding; 1/2 inch wide x by maximum lengths available.

B. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces indicated to receive brick veneer assemblies for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Verify that substrate is flat and even, and within tolerances required by brick manufacturer.

C. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protect adjacent work from soiling, spattering, moisture deterioration, and other harmful effects caused by scratch coat and veneer adhesion work.

3.3 INSTALLING METAL LATH AND WEATHER-RESISTANT BARRIER INSTALLATION

A. Include components required by and comply with stipulations in Wall System Article.

3.4 INSTALLATION OF METAL LATH

A. Metal Lath: Install according to ASTM C1063.

3.5 INSTALLATION OF ACCESSORIES

A. Install according to ASTM C1063 and at locations indicated on Drawings

3.6 APPLICATION OF CEMENT BASE-COAT

A. General: Comply with ASTM C926.

1. Do not deviate more than plus or minus 1/4 inch in 10 feet from a true plane when measured by a 10-foot straightedge placed on surface.
2. Provide cement base-coat ready to receive field-applied finishes indicated.

B. Install thin brick in accordance with BIA Technote 28C or appropriate industry standards.

C. Bonding Compound: Apply on concrete substrates for direct application of cement base-coat.

3.7 THIN BRICK VENEER INSTALLATION

A. General: Install in accordance with Wall System Article and manufacturer’s written instructions.

B. Perform necessary field cutting as brick is set. Cut lines straight and true, with edges eased slightly to prevent snipping.

C. Sort brick before it is placed in wall to remove brick that does not comply with requirements relating to aesthetic effects, physical properties, or fabrication, or that is otherwise unsuitable for intended use.

D. If brick is being applied in hot or dry weather, the back of each piece shall be moistened with a fine spray of water or a wet brush to adequately prevent excessive absorption of moisture from the mortar.

E. Install scratch coat over metal lath 1/2-inch to 3/4-inch thick, over weather resistive barrier to comply with ASTM C 926.

F. Coat backs of brick units and edges with setting mortar. Use sufficient setting mortar so a slight excess will be forced out the edges of brick units as they are set. Press units firmly into place in soft mortar bed, wiggle and apply slight pressure to unit to ensure firm bonding, completely filling space between units and scratch coat and causing mortar to extrude slightly around edges of units.

G. Arrange and trim brick for accurate fit in running bond pattern with uniform course heights, random lengths, and uniform joint widths to match existing.

H. Grout all joints to receive mortar with Portland cement mortar.

I. Tooled joint to match existing full brick jointing.

3.8 ADJUSTING AND CLEANING

A. Remove and replace thin brick veneer assemblies of the following description:

1. Broken, chipped, stained, or otherwise damaged brick. Brick may be repaired if methods and results are approved by Architect.
2. Defective joints.
3. Brick veneer assemblies not matching approved samples.
4. Brick veneer assemblies not complying with other requirements indicated.

B. Replace in a manner that results in brick veneer assemblies' matching approved samples, complying with other requirements, and showing no evidence of replacement.

C. In Progress Cleaning: Clean brick veneer assemblies as work progresses. Remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean brick veneer assemblies as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Wet wall surfaces with water before applying cleaner; remove cleaner promptly by rinsing thoroughly with clear water.
3. Clean brick veneer assemblies by bucket and brush hand cleaning method described in BIA Technical Note No. 20 Revised II, using job mixed detergent solution acceptable to brick manufacturer.

END OF SECTION 042114

SECTION 042200 - REINFORCED CONCRETE MASONRY UNITS

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Section 033000: Cast-in-Place Concrete.

1.2 SUBMITTALS

A. Mortar Color Selection: Submit 2 copies of manufacturer's standard color selection for mortar color. Architect's review will be for color only. Compliance with all other requirements is the exclusive responsibility of the Contractor.

B. Samples: Submit two sets of masonry unit samples for approval, showing full range of variation in texture and color of the material. Masonry used in the work shall be within the approved limits.

1.3 QUALITY ASSURANCE

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, with all units from the same batch, through one source from a single manufacturer.

B. Testing Laboratory Services: Laboratory selection, payment and reports in conformance with Quality Control Services Section. Perform following tests:

1. Concrete Masonry Units: Sampled and tested in accordance with ASTM C55, C90, C140, and C426 in addition, shall have a maximum linear shrinkage of .06 percent from the saturated to the oven dry condition. As an alternate, manufacturer shall provide certificates of product compliance certified by an independent testing laboratory. Certificates shall not be older than three years.

2. Cement: Sample and test cement or provide mill test reports.

3. Mortar and Grout Tests: Take minimum of one set of cylinders on each of first three days of masonry work and at least at one week intervals thereafter.

C. Masonry Inspection: Masonry work will be continuously inspected during laying by an inspector approved and paid by Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Smooth Face Hollow Concrete Masonry Units: ASTM C90, medium weight smooth face, uniform gray color.

1. Provide open end units or "H" block units, for stacked bond pattern.

2. Provide bond beam units at horizontal reinforcing.

3. Provide open end units at vertical reinforcing.

4. Special color as selected, using gray cement.

2.2 MORTAR AND GROUT MATERIALS

A. Cement: For mortar and grout: Type I or Type II Portland Cement conforming to ASTM C150. Type II Portland Cement may be used only if it equals strength of Type I. All cement used (mortar and grout) shall be low alkali type (0.6% maximum).

B. Sand: Sand for mortar shall conform to ASTM C144, except that not less than 3 per cent of sand shall pass #100 sieve. Sand for grout shall conform to ASTM C404.

C. Pea Gravel: Conforming to ASTM C33. Size Range No. 8 to 3/8 inch.

D. Lime Putty: Made from hydrated lime conforming to ASTM C207.

E. Water: Taken from a potable source.

F. Grout Admixture: Sika Chemical Corporation "Sika Grout Aid Type II."

2.3 MORTAR AND GROUT MIXES

A. Mixing: Accurately measure materials for mortar and grout in suitably calibrated devices. Measurements based on dry loose volume. Shovel measurements or fractional sack batches not acceptable. Place sand, cement and water, in that order, in mixer and mix for at least two minutes For mortar, add lime and continue mixing for at least 10 more minutes or as much longer as required to secure a uniform mass. Retemper mortar only by adding water into a basin made with mortar. Work mortar carefully in. Remove from work any mortar or grout which is unused within one hour after initial mixing.

B. Proportion grout by volume with sufficient water added to produce consistency for pouring without segregation.

C. Do not use calcium chloride in mortar or grout.

D. Mortar: Strength as required to achieve masonry assembly strength as noted in the drawings but no less than 1800 psi at 28 days.

E. Grout: Strength as required to achieve masonry assembly strength as noted in the drawings but no less than 2000 psi at 28 days.

F. Admixtures:

1. Add admixtures in accordance with admixture manufacturer’s instructions.

PART 3 - EXECUTION

3.1 REINFORCING

A. General: Clean free of loose rust, mill scale, earth, or other materials which will reduce bond to mortar or grout. Do not use reinforcing bars with kinks or bends not shown on drawings or final shop drawings, or bars with reduced cross-section due to excessive rusting or other causes.

B. Position reinforcing accurately at the spacing shown. Support and secure vertical bars against displacement. Horizontal reinforcing may be placed as the masonry work progresses. Where vertical bars are shown in close proximity, provide a clear distance between bars of not less than the nominal bar diameter or 1 inch (whichever is greater).

C. Splice reinforcing bars where shown; do not splice at other points unless acceptable to the Architect. Provide lapped splices, unless otherwise shown. In splicing vertical bars or attaching to dowels, lap ends, place in contact and wire tie.

1. Provide not less than minimum lap shown, or if not shown, as required by governing code.

2. Weld splices where shown. Comply with the requirements of AWS D1.4 for welding materials and procedures and with Section 033000 for welded reinforcement.

D. Completely embed all bars in mortar or grout for joint reinforcement embedded in horizontal mortar joints, and provide not less than 5/8 inch mortar coverage on exterior face of walls and 1/2 inch at other locations. For all other reinforcement provide minimum coverage of one bar diameter over all bars, but not less than 3/4 inch except where exposed to weather or soil in which case provide minimum coverage of 2 inches.

3.2 INSTALLATION, GENERAL

A. Lay-up walls plumb and true and with courses level, accurately spaced and coordinated with other work. Lay up masonry so that variations in texture and color will be evenly distributed throughout the masonry work.

B. Clean concrete surfaces receiving first course of masonry by removing entire surface of concrete, exposing clean aggregate.

C. Cut masonry units with motor-driven saw designed to cut masonry with clean sharp, unchipped edges. Cut units as required to provide pattern shown and to fit adjoining work neatly. Use full units without cutting wherever possible.

D. Carry masonry courses up at the same level at wall intersections and corners, or slope back. No toothed joints permitted. Keep core space free of mortar droppings and other debris.

E. Top of walls, piers, parapets and the like not covered shall be filled with grout and troweled smooth.

F. Bond Pattern:

1. Running bond.

G. Joints: Maintain joint widths shown, except for minor variations required to maintain bond alignment. If not otherwise indicated, lay walls with 3/8 inch joints. Cut joints flush for masonry walls which are to be concealed or to be covered by other materials. Tool exposed joints slightly concave. Rake out mortar in preparation for application of calking or sealants where shown.

H. Built-in Work: As the work progresses, build-in items specified under this and other sections of these specifications. Fill in solidly with masonry around built-in items.

1. Fill space between hollow metal frames and masonry solidly with mortar.

2. Install reglets and nailers for flashing and other related work where shown to be built into masonry work.

3. Install bolts, dowels, plates, anchors, hangers and the like where shown to be built into masonry for work of other trades.

4. Install loose lintels of steel and other materials where shown.

5. Solid grout hollow metal door frames where shown.

I. Build chases and recesses as shown and as required for the work of other trades.

3.3 GROUTING

A. Vertical cells shall have vertical alignment, to maintain continuous unobstructed vertical cell area of 3-by-3 inches minimum. Grout shall be sufficiently fluid to ensure complete filling of all sections of units, but not so thin as to allow segregation of aggregate.

1. Grout all cells.

B. In no case shall grout contain more than 7-1/2 gallons of water per sack of cement.

C. Grout pours in excess of 4’-0” height shall be provided with cleanouts.

D. Unless high-lift method is used the maximum lift of grout pour shall be 4’-0”.

E. When grouting is stopped for a period of one hour or longer, horizontal construction joints shall be formed by stopping the grout one inch below top of uppermost unit.

F. High lift grout method may be used complying with the following:

1. TMS 602 § 3.5 (CBC § 2104A.1.3.1.1.1.2 for DSA & OSHPD).

3.4 CURING

A. Do not saturate with water for curing or any other purpose.

3.5 REPAIR, POINTING AND CLEANING

A. Remove and replace masonry units which are loose, chipped, broken, stained or otherwise damaged, or if units do not match adjoining units as intended. Provide new units to match adjoining units and install in fresh mortar or grout, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge any voids or holes, except weep holes, and completely fill with mortar. Point-up all joints at corners, openings and adjacent work to provide a neat, uniform appearance, properly prepared for application of caulking or sealant compounds.

C. Repair of Cores: Neatly patch core holes, restoring walls as nearly as possible to original appearance.

D. Cleaning: Exercise extreme care to prevent mortar from coming in contact with exposed concrete masonry surfaces. Remove excess mortar immediately from surfaces to prevent stain. Completed masonry work shall be free of stains or marks from mortar or grout or other foreign materials.

E. Cleaning at Completion: Tuck point holes 1/8 inch or more. Grind off lumps, clean debris and surplus. Leave the masonry clean and free of mortar drops.

END OF SECTION

SECTION 050523 - WELDED STUD CONNECTORS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Welded Stud Connectors (on embed plates, beam, or columns)

1.2 RELATED SECTIONS

A. Section 051200- Structural Steel

1.3 QUALITY ASSURANCE

A. Reference Specifications:

1. American Society for Testing and Materials (ASTM): A108 Steel Bars, Carbon and Alloy, Cold-Finished, Standard Quality.
2. American Welding Society (AWS): D1.1 Structural Welding Code, Steel
3. ICC ESR-2907 or equivalent.

B. Welder's Qualifications: Qualified in accordance with AWS D1.1

1.4 SUBMITTALS

A. Product Data: Submit the stud manufacturer's technical product data, including detailed equipment and installation requirements, and maintain copies available at the site.

1.5 PACKAGING, DELIVERY, STORAGE, AND HANDLING

A. Protect materials from damage during shipping, handling, and storage at the site. Deliver studs to site in unbroken sealed packages bearing manufacturer's name and label identifying the contents.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Studs: Standard product steel stud units intended for welding by automatically timed stud-welding equipment, furnished complete with an arc shield (ferrule) of heat-resistant ceramic or equivalent for all studs and, for studs 5/16-inch diameter or larger, a deoxidizing and arc stabilizing flux; not painted, galvanized, or cadmium plated prior to welding and all finished by cold heading, cold rolling, or machining. Furnish studs of uniform quality and condition, free of injurious laps, fins, seams, cracks, twists, bends not indicated, rust, rust pits, scale, oil, or other injurious defects or substances.

B. Steel: Furnish studs manufactured of Grade C-1015 cold-drawn steel conforming to ASTM A108 and having minimum 60,000 psi tensile strength with 20 percent elongation in 2 inches and 50 percent area reduction.

PART 3 - EXECUTION

3.1 PREPARATION

A. Cleaning: Clean steel surfaces to receive studs of all paint, scale, rust, and other injurious substances by wire brushing, peening, prick-punching, grinding, or other methods as required to produce clean bare substrates.

B. Preparation for Replacement Studs and Repairs: Repair steel surfaces as follows wherever a defective stud is removed. Make the areas where a stud is removed flush and smooth if the surface remains exposed in the Work. Complete repairs before installing a replacement stud on a defect area.

C. Areas Subject to Tensile Stress: Make areas flush and smooth. If the base metal has been pulled out by the stud removal, fill the pocket by shielded metal-arc welding conforming to AWS D1.1 using low-hydrogen electrodes, and grind the weld surfaces flush.

D. Areas Subject to Compression: Where the stud failures are confined to shanks or fusion zones of the studs, a new stud may be installed adjacent to the defective area in lieu of repairing the defective area and installing a replacement stud, subject to approval. If metal is pulled out of the base metal, fill the pocket as above for tensile areas except, if defect depth is not more than the lesser of 1/8 inch or 7 percent of the base metal thickness, the defect may be faired by grinding in lieu of weld filling.

3.2 STUD WELDING

A. Conform installations to stud manufacturer's instructions and requirements herein.

1. Welding equipment: Furnish automatically timed stud-welding equipment together with a suitable power source, type and manufacture approved by the stud manufacturer. Interlock the welding equipment supplying current to two or more stud-welding guns so that only one gun can operate at a time and so the power source has fully recovered from making one weld before another weld is started.
2. Installation: Do not install studs on wet surfaces, nor studs showing defects, rusting, rust pits, scale, oil, or other deleterious substances. Install studs promptly after cleaning and preparation. Hold welding gun in correct position and without movement until the weld metal has solidified. Break and remove arc shield after welding. Produce welded studs free from any defect or substance that interferes with intended functions.
    a. Placing locations: The longitudinal and lateral spacings for all stud connectors with respect to each other and to edges of member may vary 1/2-inch maximum from locations shown provided adjacent studs are not closer than 3 inches on centers. Provide a minimum distance between edges of stud bases and flange edges equal to the stud diameter plus 1/8 inch, but minimum 1 inch clearance. Location accuracy of other types of studs shall permit the assembly of attachments without alterations or reaming.
    b. Stud lengths: Stud lengths indicated are minimum net lengths after welding. If reduction in length of a stud as it is welded is such that the length of the stud is more than 1/16 inch greater than specified by stud manufacturer, discontinue installation until cause is determined and eliminated and pre-production testing is satisfactorily repeated.
    c. Defective fillets: Studs not showing a full 360-degree weld fillet after welding may be repaired by adding a 3/16-inch fillet weld in lieu of the missing weld fillet in accordance with AWS D1.1 and using low-hydrogen electrodes.

3.3 FIELD QUALITY CONTROL

A. Inspection: Perform pre-production testing, stud installation, and production testing under continuous inspection of the testing laboratory specialist welding inspector. In addition to the standard reports, inspector's reports shall detail the location of all defective studs with repair or replacement action taken, damage resulting from stud installation, and all defects and unusual occurrences.

B. Pre-Production Testing: Perform the following tests with each welding equipment power source at the start of each production period (time interval from start-up to any shut-down of any stud-welding equipment), at the start of any new welding procedure, and after any change in the welding procedure.

1. Studs other than shear connectors: Weld two studs to separate material in the same general position (such as flat, vertical, sloping, or overhead) and of similar steel material and thickness as members to receive studs. After cooling, hammer bend the studs to a 30-degree angle. If failure occurs in any stud shank, ascertain and correct the cause before making further welds. If a failure occurs in the weld zone of either stud, correct the procedure and successfully weld and test two successive studs before any studs are welded to members.

C. Production Inspection and Testing:

1. Inspection of studs other than shear connector: Test at least one stud in every one hundred studs by hammer bending to a 15-degree angle or, if the stud threaded, torque test with a calibrated torque wrench to an approved value for stud diameter and thread in an approved device. If the stud fails, correct the welding procedure as required herein for pre-production testing and bend or torque test two more in-place studs. If either of the two second studs fail, all studs represented by the tests shall be bend or torque tested, or shall be rejected and replaced. The extent of additional inspection and testing for critical structural connections shall be as designated by the Structural Engineer.

D. Straightening: Leave in a bent condition those stud shear connectors and shear transfer devices that are bent less than 16 degrees and are free of failure provided no portion of the studs is within 1 inch of an exposed concrete surface. Perform stud bending and straightening without heating and before completion of each day's stud welding. Obtain inspection and approval of straightened studs before covering.

E. Load testing: Testing laboratory shall load test studs in the extent and by methods directed.

END OF SECTION

SECTION 051200 -STRUCTURAL STEEL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Structural steel work is as shown on drawings, including schedules, notes, and details to show size and location of members, typical connections and type of steel required.

B. Structural steel is that work defined in AISC" Code of Standard Practice" and as otherwise shown on drawings.

C. Shop priming and field touch-up to extent specified.

D. Grouting under base plates.

E. Employment of a licensed surveyor registered in State of California to certify lines and levels of installed structural steel.

1.2 RELATED SECTIONS

A. Section 032000 – Reinforcing Steel.

B. Section 050523 – Welded Stud Connectors.

C. Section 055000 - Metal Fabrications: Steel fabrications affecting structural steel work.

D. Section 055100 – Metal Stairs.

1.3 UNIT PRICES - MEASUREMENT AND PAYMENT

A. See Section 012200 - Unit Prices, for additional unit price requirements.

B. Structural Steel Framing:

1. Basis of Measurement: By the ton.
2. Basis of Payment: Includes structural members fabricated, placed, and anchored.

1.4 REFERENCES

A. AISC (MAN) - Steel Construction Manual; American Institute of Steel Construction, Inc. – 15th edition.

B. AISC Specifications for the Design Fabrication and Erection of Structural Steel for Buildings, including the Commentary and Supplements thereto as issued.

C. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges; American Institute of Steel Construction, Inc.

D. AISC Specification for Structural Joints Using ASTM F3125/F3125M Bolts.

E. ANSI/AISC 360 – Specification for Structural Steel Buildings; 2016.

F. AISC – Specification for Architectural Exposed Structural Steel.

G. California Code of Regulations (CCR) Title 24 California Building Code (CBC), 2022.

H. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society, 2020.

I. AWS D1.8/D1.8M –Structural Welding Code - Seismic Supplement, 2016.

J. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society, 2012.

K. SSPC-Paint 15 - Steel Joist Shop Primer; Society for Protective Coatings.

L. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings.

M. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.

N. ASTM A36/A36M - Standard Specification for Carbon Structural Steel, 2014

O. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless, 2012

P. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold Finished, 2013

Q. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products, 2015.

R. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware, 2016

S. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, and Threaded Rod 60 000 PSI Tensile Strength, 2014.

T. ASTM A449 - Standard Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use, 2014.

U. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes, 2013.

V. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing, 2014.

W. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts, 2015

X. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel, 2015.

Y. ASTM A913/A913M Standard Specification for High Strength Low-Alloy Steel Shapes of Structural Quality, Produced by Quenching and Self-Tempering Process (QST), 2015.

Z. ASTM A992/A992M - Standard Specification for Structural Steel Shapes, 2015.

AA. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink), 2014.

BB. ASTM E94 - Standard Guide for Radiographic Examination Using Industrial Radiographic Film; 2017.

CC. ASTM E164 - Standard Practice for Contact Ultrasonic Testing of Weldments, 2013.

DD. ASTM E165/E165M - Standard Practice for Liquid Penetrant Examination for General Industry; 2012

EE. ASTM E709 - Standard Guide for Magnetic Particle Testing; 2015.

FF. ASTM F436/F436M - Standard Specification for Hardened Steel Washers, Inch and Metric Dimensions; 2016

GG. ASTM F959/F959M - Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners, Inch and Metric Dimension; 2017.

HH. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength, 2015.

II. ASTM F3125/F3125M – Standard Specifications for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions; 2015.

1.5 SUBMITTALS

A. See Section 013300 - Administrative Requirements, for submittal procedures. Allow adequate time to check the number of drawings in each submittal. A normal two-week turnaround time applies to individual non-overlapping submittals not exceeding 250 sheets.

B. Product Data: Submit copies of producers or manufacturer’s specifications and installation instructions for the following products. Include laboratory test reports and other data required to show compliance with these specifications (including specified standards).

C. Certified Mill Test Reports: Structural Steel (each type) indicates chemical, physical properties, destructive test analysis and non-destructive test analysis.

D. Welding electrodes.

E. Welding gas.

F. Unfinished bolts and nuts.

G. Structural Steel Primer Paint.

H. High-strength bolts, including nuts and washers.

I. Shop Drawings: Submit shop drawings, including complete details and schedules for fabrication and shop assembly of members, and details, schedules, procedures, and diagrams showing the sequence of erections. Fully detail minor connections and fastenings not shown or specified in the Contract Documents to meet required conditions using similar details as shown in the Contract Documents. Include a fully detailed, well controlled sequence and technique plan for shop and field welding that minimizes locked-in stresses and distortion; submit sequence and technique plan for review by the SEOR.

1. Include details of cuts, connections, camber, holes per Figure 5.2 of AWS D1.1 or AISC Section J1.8, weld position plan and other pertinent data. Indicate welds by standard AWS symbols, and show size, length and type of each weld, and the requirements of AISC 341 Section 5.2.
2. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed for work specified in other sections.
3. Shop drawings shall use the “United States Standards” system dimensioning (feet, inches, etc.). Shop drawings which use only metric system of measurements will be rejected.
4. Shop drawings shall be drawn on sheet sizes not less than 24” x 32”.
5. During the shop drawings submittal phase if the Contractor cannot establish approved document within two submissions he will assume the responsibility for the additional cost incurred by the Architect for the additional reviews.
6. No deviation of structural details or framing shall be made in the shop drawings without prior approval by DSA and the SEOR/Architect.
7. All approved deviations from the contract documents through the Request for Information (RFI) process shall be referenced on the shop drawings with appropriate RFI numbers.
8. Maximum number of shop drawing sheets in any submittal shall not exceed 250 for a minimum two-week review period by the SEOR. The review period for additional submittals will begin at the end of the previous submittal review.
9. Erection and Bracing Plan and Erection Procedure: Employ a professional engineer licensed in the State of California to prepare an erection and framing plan including column, beams, and girders. In accordance with Title 8 CCR, Section 1710. This engineer shall be solely responsible for compliance with the plans. Keep a copy at site as required by the governing agency and the California Division of Industrial Safety. The plan shall follow the minimum procedures described below. Provide descriptive data to illustrate structural steel erection procedure including the following:
    a. Equipment & method to be used in structural steel erection.
    b. Sequence of erection.
    c. Provisions to be made for stresses resulting from loads imposed by piles of materials, erection equipment or other loads on the framing during erection.
    d. Extent of completion and guying required for the intermediate floors between the floors being erected and the concrete poured floors.
        1) List of beams to be galvanized.
        2) List of stress relieved joints.

J. Weld Procedures: Contractor shall submit all welding procedures applicable to the project, stamped and signed by an AWS/CWI Inspector licensed in the State of California, for review by the owners testing and inspection firm, the SEOR and DSA. Welding procedures shall be qualified as described in AWS D1.1, Section 3 or 4. All CJP single and/or double groove welds shall be back gouged unless otherwise noted on the drawings. Weld procedure shall indicate joints details and tolerances, back gouge, preheat and interpass temperature, post heat treatment, single or multiple stringers passes, peening of stringer passes for groove welds except for the first and the last layers, electrode type and size, welding current polarity and amperes and root treatment. The welding variables for each stringer pass shall be recorded and averaged, from these averages the weld heat input shall be calculated.

K. Test Reports: Submit copies of tests conducted on shop and field welds and bolted connections. Include data on type of tests conducted and test results.

L. Provide Procedure Qualification Record (PQRs) in accordance with AWS D1.1.

M. Welders Certificates: All field welders shall be job certified per AWS D1.1. All shop welders shall be job certified for FCAWS per AWS D1.1. Welders working on restricted access joints shall be certified per AWS D1.8.

1.6 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC "Steel Construction Manual" in an AISC certified shop (LA City certified shop is an approved alternate).

B. Comply with Section 10 of AISC 303 "Code of Standard Practice for Steel Buildings and Bridges" for architecturally exposed structural steel.

C. Maintain one copy of each document on site.

D. Fabricator: See Paragraph **Error! Reference source not found.**.

E. Erector: See Paragraph **Error! Reference source not found.**.

F. Except per prequalified welds per AWS D1.1, weld procedures for non-rigid frame connections shall be qualified and must be reviewed and approved by the SEOR and DSA.

G. Continuous inspection by a Registered Deputy Inspector hired by the owner and approved by the SEOR and DSA will be provided during fabrication.

H. To assure the proper amperage and voltage of the welding process, the use of the handheld calibrated amp and voltmeter shall be used. The hand-held amperage and volt meters shall be calibrated at the start of each shift or once a day as a minimum.

This equipment shall be used by the fabricator, erector, and the inspectors. Amperage and voltage shall be measured near the arc. Travel speed and electrode stick out shall be verified to be in compliance with the approved welding procedures.

I. Inspection agency approved by the SEOR and DSA will perform visual inspection of all welds.

J. Contractor's Responsibility: The Contractor alone shall be responsible for correct fitting of structural members and the elevation and alignment of the finished structure. The Contractor shall be responsible for establishing, setting and maintaining control points and building lines to be used in plumbing the structural steel frame in accordance with AISC Code of Standard Practice, Sections 7.12 and 7.13, and shall verify the following:

1. Verify that anchor bolts are located as specified on the Drawings and are in proper relation to the control points and building lines, prior to setting of structural steel.
2. Verify that structural steel members have been located, elevated, plumbed and aligned in relation to the control points and buildings lines, within the tolerance permitted by AISC Code of Standard Practice, Sections 7.12 and 7.13, and as specified in Section 3.3. Any adjustments necessary in the steel frame because of fabrication, construction or erection discrepancies in elevations and alignment shall be the responsibility of the Contractor.
3. At the location identified by Floor, record steel elevations prior to, and after the completion of concreting operations. Readings shall be taken from below the steel members. Locations of readings shall be marked in a manner which will allow subsequent elevations to be taken at the same points. These data shall be submitted to the SEOR for review.

K. Survey Work:

1. Contractor shall employ a registered surveyor to establish control points and layout work for the Building Control Lines, The Contractor shall conduct layout work and elevations for erection of structural steel.
2. Check elevations of concrete bearing surfaces and anchor bolts locations prior to erection and submit any discrepancies to Architect prior to start of erection. Corrections or adjustments to the structural steel shall be made and submitted for approval prior to start of erection.
3. Upon completion of erection of steel frame and before the start of work specified in other sections that are supported, attached or applied to the frame, make a final survey of the frame and submit a report to the Architect within 3 days certifying compliance with the specified tolerances.

L. Codes and Standards: Comply with Paragraph 1.4 and provisions of following, except as otherwise indicated:

AISC "Code of Standard Practice for Steel Buildings and Bridges AISC "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings" and including the Commentary" and Supplements thereto as issued.

AWS D1.1 "Structural Welding Code.

ASTM-A6 "General Requirements for Delivery of Rolled Steel Plates, Shapes. Sheet Piling and Bars for Structural Use."

CCR, Title 24, Chapter 22A – California Building Code, 2022

M. Qualifications for Welding Work: Qualify welding processes and welding operators in accordance with the AWS "Procedure Qualification" and "Welder Qualification".

N. Source Quality Control: Materials and fabrication procedures are subject to inspection and test in mill, shop and field, conducted by a qualified inspection agency appointed by the Architect. Such inspections and tests will not relieve contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.

O. Testing Laboratory shall perform conformance testing in accordance with CBC Chapter 17A.

1. Identified Structural Steel: Steel shall be identified in accordance with ASTM A6 and bear legible heat numbers acceptable to the Testing Laboratory which shall make positive identification of structural steel as to mill source, heat numbers, and certified mill analysis and test report for each heat. Obtain the mill test reports and furnish report certifying identity of steel.
2. Unidentified Structural Steel: Steel not identified and certified as specified above shall be tested according to following requirements. Structural steel fabricator shall cut samples under direction of the Testing Laboratory. Testing Laboratory shall machine or otherwise prepare the specimens and perform testing of each 5 tons or fraction thereof, for each size of unidentified steel except, in the case of random pieces or steel having Fy equal to or greater than 36 ksi, testing of each piece is required. Tests required are:
   a. For pipe, one tension and elongation test and one flattening test of each size.
   b. For all other steel, one tension and elongation test and one bend test for each size.
   c. Additional test per Paragraph **Error! Reference source not found.** may be required for quantity when deemed necessary by the Architects or by the governing agency.
   d. Contractor shall reimburse to the owner all costs paid by the owner for testing unidentified steel.
3. For all other unidentified steel having Fy equal to or greater than 36 ksi, one tension and elongation test and one bend or flattering test, as applicable, for each heat plus steel manufacturer's certified mill analysis and test report as specified above shall be performed.
4. Testing of High Strength, Bolts, Nuts and Washers: In accordance with CBC Chapter 17A.
5. Promptly remove and replace materials or fabricated components which do not comply.

P. Design of Members and Connections: Details shown are typical; similar details apply to similar conditions, unless otherwise indicated. Verify dimensions at site whenever possible without causing delay in the work.

Promptly notify the Architect whenever design of members and connections for any portion of structure are not clearly indicated.

Q. For Exposed Structural Steel: Perform work in accordance with AISC – Specification for Architectural Exposed Structural Steel.

R. Preheat and Interpass Temperatures:

1. The preheat temperatures and conditions given in AWS D1.1, Chapter 3 shall be strictly observed with special attention given to Paragraph 3.5 for the thickness of material to be welded.
2. Preheat temperatures should be measured at a distance from the weld equal to the thickness of the part being welded, but not less than three inches in any direction including the through thickness of the piece. Where plates are of different thickness, the pre-heat requirements for the thicker plate should govern. Maintenance of pre-heat temperatures through the execution of the weld (i.e. the interpass temperature) is essential. Maximum interpass temperature should be limited to 550 degrees Fahrenheit for all complete joint penetration welds. Welding operators and inspectors shall be in possession of and utilizing temperature measure devices. Temperature indicating sticks may be used.

S. When ambient temperature drops below 50°F or under circumstances where the wind chill at higher temperature would increase the heat loss to be equivalent to a temperature of 50°F controlled cooling shall be provided by wrapping insulating blankets over the welded assembly immediately after completion of welding.

T. Where noted on drawings, perform work in accordance with AISC “Specification for Architectural Exposed Structural Steel” (AESS).

1.7 QUALIFICATIONS

A. Qualifications: Contractor shall determine, warrant, and certify that producer, detailer, fabricator, erector, materials suppliers and all other involved in the Work of this Section with minimum five years documented experienced for at least five buildings of 3 stories or more in height.

1.8 FIELD MEASUREMENTS

A. Verify that field measurements are as shown on the Contract Documents. Contractor shall furnish accurate as-built drawings of bolt settings for work specified in this section and other sections.

1.9 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to site at such intervals to insure uninterrupted progress of work. Protect all steel materials from damage during shipping, handling, and storage on the site. Steel showing dents, creases, deformations, weathering, or other defects is not acceptable. Deliver welding electrodes to site in unbroken packages bearing the manufacturer's name and label identifying the contents.

1. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete, in ample time to not delay that work. Anchor bolts and template delivery shall be indicated as a milestone date on the project construction schedule.

B. Storage of fabricated steel at the site shall be the responsibility of the Contractor. Store materials to permit easy access for inspection and identification. Keep steel members off ground, using pallets, platforms, or other supports. Protect steel members and package materials from corrosion and deterioration.

C. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as required by the architect.

D. Other material shall be stored in weather-tight containers until ready for use in the Work. Containers must be stored in a dry place.

E. The Architect reserves the right to reject any material that has become damaged because of improper storage.

F. Storage areas must be shown on the current site use plan.

G. High-strength bolts and certificates shall be identified, stored and tracked at the site until they are installed.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel Angles and Channels: ASTM A36/A36M, ASTM/A572 Grade 50 if noted on the drawings.

B. Steel W Shapes and Tees: ASTM A992/A992M.

C. Rolled Shapes: ASTM A913/A913M Grade 65 if noted on the drawings.

D. Built-up column and connection plates ASTM A572, Grade 50 steel.

E. Steel Plates and Bars: ASTM A572/A572M, Grade 50 (345) high-strength, columbium-vanadium steel, or as indicated on the drawings.

F. Structural Tubing: ASTM A500, Grade C.

G. Pipe: ASTM A53/A53M, Grade B, Finish black.

H. Shear Stud Connectors: Made from ASTM A108 Grade 1015 bars.

I. Structural Bolts and Nuts: Carbon steel, ASTM A307, Grade A galvanized to ASTM A153/A153M, Class C.

J. High-Strength Structural Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, medium carbon.

K. High-Strength Structural Bolts: ASTM F3125/F3125M, with matching ASTM A563 (ASTM A563M) nuts and ASTM F436 washers; Type 1 alloy steel.

L. Unheaded Anchor Rods: ASTM F1554, Grade 55 S1 (UNO), plain, with matching ASTM A563 or A563M nuts and ASTM F436 Type 1 washers.

M. Headed Anchor Rods: ASTM F1554, Grade 55 S1, (UNO).

N. High-Strength Anchor Bolts: ASTM F3125/F3125M, Type 1 medium carbon, plain.

O. Load Indicator Washers: Provide washers complying with ASTM F959 at all connections requiring high-strength bolts.

P. Welding Materials: AWS D1.1; type required for materials being welded.

Q. Grout: Non-shrink, non-metallic aggregate type, complying with ASTM C1107 and capable of developing a minimum compressive strength of 7,000 psi at 28 days.

R. Shop and Touch-Up Primer: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

S. Touch-Up Primer for Galvanized Surfaces: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

T. Beams and Plates for moment frames ASTM A36, ASTM A572 Grade 50 plates, and ASTM A992 beam steel meeting the requirements of ASTM A6 with Charpy V Notch (CVN) toughness of 20 ft. lbs at 70 degrees Fahrenheit per Paragraph **Error! Reference source not found.**.

U. Unfinished Threaded Fasteners: ASTM A307, Grade A, regular low-carbon steel bolts and nuts. Provide hexagonal heads and nuts for all connections.

V. High-Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, as follows:

Quenched and Tempered Medium-Carbon Steel Bolts, nuts, and washers, complying with ASTM-A325, and/or as called for on the drawings.

W. Anchor Bolts: ASTM A36, non-headed type or ASTM F1554 Headed unless otherwise indicated. ASTM A572 and/or ASTM F1554 where indicated on drawings.

X. Welding Materials: AWS D1.1; type required for materials being welded. All welding electrodes shall be low hydrogen and shall have a minimum Charpy V-Notch toughness of 20 ft. lbs. at minus 20-degrees Fahrenheit per AWS. Use of FCAW T4 wires is specifically prohibited.

Y. Electrodes for Flux Cored Arch welding (FCAW) shall not have diameter greater than 7/64 inch and an electrical stick out greater than two inches.

2.2 FABRICATION

A. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in the shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on contract documents. Properly mark and match- mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.

B. Cleaning and Straightening: Wire brush steel materials and clean off loose mill scale and rust. Straighten steel members by non-injurious methods prior to fabrication. Remove twists or bends after punching or working component parts of a member before the parts are assembled. Produce finished members free from twists, bends, and open joints when erected.

C. Provide and deliver test samples for material properties verifications per Paragraph 1.6.O.3 and 1.6.O.4 to the testing laboratory.

D. The extent of the welding to webs of rolled sections shall be carefully controlled. The web welds shall not extend into the "K" dimension (web-flange intersection). Stress relief access holes shall be provided in the webs. Follow AISC 360 J-6 and AWS D1.1 Section 5-17.

E. Connections: Weld or bolt shop connections, as indicated.

F. Welded Construction: Strictly comply with AWS D1.1 code for procedures, appearance, and quality of welds, and methods used in correcting defective welding work.

G. Assemble and weld built-up sections by some method which will produce true alignment of axes without warp.

H. Holes for Other Work: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members. Provide threaded nuts welded to framing, and other specialty items as indicated to receive other work including hole reinforcing as shown or required.

Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning.

Holes in steel may be punched 1/16" larger than nominal diameter of bolt if steel thickness is equal to or less than 1/8" plus bolt diameter. If the steel is thicker than the diameter of the bolt plus 1/8", the holes shall be drilled or sub-punched and reamed. Diameter of sub-punched holes, and the drill for sub-drilled holes, shall be 1/16" smaller than the nominal diameter of bolt to be installed. Precisely locate finished holes to ensure passage of all bolts through steel assemblies without drifting. Enlarge holes only by reaming. Poor matching of holes is cause for rejection.

I. Anchor Bolts: Furnish anchor bolts and other connectors required for securing structural steel to foundations and other in-place work.

Furnish templates and other devices as necessary for presetting bolts and other anchors to accurate locations.

Punch and drill or ream holes in base and bearing plates. Do not make or enlarge the holes by burning except at grouting holes in column bases plates and then only with the approval of the Architect.

J. Base Plates: Finish column bases and base plates per AISC 360 Section M2-8.

K. Gas Cutting: Use of a cutting torch is allowed where the metal being cut is not stressed during the operation, and provided stresses are not transmitted through flame-cut surface. Make gas cuts with a smooth regular contour. Deduct 1/8" from the width of gas cut edges to determine the effective width of gas cut members. Make reentrant gas cut radius as large as possible, but 1" minimum. For reentrant corners (e.g. slots in tube steel braces) drill 1” (inch) diameter pilot holes.

L. Welded Construction: Strictly comply with AWS Codes for procedures, appearance and quality of welds, and methods used in correcting welding work. Assemble and weld built-up sections by methods that will produce true alignment of axes without warp.

1. Conform to AWS D1.1 and D1.3, as modified by referenced AISC Standards, and as indicated or noted on Drawings. Employ welding operators qualified in accordance to AWS D1.1 and D1.3, as applicable, who are thoroughly trained and experienced in arc welding and that produce uniformly reliable groove and fillet welds in flat, vertical, and overhead positions, and make neat and consistent welds. Weld all structural steel joints by shielded electric-arc method unless otherwise shown, specified, or approved.
2. Qualifications of Welders: Each welder working on the Project shall be assigned an identification symbol or mark. Each welder shall mark or stamp his identification symbol at each completed weldment.
3. Welders and Welding operators shall be qualified per AWS "Standard for Qualifications". The Contractor shall require any welder to retake the test when, in the opinion of the Architect, the Work of the welder creates a reasonable doubt as to the proficiency of the welder. All such tests shall be made using the filler metal to be used in actual fabrication.

4. Test, when required, and costs for qualifying welders shall be conducted at no additional expense to the Owner.
5. Recertification of the welder shall be made to Architects only after the welder has taken and passed the required retest. The architect may require coupons to be cut from any location in any joint for testing. All sections of welds found defective shall be chipped or cut out to base metal and properly re welded before proceeding with the Work.
   a. Should any 2 coupons cut from the work of any welder show strengths that, under test, are less than that of the base metal, it will be considered evidence of negligence or incompetence and such welder shall be permanently removed from the Work.
   b. When coupons are removed from any part of a structure, the members cut shall be repaired, at no additional cost to the owner. Make repairs in a neat and workmanlike manner with joints of proper type to develop the full strength of the member and joint cut. Peen as necessary or directed to relieve residual stress.
6. Storage and Care of Electrodes: Coating of low-hydrogen type electrodes shall be thoroughly dry as used. Conform to AWS D1.1. Use electrodes taken from hermetically sealed packages within time limit specified therein after package is opened. Electrodes not used within allowable time period and electrodes that have been exposed more than one hour to air having a relative humidity of 75% or greater shall be dried according to AWS D1.1 before they are used, or shall be reconditioned according to electrode manufacturer's recommendations. Electrodes so dried or reconditioned and not used within allowable time period shall be redried before use. Electrodes of any class that have been wet shall not be used under any conditions.
7. Preparation: Clean surfaces to be welded of all paint, grease, oil, mill scale, and foreign matter. Clean weld each time the electrode is changed. Chip full surface of hand guided and controlled flame-cut edges before welding. Steel surfaces prepared with automatic or mechanically guided and controlled equipment need not be ground or chipped before welding.
8. Procedures: During assembling and welding, hold components of a built-up member with adequate clamps, bolts, or other means to keep parts straight and in tight contact.

   GMAW, FCAW-G, GTAW and EGW shall not be performed when the wind velocity in the immediate vicinity of the weld exceeds three miles per hour. Welding performed within an enclosed area, and not subject to drafts may be deemed to satisfy this requirement.
   SMAW, FCAW-S, AND SAW may be performed without limitation to wind velocity, provided the wind does not affect the appearance of the molten weld puddle. Cut out defective welding with chisel or air arc and replace.
9. Maintain record of welding procedures, welders employed, date of qualification and identification symbol of mark. Submit at completion of Work, or upon request, certified copies of records.
10. Related Welding: Conform to AWS D1.1 for fillet, plug, slot, partial or flared groove, and lap. Welding starts and stops do not count as part of the effective length of any weld.
11. Connection to Embedment's in Concrete and Masonry: Make welds to metal embedment's installed in concrete or masonry construction with electrodes of size and by methods that will ensure against damage to adjacent construction due to heat input to and connection from embedded metal.
12. Weather Exposed Welds: Seal weld around entire connection where welds remain exposed to weather, in addition to required structural welding.
13. Weld Characteristics: Clean and wire brush all welds. Visual inspection of finished welds must show uniform section, smoothness of welded metal, feather edges without undercuts or overlays, freedom from porosity and inclusions, and good fusion and penetration into base metal at edges and ends of fillet welds.

14. Weld Finishing: Grind exposed welds to smooth surfaces free of holes, slag, or other defects, flush with adjoining surfaces. No finish treatment is required for permanently concealed welds.

M. Bolted Construction

1. Machine Bolts: Make connections with machine bolts only where indicated.
2. High-Strength Steel Bolting: For joints connected by high strength steel bolts, hardened washers, and nuts tightened to high tension, conform materials, methods of installation and tension control, and wrenches to Reference Standards.
   Install all high-strength bolts under inspection required by CBC Chapter 17.
   a. Connections shall be the bearing type bolts (N or X) unless noted to be Slip Critical" (SC)
   b. Minimum bolt lengths shall be per AISC - 15th edition Table 7-14.
   c. Clean all contact surfaces of bolted parts and threads free of scale, slag, burrs, pits, dirt, paint, and other foreign material or defects which would prevent solid seating of connected parts.
   d. Install hardened washers per AISC Standards.
   e. Tighten bolts systematically from most rigid part of connection to the free edges.
   f. Retighten first installed bolts that may have loosened by tightening of subsequent bolts so all bolts are tightened to correct tension.
   g. Mark fully tightened bolts with identifying symbol.
3. Load Indicator Washers: Manufactured and licensed by Cooper and Turner, or equal, may be used for field installation of high-strength bolts. Load indicator washers do not replace required washers but may be used in conjunction with required washers. Conform tightening to Paragraph 5e of "Reference Specifications". After sufficient bolts in a joint are snugged to bring the members into close contact, perform tightening from most rigid part to free edges until load indicators on all bolts are closed to required gap of 0.015" under bolts heads or 0.010" under the nuts. Do not completely close the gap to prevent overtightening and damage to the bolts.
4. Tension Set or Load Indicator Bolts, Nuts, and Washers: As manufactured by Cold Form Specialties, or equal, may be used for the field installation of high-strength bolts. In multi-bolts joints, tighten the nuts in stages (a little at a time) without breaking spline in any of them until final stage, to minimize slackening of the installed bolts.

N. Space shear stud connectors at spacing indicated on the drawings.

O. Fabricate connections for bolt, nut, and washer connectors.

P. Develop required camber for members.

2.3 FINISH

A. General: Shop paint structural steel work, except as follows:

1. Steel surfaces embedded in concrete or masonry.
2. Structural steel which is completely closed-in by interior or exterior building finish.
3. Do not paint surfaces which are to be welded or high-strength bolted with slip critical (SC)-type connection.
4. Do not paint surfaces which are scheduled to receive sprayed-on fireproofing.

B. Prepare structural component surfaces in accordance with SSPC-Paint 20.

C. Shop prime all structural steel which will be exposed in the finished work. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete, high strength bolted, or where concealed by building finishes unless noted on the drawings.

D. Painting: Immediately after surface preparation, apply structural steel primer paint in accordance with manufacturer's instructions and at a rate to provide a uniform dry film thickness of not less than 1.5 mils. Use painting methods which will result in full coverage of joints, corners, edges and exposed surfaces.

E. Galvanize all steel exposed to weather per ASTM A123. Provide minimum 1.7 oz/sq ft. galvanized coating.

2.4 SOURCE QUALITY CONTROL AND TESTS

A. High-Strength Bolts: Provide testing and verification of shop-bolted connections in accordance with AISC "Specification for Structural Joints Using ASTM F3125/F3125M Bolts", testing at least 10 percent of bolts at each connection, minimum one per connections.

B. Welded Connections: Visually inspect all shop-welded connections and test 100 percent of complete penetration welds ultrasonically in accordance with ASTM E164 and test at least 10 percent of all other welds using one of the following:

1. Radiographic testing performed in accordance with ASTM E94.
2. Ultrasonic testing performed in accordance with ASTM E164.
3. Liquid penetrant inspection performed in accordance with ASTM E165.
4. Magnetic particle inspection performed in accordance with ASTM E709.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

B. Beginning of installation means erector accepts existing conditions.

3.2 ERECTION

A. General: Comply with AISC Specifications and Code of Standard Practice, and as herein specified.

B. Temporary Shoring and Bracing: Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds.

C. Temporary Planking: Provide temporary planking and working platforms as necessary to effectively complete the work.

D. Setting Bases and Bearing Plates: Furnish and deliver anchor bolts with setting drawings and templates. Verify position of bolts prior to delivery of steel; report errors or deviation for correction to the architect.

1. Clean concrete bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean the bottom surface of base and bearing plates.
2. Set loose and attached base plates and bearing plates for structural members on wedges or other adjusting devices.
3. Snug tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.

E. Field Assembly: Set structural frames accurately to lines and elevations. Align and adjust various members forming a part of a complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces that will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure within specified tolerances.
2. Splice members only where indicated and accepted on final shop drawings.
3. Do not enlarge unfair holes in members by burning or by use of drift pins except in secondary bracing members. Ream holes that must be enlarged to admit bolts.
4. Except for gravity or cantilevered connections, all back-up bars, dams, and runoff tabs shall be removed: the weld, base metal shall be ground flush and smooth per AWS D1.8 Table C-1.1 and AISC 341I2.3 unless noted otherwise on drawings.

F. Gas Cutting: Do not use gas cutting torches in field for correcting fabrication errors in structural framing without the approval of the architect. Cutting will be permitted only on secondary members which are not under stress. Finish gas-cuts sections equal to a sheared appearance when permitted.

G. Damaged Members: Remove members damaged to an extent impairing appearance, strength or serviceability, as determined by architect and replace with new members at no extra cost to the owner.

H. Grouting of Base Plates and Bearing Plates

1. Plates shall be set and anchored to the proper line and elevation. Metal wedges, shims and/or setting nuts shall be used for leveling and plumbing the structural members, including plumbing of columns. Concrete surfaces shall be rough, clean, free of oil, grease, and laitance, and shall be damp. Metal surfaces shall be clean and free of oil, grease, and rust. Addition of water, mixing and placing shall be in conformance with the material manufacturer's instructions. Grout shall be mixed by using a mortar mixer. Batches shall be of size to allow continuous placement of freshly mixed grout. Placing shall be quick and continuous. Exposed surfaces shall have smooth, dense finish. Fill grout space solid with non-shrink grout.
2. Base plates shall be grouted prior to the placement of structural concrete slabs and/or concrete fill on metal decks.

I. Field Touch-up Painting: After structural steel erection and connections are completed, inspected, and approved, clean all connections to be painted and damage to shop painted surfaces, and apply a field touch-up coat of same primer used for shop coat.

3.3 TOLERANCES: ERECT MEMBERS TO THE TOLERANCES CONFORMING TO REFERENCED AISC STANDARDS AND CBC, EXCEPT AS FOLLOWS:

A. Vertical Dimensions: Measured from top of beams at their connections at any column, variation not more than 1/4" plus or minus per story or, when variations are accumulative from floor to floor, not exceeding 3/8" per story exclusive of column shortening due to dead load.

B. Plumb Displacement: Center line of columns from established column line, no more than 1" toward or away from established center line.

C. Floor Elevation: Top of steel elevation for floor elevation will be considered level if ~~o~~n any one floor~~,~~ all beam connecting to column at the column connections -do not vary more than 3/8" plus or minus. See Section 033000 for concrete finishing.

D. Horizontal Dimension Variances: Governed by specified column plumb displacement.

3.4 QUALITY CONTROL – SHOP AND FIELD

A. The Owner will engage an independent testing and inspection agency to inspect high strength bolted connections and welded connections and to perform tests and prepare test reports in accordance with CBC Chapter 17A.

B. Testing Agency shall conduct and interpret tests and state in each report whether test specimens comply with requirements, and specifically state any deviations therefrom.

C. Provide access for testing agencies to places where structural steel work is being fabricated or produced so that required inspection and testing can be accomplished safely.

D. The testing agency may inspect structural steel at plant before shipment; however, Architect reserves the right at any time before final acceptance to reject material not complying with specified requirements.

E. Correct deficiencies in structural work which inspections and laboratory test reports have indicated to be not in compliance with requirements. Perform additional tests, at Contractor's expense, as may be necessary to reconfirm any non-compliance of original work, and as may be necessary to show compliance of corrected work.

F. Welding: Inspect and test during fabrication and erection of structural steel assemblies, as follows:

1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in the work. Record work required and performed to correct deficiencies.
2. Inspect all welds. All welds shall be accepted visually prior to performing any non-destructive testing. Groove weld shall be inspected by ultrasonic or other approved non-destructive test methods. All testing shall be performed to AWS D1.1 Table 6.2 *statically* loaded non-tubular connections.
3. Ultrasonic testing shall be performed by a specially trained and qualified technician who shall operate the equipment, examine welds, and maintain a record of welds examined, defects found, and disposition of each defect. All defective welds shall be repaired and costs for retesting defective welds shall be paid by Contractor.
4. Rate of Testing: All completed welds contained in joints and splices shall be tested 100 percent either by ultrasonic testing or by radiography.

5. Base metal thicker than 1 1/2 inches, when subjected to through-thickness weld shrinkage strains, shall be ultrasonically inspected by shear wave methods for discontinuities directly behind such welds. Tests shall be performed not less than 48 hours after completed joint has cooled down to ambient air temperature.
6. Any material discontinuities shall be accepted or rejected on the basis of the defect rating in accordance with the criteria of AWS D1.1 *Table 6.2* by the Architect.
7. Welds inspected by visual or ultrasonic testing or any other approved method that does not meet the requirements of AWS D1.1 shall be repaired or replaced as prescribed by AWS D1.1. Additional testing of repaired or replaced areas shall be made at the Contractor's expense.
8. Should defects appear in base metal and/or in welds tested, repairs of defects in base metal or welds shall be similarity inspected, as approved by architect at the Contractor's expense until satisfactory performance is assured.
9. Other methods of non-destructive testing and inspection, for example, liquid dye penetrant testing, magnetic particle inspection or radiographic inspection, may be used on weld if required.
10. Lamellar Tearing: Lamellar tearing resulting from welding is a crack (with zero tolerance) and shall be repaired per AWS D1.1.
11. Lamination: Lamination are defects in the base metal. The rejection criteria shall be based on ASTM A435.
12. Where lamination or conditions of lamellar tearing in base metal are revealed by testing, the steel fabricator shall submit a proposed method of repair for approval. Retesting of repaired areas is required. Costs of repair and retesting shall be borne by the Contractor.
13. Magnetic Particle Testing: Magnetic particle testing when required shall be provided in accordance with AWS D1.1 for procedure and technique. The standards of acceptance shall be in accordance with AWS D1.1 - Qualification.

G. Lamellar Tearing: See Paragraph **Error! Reference source not found.**.

H. Prior Testing of Base Material: Test material prior to fabrication in order to detect possible defects that would require difficult and expensive repair.

I. Lines and levels of erected steel to be certified by a licensed surveyor. See additional requirements in Division 1 Sections.

J. Welded studs shall be tested and inspected by the owner’s testing laboratory in accordance with the requirements of AWS D1.1 - Stud Welding.

K. As erected Drawings: After all steel has been erected, correct, or revise shop drawings and erection diagrams to correspond with the changes made in the field.

L. High-Strength Bolts: Provide testing and verification of field-bolted connections in accordance with AISC "Specification for Structural Joints Using ASTM F3125/F3125M Bolts".

END OF SECTION

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Steel framing and supports for overhead doors.
2. Steel framing and supports for countertops.
3. Steel tube reinforcement for low partitions.
4. Steel framing and supports for mechanical and electrical equipment.
5. Steel framing and supports for applications where framing and supports are not specified in other Sections.
6. Metal ladders.
7. Miscellaneous steel trim including steel angle corner guards and steel edgings.
8. Metal bollards.
9. Loose bearing and leveling plates for applications where they are not specified in other Sections.

B. Products furnished, but not installed, under this Section include the following:

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

C. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.
2. Section 051200 "Structural Steel."

1.3 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.4 SUBMITTALS

A. Submit in accordance with Section 013300 “Submittals.”

B. Product Data: For the following:

1. Nonslip aggregates and nonslip-aggregate surface finishes.
2. Paint products.
3. Grout.

C. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

1. Steel framing and supports for overhead doors.
2. Steel framing and supports for countertops.
3. Steel tube reinforcement for low partitions.
4. Steel framing and supports for mechanical and electrical equipment.
5. Steel framing and supports for applications where framing and supports are not specified in other Sections.
6. Shelf angles.
7. Metal ladders.
8. Miscellaneous steel trim including steel angle corner guards and steel edgings.
9. Metal bollards.
10. Loose steel lintels.

D. Samples for Verification: For each type and finish of extruded nosing.

E. Qualification Data: For professional engineer.

F. Welding certificates.

G. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

H. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.6 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

C. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

D. Stainless-Steel Sheet, Strip, and Plate: ASTM A 240/A 240M or ASTM A 666, Type 316L.

E. Stainless-Steel Bars and Shapes: ASTM A 276, Type 316L.

F. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.

G. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.

H. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.

1. Size of Channels: 1-5/8 by 1-5/8 inches.
2. Material: Galvanized steel, ASTM A 653/A 653M, commercial steel, Type B, with G90 coating; 0.079-inch nominal thickness.

I. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

J. Aluminum Plate and Sheet: ASTM B 209, Alloy 6061-T6.

K. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.

L. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

C. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325 (Grade A325M), Type 3, heavy-hex steel structural bolts; ASTM A563, Grade DH3, (ASTM A563M, Class 10S3) heavy-hex carbon-steel nuts; and where indicated, flat washers.

D. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers; Alloy Group 2.

E. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

F. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.

G. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.

H. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 2 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

I. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.

2.4 MISCELLANEOUS MATERIALS

A. Shop Primers: Provide primers that comply with Section 099113 "Exterior Painting," Section 099123 Interior Painting," and Section 099600 "High-Performance Coatings."

B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

D. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

E. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 4000 psi.

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

1. Fabricate units from slotted channel framing where indicated.
2. Furnish inserts for units installed after concrete is placed.

C. Galvanize miscellaneous framing and supports where indicated.

2.7 METAL LADDERS

A. General: Comply with ANSI A14.3.

B. Steel Ladders:

1. Space siderails 16 inches apart unless otherwise indicated.
2. Siderails: Continuous, 3/8-by-2-1/2-inch steel flat bars, with eased edges.
3. Rungs: 3/4-inch-diameter steel bars.
4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
5. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
6. Provide platforms as indicated fabricated from welded or pressure-locked steel bar grating, supported by steel angles. Limit openings in gratings to no more than 1/2 inch in least dimension.
7. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets.
8. Galvanize and prime exterior ladders, including brackets.

C. Aluminum Ladders:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. O'Keeffe's Inc.
    b. Precision Ladders, LLC.
    c. Or equal.

2. Source Limitations: Obtain aluminum ladders from single source from single manufacturer.
3. Space siderails 18 inches apart unless otherwise indicated.
4. Siderails: Continuous extruded-aluminum channels or tubes, not less than 2-1/2 inches deep, 3/4 inch wide, and 1/8 inch thick.
5. Rungs: Extruded-aluminum tubes, not less than 3/4 inch deep and not less than 1/8 inch thick, with ribbed tread surfaces.
6. Fit rungs in centerline of siderails; fasten by welding or with stainless steel fasteners or brackets and aluminum rivets.
7. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted aluminum brackets.

2.8 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Galvanize and prime exterior miscellaneous steel trim.

2.9 METAL BOLLARDS

A. Fabricate metal bollards from Schedule 40 steel pipe. Where bollards are indicated to receive controls for door operators, provide cutouts for controls and holes for wire.

B. Where bollards are indicated to receive light fixtures, provide cutouts for fixtures and holes for wire.

2.10 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Galvanize plates.

C. Prime plates with zinc-rich primer.

2.11 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.12 FINISHES, GENERAL

A. Finish metal fabrications after assembly.

B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.13 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.

C. Shop prime iron and steel items unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated. Shop prime with primers specified in Section 09911 "Exterior Painting" primers specified in Section 09912 "Interior Painting" unless primers specified in Section 09960 "High-Performance Coatings" are indicated.

D. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.14 ALUMINUM FINISHES

A. As-Fabricated Finish: AA-M12.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:

1. Cast Aluminum: Heavy coat of bituminous paint.
2. Extruded Aluminum: Two coats of clear lacquer.

3.2 INSTALLING METAL BOLLARDS

A. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing.

B. Anchor bollards in place with concrete footings. Center and align bollards in holes 3 inches above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.

C. Fill bollards solidly with concrete, mounding top surface to shed water.

3.3 INSTALLING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with nonshrink grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION

SECTION 055213 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Steel tube railings.
2. Stainless-steel tube railings.

1.3 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

1.4 SUBMITTALS

A. Submit in accordance with Section 013300 “Submittals.”

B. Product Data: For the following:

1. Manufacturer's product lines of mechanically connected railings.
2. Railing brackets.
3. Grout, anchoring cement, and paint products.

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

D. Samples: For each type of exposed finish required.

1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters, including finish.
2. Fittings and brackets.
3. Assembled Sample of railing system, made from full-size components, including top rail, post, handrail, and infill. Sample need not be full height. Show method of connecting and finishing members at intersections.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Welding certificates.

C. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.

D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

E. Product Test Reports: For pipe and tube railings, for tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

F. Evaluation Reports: For post-installed anchors, from ICC-ES.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Performance Criteria: Railings and handrails shall comply with CBC Section 11B-505 as follows:

1. Top of gripping surfaces of handrails shall be 34 inches minimum and 38 inches maximum above walking surfaces, stair nosing, and ramp surfaces. Handrails shall be at a consistent height above such surfaces.
2. Clearance between handrail gripping surfaces and adjacent surfaces shall be 1-1/2 inch minimum. Handrail may be located in a recess if the recess is 3 inches maximum deep and 18 inches minimum clear above the top of the handrail.
3. Handrail gripping surfaces shall be continuous along their length and shall not be obstructed along their tops or sides. The bottoms of handrail gripping surfaces shall not be obstructed for more than 20% of their length. Where provided, horizontal projections shall occur 1-1/2 inch minimum below the bottom of the handrail gripping surfaces.
4. Handrail gripping surfaces with a circular cross section shall have an outside diameter of 1-1/4 inch minimum and 2 inch maximum.
5. Handrail gripping surfaces with a non-circular cross section shall have an out dimension of 4 inch minimum and 6-1/4 inch maximum, and a cross-section of 2-1/4 inch maximum.
6. Handrail gripping surfaces with a non-circular cross section shall have an outside dimension of 4 inch minimum and 6-1/4 inch maximum, and a cross-section dimension of 2-1/4 inch maximum.
7. Handrail gripping surfaces and any surfaces adjacent to them shall be free of sharp or abrasive elements and shall have rounded edges.
8. Handrails shall not rotate within their fittings.
9. Handrail gripping surfaces shall extend beyond and in the same direction of stair flights and ramp runs in accordance with CBC Section 11B-505.10. Such extensions are not required for continuous handrails at the inside turn of switchback or dogleg stairs and ramps.
10. The orientation of at least one handrail shall be in the direction of the stair run, perpendicular to the direction of the stair nosing, and shall not reduce the minimum required width of the stair. CBC Section 11B-505.2.1.
11. A 4 inch minimum high curb or barrier shall be provided to prevent the passage of a 4 inch diameter sphere rolling off the edges on a ramp or landing surface. Such a curb or barrier shall be continuous and uninterrupted along the length of a ramp. CBC Section 11-405.9.2**.**

2.2 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated. Provide type of bracket with flange tapped for concealed anchorage to threaded hanger bolt and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.

2.3 STEEL AND IRON

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads. Provide galvanized finish for exterior installations and where indicated.

C. Tubing: ASTM A500/A500M (cold formed).

D. Plates, Shapes, and Bars: ASTM A 36/A 36M.

2.4 STAINLESS STEEL

A. Tubing: ASTM A 554, Grade MT 316L.

B. Castings: ASTM A 743/A 743M, Grade CF 8M or CF 3M.

C. Plate and Sheet: ASTM A 240/A 240M or ASTM A 666, Type 316L.

2.5 FASTENERS

A. General: Provide the following:

1. Ungalvanized-Steel Railings: Plated steel fasteners complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5 for zinc coating.
2. Hot-Dip Galvanized Railings: Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A 153/A 153M or ASTM F 2329 for zinc coating.
3. Stainless-Steel Railings: Type 316 stainless-steel fasteners.
4. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

C. Fasteners for Interconnecting Railing Components:

1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.

2. Provide square or hex socket flat-head machine screws for exposed fasteners unless otherwise indicated.

D. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to 6 times the load imposed when installed in unit masonry and 4 times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.

1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 2 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.6 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded. For stainless-steel railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

B. Etching Cleaner for Galvanized Metal: Complying with MPI#25.

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

D. Shop Primers: Provide primers that comply with Section 099113 "Exterior Painting," Section 099123 "Interior Painting," and Section 099600 "High-Performance Coatings."

E. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

F. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.

G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

H. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

I. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound. Water-Resistant Product: At exterior locations and provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.7 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that are exposed to weather in a manner that excludes water. Provide weep holes where water may accumulate.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Connections: Fabricate railings with welded connections unless otherwise indicated.

H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove flux immediately.
4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

I. Form Changes in Direction as Follows:

1. As detailed.
2. By bending.

J. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

K. Close exposed ends of railing members with prefabricated end fittings.

L. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.

M. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.

N. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

O. For railing posts set in concrete, provide steel sleeves not less than than length indicated with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with metal plate forming bottom closure.

2.8 STEEL AND IRON FINISHES

A. Galvanized Railings:

1. Hot-dip galvanize indicated steel railings, including hardware, after fabrication where indicated.
2. Comply with ASTM A 123/A 123M for hot-dip galvanized railings.
3. Comply with ASTM A 153/A 153M for hot-dip galvanized hardware.
4. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
5. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.

D. For nongalvanized-steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves; however, galvanize anchors to be embedded in exterior concrete or masonry.

E. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

F. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

1. Shop prime uncoated railings with primers specified in Section 09911 "Exterior Painting" and Section 09912 "Interior Painting" unless primers specified in Section 09960 "High-Performance Coatings" are indicated.
2. Do not apply primer to galvanized surfaces.

G. High-Performance Coating: Apply epoxy intermediate and polyurethane topcoats to prime-coated surfaces. Comply with coating manufacturer's written instructions and with requirements in SSPC-PA 1, "Shop, Field, and Maintenance Painting of Steel," for shop painting. Apply at spreading rates recommended by coating manufacturer.

2.9 STAINLESS-STEEL FINISHES

A. Remove tool and die marks and stretch lines, or blend into finish.

B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

C. Stainless Steel Tubing Finishes: 180-Grit Polished Finish: Uniform, directionally textured finish.

D. Stainless Steel Sheet and Plate Finishes: Directional Satin Finish: ASTM A 489/A 480, No. 4.

E. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements are clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.

3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

D. Adjust railings before anchoring to ensure matching alignment at abutting joints.

E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches of post.

3.4 ANCHORING POSTS

A. Use metal sleeves preset and anchored into concrete for installing posts. After posts are inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.

B. Leave anchorage joint exposed with 1/8-inch buildup, sloped away from post.

C. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

3.5 ATTACHING RAILINGS

A. Anchor railing ends at walls with round flanges anchored to wall construction and welded to railing ends.

B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends.

C. Attach railings to wall with wall brackets. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

D. Secure wall brackets and railing end flanges to building construction as follows:

1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
2. For hollow masonry anchorage, use toggle bolts.
3. For steel-framed partitions, use self-tapping screws fastened to steel framing or to concealed steel reinforcements.

3.6 ADJUSTING AND CLEANING

A. Clean stainless steel by washing thoroughly with clean water and soap and rinsing with clean water.

B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A 780/A 780M.

3.7 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION

SECTION 057300 - DECORATIVE METAL RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Stainless steel decorative railings.
2. Section 055213 "Pipe and Tube Railings" for nonornamental railings fabricated from pipes and tubes.
3. Section 061053 "Miscellaneous Rough Carpentry" for wood blocking for anchoring railings.

1.3 COORDINATION AND SCHEDULING

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible.

B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver items to Project site in time for installation.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data:

1. Manufacturer's product lines of decorative metal railings assembled from standard components.
2. Woven-wire mesh infill panels.
3. Fasteners.
4. Post-installed anchors.

5. Handrail brackets.
6. Shop primer.
7. Bituminous paint.
8. Nonshrink, nonmetallic grout.
9. Anchoring cement.
10. Metal finishes.

B. Shop Drawings: Include plans, elevations, sections, and attachment details.

1. For illuminated railings, include wiring diagrams and roughing-in details.

C. Samples for Verification: For each type of exposed finish required.

1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters
2. Fittings, end caps, and brackets.
3. Welded connections.
4. Assembled Sample of railing system, made from full-size components, including top rail, post, handrail, and guard infill. Sample need not be full height.

a. Show method of connecting and finishing members at intersections.

1.6 INFORMATIONAL SUBMITTALS

A. Mill Certificates: Signed by manufacturers of stainless steel products, certifying that products furnished comply with requirements.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

D. Research Reports: For post-installed anchors, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

E. Preconstruction test reports.

1.7 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Build mockups for each form and finish of railing, consisting of two posts, top rail, infill area, and anchorage system components that are full height and are not less than 24 inches in length.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect mechanical finishes on exposed surfaces of railings from damage by applying a strippable, temporary protective covering before shipping.

1.9 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:

a. Uniform load of 50 lbf/ft. applied in any direction.
b. Concentrated load of 200 lbf applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
b. Infill load and other loads need not be assumed to act concurrently.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior railings by preventing buckling, opening

of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Same metal and finish as supported rails unless otherwise indicated.

2.3 STAINLESS STEEL DECORATIVE RAILINGS

A. Source Limitations: Obtain stainless steel decorative railing components from single source from single manufacturer.

B. Tubing: ASTM A554, Grade MT 316.

C. Pipe: ASTM A312/A312M, Grade TP 316.

D. Castings: ASTM A743/A743M, Grade CF 8M or CF 3M.

E. Plate, Sheet, and Strip: ASTM A240/A240M or ASTM A666, Type 316.

F. Flat Bar: ASTM A666, Type 316.

G. Bars and Shapes: ASTM A276/A276M, Type 316.

H. Woven-Wire Mesh Infill Panels: Intermediate-crimp, rectilinear pattern, woven-wire mesh, made from stainless steel wire complying with ASTM A580/A580M, Type 316.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Wagner Architectural Model BMW13Z-145 crimp pattern in-fill panels.

2.4 FASTENERS

A. Fastener Materials:

1. Stainless Steel Railing Components: Type 316 stainless steel fasteners.
2. Hot-Dip Galvanized-Steel Railing Components: Type 304 stainless steel or hot-dip zinc-coated steel fasteners complying with ASTM A153/A153M or ASTM F2329/F2329M for zinc coating.
3. Dissimilar Metal Railing Components: Type 316 stainless steel fasteners.

B. Fasteners for Anchoring to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction and capable of withstanding design loads.

C. Provide concealed fasteners for interconnecting railing components and for attaching railings to other work unless otherwise indicated.

D. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, in accordance with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193.

1. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 2 stainless steel bolts, ASTM F593 and nuts, ASTM F594.

2.5 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

1. For stainless steel railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

B. Etching Cleaner for Galvanized Metal: Complying with MPI#25.

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

D. Shop Primers: Provide primers that comply with Section 099600 "High-Performance Coatings."

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

F. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

G. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.

1. Water-Resistant Product: At exterior locations, provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.6 FABRICATION

A. Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations.

1. Clearly mark units for reassembly and coordinated installation.
2. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately.

1. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated.
2. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that will be exposed to weather in a manner to exclude water.

1. Provide weep holes where water may accumulate.
2. Locate weep holes in inconspicuous locations.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Connections: Fabricate railings with welded connections unless otherwise indicated.

H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove flux immediately.
4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #1 welds; ornamental quality with no evidence of a welded joint.

I. Form changes in direction as follows:

1. As detailed.

J. Bend members in jigs to produce uniform curvature for each configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

K. Close exposed ends of hollow railing members with prefabricated cap and end fittings of same metal and finish as railings.

L. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, handrail brackets, miscellaneous fittings, and anchors to interconnect railing members to other Work unless otherwise indicated.

1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and to prevent bracket or fitting rotation and crushing of substrate.

M. Provide inserts and other anchorage devices for connecting railings to concrete or masonry Work.

1. Fabricate anchorage devices capable of withstanding loads imposed by railings.
2. Coordinate anchorage devices with supporting structure.

N. For railing posts set in concrete, provide stainless steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with metal plate forming bottom closure.

O. Perforated-Metal Infill Panels: Fabricate infill panels from perforated metal made from stainless steel.

1. Edge panels with U-shaped channels made from metal sheet, of same metal as perforated metal and not less than 0.043 inch thick.
2. Orient perforated metal with pattern parallel to top rail.

P. Woven-Wire Mesh Infill Panels: Fabricate infill panels from woven-wire mesh crimped into 1-by-1/2-by-1/8-inch metal channel frames.

1. Fabricate wire mesh and frames from stainless steel.
2. Orient wire mesh with wires perpendicular and parallel to top rail.

Q. Toe Boards: Where indicated on Drawings, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

2.7 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.

C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.8 STAINLESS STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

1. Run grain of directional finishes with long dimension of each piece.
2. When polishing is completed, passivate and rinse surfaces.
3. Remove embedded foreign matter and leave surfaces chemically clean.

C. Stainless Steel Tubing Finishes:

1. 180-Grit Polished Finish: Uniform, directionally textured finish.

D. Stainless Steel Sheet and Plate Finishes:

1. Directional Satin Finish: ASTM A480/A480M, No. 4.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

A. Perform cutting, drilling, and fitting required for installing railings.

1. Fit exposed connections together to form tight, hairline joints.
2. Install railings level, plumb, square, true to line; without distortion, warp, or rack.
3. Set railings accurately in location, alignment, and elevation; measured from established lines and levels.
4. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
5. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
6. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

C. Adjust railings before anchoring to ensure matching alignment at abutting joints.

D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article, whether welding is performed in the shop or in the field.

B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve, extending 2 inches beyond joint on either side; fasten internal sleeve securely to one side; and locate joint within 6 inches of post.

3.4 ANCHORING POSTS

A. Anchor posts to metal surfaces with flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:

1. For stainless steel railings, weld flanges to posts and bolt to metal-supporting surfaces.

3.5 ATTACHING RAILINGS

A. Anchor railing ends to concrete with flanges connected to railing ends and anchored to wall construction with anchors and bolts.

B. Secure wall brackets and railing end flanges to building construction as follows:

1. For concrete anchorage, use drilled-in expansion shields and hanger or lag bolts.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and to prepare test reports. Payment for these services will be made by Owner.

B. Extent and Testing Methodology: Testing agency will randomly select completed railing assemblies for testing that are representative of different railing designs and conditions in the completed Work. Test railings in accordance with ASTM E894 and ASTM E935 for compliance with performance requirements.

C. Remove and replace railings where test results indicate that they do not comply with specified requirements unless they can be repaired in a manner satisfactory to Architect and comply with specified requirements.

D. Perform additional testing and inspecting, at Contractor's expense, to determine compliance of replaced or additional work with specified requirements.

3.7 CLEANING

A. Clean stainless steel by washing thoroughly with clean water and soap, rinsing with clean water, and wiping dry.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

3.8 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

B. Restore finishes damaged during installation and construction period, so no evidence remains of correction work. Return items that cannot be refinished in

the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION

SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Structural framing.

B. Floor, wall, and roof sheathing.

C. Preservative treatment of wood.

D. Miscellaneous framing and sheathing.

E. Telephone and electrical panel boards.

F. Wood nailers and curbs for roofing and items installed on roof.

G. Roofing cant strips.

H. Concealed wood blocking for support of toilet and bath accessories, wall cabinets, wood trim, and other items in drawings.

I. Miscellaneous wood nailers and furring strips.

1.2 RELATED SECTIONS

A. Section 051200 - Structural Steel.

B. Section 055000 - Metal Fabrications: Miscellaneous steel connectors and support angles for wood framing.

C. Section 061500 - Wood Decking.

D. Section 061733 – Prefabricated Wood Lumber.

1.3 REFERENCES

A. ANSI A208.1 - American National Standard for Particleboard.

B. AFPA T10 - Wood Frame Construction Manual; American Forest and Paper Association.

C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

E. ASTM D 2898 - Standard Test Methods for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

G. AWPA U1 - Use Category System: User Specification for Treated Wood; American Wood-Preservers' Association.

H. PS 20 - American Softwood Lumber Standard; National Institute of Standards and Technology (Department of Commerce).

I. RIS (GR) - Standard Specifications for Grades of California Redwood Lumber; Redwood Inspection Service.

J. SPIB (GR) - Grading Rules; Southern Pine Inspection Bureau, Inc.

K. WCLB (GR) - Standard Grading Rules for West Coast Lumber No. 17; West Coast Lumber Inspection Bureau.

L. WWPA G-5 - Western Lumber Grading Rules; Western Wood Products Association.

1.4 SUBMITTALS

A. See Division 1 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide technical data on insulated sheathing, wood preservative materials, and application instructions.

C. Shop Drawings and Calculations: For site fabricated truss frames, indicate dimensions, wood species and grades, component profiles, drilled holes, fasteners, connectors, details, and sequence of erection. Drawings and calculations must be signed and stamped by the Professional Engineer responsible for the design.

D. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Lumber: Comply with PS 20 and approved grading rules and inspection agencies.

1. Acceptable Lumber Inspection Agencies: Any agency with rules approved by American Lumber Standards Committee.

B. Exposed-to-View Rough Carpentry: Submit manufacturer's certificate that products meet or exceed specified requirements, in lieu of grade stamping.

C. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

1.6 QUALIFICATIONS

A. Design structural site fabricated trusses under direct supervision of a Professional Engineer experienced in design of such trusses and licensed in the state in which the project is located.

1.7 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

B. Trusses: Protect site fabricated trusses from warping or other distortion by stacking in vertical position, braced to resist movement.

C. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.

PART 2 - PRODUCTS

2.1 DIMENSION LUMBER

A. Sizes: Nominal sizes as indicated on drawings.

B. Moisture Content: Provide seasoned lumber with 19% maximum moisture content at time of installation.

C. Structural Framing:

1. Species and grade as indicated on drawings.

D. Miscellaneous Blocking, Furring, and Nailers:

1. Lumber: S4S, No. 2 or Standard Grade.
2. Boards: Standard or No. 3.

2.2 ACCESSORIES

A. Fasteners and Anchors:

1. Metal and Finish: Hot-dipped galvanized steel per ASTM A 153/A 153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere. Type as indicated on drawings.
2. Furnish bolts and attachments to other trades for installation in masonry and concrete work.
3. Nails: Common wire, galvanized for exterior use.
4. Lag Screws and Wood Screws: Steel. Conforming to ANSI/ASME Standard B18.2.1, galvanized for exterior use.
5. Machine Bolts: ASTM A307, galvanized for exterior use.
6. Plain Washers: ANSI B18.22, galvanized for exterior use.
7. Hangers, Straps, Ties and other Framing Connectors: Steel, Galvanized. “Simpson Strong-Tie" unless noted otherwise.

B. Sill Gasket on Top of Foundation Wall: 1/4-inch-thick, plate width, closed cell plastic foam from continuous rolls.

C. Sill Flashing: As specified in Section 076200.

D. Subfloor Glue: Waterproof, water base, air cure type, cartridge dispensed.

E. Building Paper: No. 15 asphalt felt.

2.3 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.

B. Preservative Treatment:

1. Manufacturers:
   a. Arch Wood Protection, Inc.; www.wolmanizedwood.com.
   b. Chemical Specialties, Inc.; www.treatedwood.com.
   c. Osmose, Inc.; www.osmose.com.
   d. Substitutions: See Section 016000- Product Requirements.

C. Preservative Pressure Treatment of Lumber Above Grade:

1. Interior: AWPA Standard U1, Commodity Specification A, to the requirement of UC2 using waterborne preservative to 0.25 lb./cu. ft. retention.
2. Exterior: AWPA Standard U1, Commodity Specification A, to the requirement of UC3B using waterborne preservative to 0.25 lb./cu. ft. retention.
3. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
4. Treat lumber in contact with roofing, flashing, or waterproofing.
5. Treat lumber in contact with masonry or concrete.
6. Treat lumber less than 18 inches above grade.
7. Treat lumber in other locations as indicated.
8. Identification: Preservative treated wood shall be identified in accordance with California Building Code (International Building Code) Section 2303.1.9.1.

D. Preservative Pressure Treatment of Lumber in Contact with Soil: AWPA Use Category UC4A, Commodity Specification A using waterborne preservative to 0.4 lb. /cu ft. retention.

1. Preservative for Field Application to Cut Surfaces: As recommended by manufacturer of factory treatment chemicals for brush-application in the field.
2. Restrictions: Do not use lumber or plywood treated with chromated copper arsenate (CCA) in exposed exterior applications subject to leaching.

E. Preservative Pressure Treatment of Plywood Above Grade: AWPA Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative to 0.25 lb. /cu ft. retention.

   a. Kiln dry plywood after treatment to maximum moisture content of 19 percent.
   b. Treat plywood in contact with roofing, flashing, or waterproofing.
   c. Treat plywood in contact with masonry or concrete.
   d. Treat plywood less than 18 inches above grade.
   e. Treat plywood in other locations as indicated.

PART 3 - EXECUTION

3.1 FRAMING INSTALLATION

A. Verify that surfaces to receive rough carpentry materials are prepared to require grades and dimensions.

B. Conduct work under direction of capable experienced foreman.

C. Accurately located members to line and dimension. Ensure full contact of timbers framed together. Ensure let-in members in full contact on two surfaces. Where there is a significant variation in moisture content between individual members, shrinkage shall be allowed for and final connection shall not be made until moisture content of adjacent members has been stabilized. Allow no construction over framing members until final connections and/or adjustments have been made to achieve maximum strength at connections and maximum future movement from shrinkage or expansion.

D. Cutting: Do all cutting and framing required to accommodate structural members, piping conduit, ducts and installation of mechanical, electrical, and other equipment and apparatus.

1. Obtain Architect's approval for cutting of structural members not detailed on structural drawings.
2. Reinforce cut sill and top plates with metal straps in accordance with the requirements of the drawings.

E. Bracing and Shoring: Provide all supports, guys and braces, required to stabilize structure during construction.

F. Accurately saw-cut and fit lumber into position and securely nail, spike, lag bolt, or bolt as required.

G. Fasteners: Installation of fasteners shall be performed in accordance with ANSI/ASME Standard B18.6.1. Drill holes for fasteners and size as noted:

1. Nails and spikes: Smaller than diameter of fastener. Predrill as required to prevent splitting.
2. Lag Bolts: Drill holes same length as shank. Bit size, no larger than base of threaded portion of screw.
3. Bolts: Holes 1/32" - 1/16" larger than bolt.
4. Framing Connectors: Smaller than diameter of fastener. Predrill as required to prevent splitting.
5. No lubricant of any kind shall be used on any fastener depending on friction for holding.

H. Nailing: Refer to details and tables on drawings for specific nailing requirements. In absence of specific instruction, comply with the following:

1. Edge Distance: 1/4 length of fastener.
2. Toe Nailing: Drive toe nails at an angle or approximately thirty degrees with the piece and started approximately one-third the length of the nail from end of piece.
3. Replace split or otherwise damaged structural members.

I. Bolts: Use standard cut washer under bolt heads and nuts against wood. Use heavy plate washer or malleable iron washer where noted on drawings. Drive into place. Ensure full engagement of nut, but projection of bolt beyond nut not to exceed one bolt diameter. Tighten nuts at installation and again immediately prior to enclosure.

J. Lag Screws: Lubricate with soap or similar material. Turn into place without driving. Ensure penetration into lagged member of 60 percent of screw length. Lead hole shall have diameter of about 70 percent of the root diameter of the screw. Provide washers of same sizes as specified for bolts.

K. Framing Connectors: Drive nails into all holes of each connector. Install all bolts in each framing connector unless detailed otherwise.

L. Screws: Screws shall not be driven by hammering.

M. Frame openings with two or more studs at each jamb and support headers on cripple studs unless noted otherwise in the drawings.

N. Provide miscellaneous members as indicated or as required to support finishes, fixtures, specialty items, and trim.

3.2 INSTALLATION OF ACCESSORIES AND MISCELLANEOUS WOOD

A. Place full width continuous sill flashings under framed walls on cementitious foundations. Lap flashing joints 4 inches and seal.

B. Place sill gasket directly on sill flashing. Puncture gasket cleanly and fit tightly to protruding foundation anchor bolts.

C. Coordinate installation of wood decking, wood chord metal joists, glue laminated structural units, prefabricated wood trusses, and plywood web joists.

D. Curb roof openings except where prefabricated curbs are provided. Form corners by alternating lapping side members.

E. Coordinate curb installation with installation of decking and support of deck openings.

3.3 SILLS AND PLATES

A. Install Pressure Preservative-treated lumber for plates and sill in contact with concrete or masonry construction.

B. Bolt to foundations and slabs. Level sill with shims, washers placed, and nuts tightened to level bearing.

C. Park space between sill and concrete with non-shrink grout.

3.4 STUD WALLS, PARTITIONS AND FURRING

A. Provide studs in continuous lengths without splices.

B. Plates: Provide single bottom plate and double top plate. Stagger joints 4' minimum in top plates.

C. Nail or anchor plates to supporting construction.

D. Corners and Intersections: Frame with 3 studs or as detailed in the drawings.

E. Openings: Frame with double studs each side and double header placed on edge, resting on cripple studs.

F. Provide continuous horizontal blocking row at mid-height of single-story partitions over 8' high and at midpoint of multi-story partitions, using 2" thick members of same width as wall or partitions.

G. Cut-in blocks wherever necessary for bracing or backing for applied finish or fixtures. Cut-in 2" solid blocking between studs at all horizontal joints in non-structural plywood wall sheathing.

3.5 FLOOR FRAMING

A. Girders, Posts, Ledgers, and Anchors: Set accurately and secure with level bearings. Coordinate work with Cast-in-Place Concrete Contractor to set bolts and anchors properly.

B. Floor Joists: Lay with crowning edge up, with 1-1/2" minimum bearing at supports except, at ledgers, full width of ledger.

C. Blocking: Provide 2" solid blocking of same depth as joist at all walls and partitions.

D. Bridging: Provide bridging for floor joists of more than 4" depth which are spaced 32" on center or less. Bridge floor joists every 8' by solid blocking 2" thick and full depth of joist or by wood cross bridging of not less than 1"x3" or nailed metal cross bridging of equal strength. Where cross bridging is used, drive lower ends of such cross bridging up and nail after floor or subfloor has been nailed.

E. Piping: Where partitions containing plumbing, heating, or other piping occur above joists, space joists to give clearance for piping. Where partition containing piping runs parallel to floor joists, double joists below partition spaced to permit passage of pipes, and solid bridged.

F. Joist: Double header joists and hang on steel joist hangers. Hang joists on steel joist hangers, Double trimmer joists receiving header joists over 6' long.

3.6 JOISTS AND RAFTERS

A. Joists and Rafters: Lay with crowning edge up with full end bearing.

B. Openings: Frame for hatches, vents, and other openings as required.

C. Bridging: Provide bridging for roof joists or rafters of more than 8" which are spaced 32" on center or less. Bridge roof joist or rafters every 10' by solid blocking 2" thick and full depth of joist or rafter, or by wood cross bridging of not less than 1"x3" or nailed metal cross bridging of equal strength. Where cross bridging is used, drive lower ends of such cross bridging up and nail after roof sheathing has been nailed.

D. Solid Blocking: Install between roof rafters and ceiling joists over partitions and at end supports as indicated.

E. Plywood Roof Sheathing: Install plywood over rafters or decking as indicated on drawings. Thickness and nailing shall be as indicated on structural drawings.

F. Plywood Joints: Install 1/2" H clips at butt joints of roof sheathing, between rafters spaced 24" on center where solid blocking is not required.

3.7 SITE APPLIED WOOD TREATMENT

A. Apply preservative treatment compatible with factory applied treatment at site-sawn cuts, complying with manufacturer's instructions.

B. Allow preservative to dry prior to erecting members.

3.8 TOLERANCES

A. Framing Members: 1/4 inch from true position, maximum.

B. Surface Flatness of Floor: 1/8 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

C. Variation from Plane (Other than Floors): 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

END OF SECTION

SECTION 061053 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Wood blocking and nailers.
2. Plywood backing panels.

B. Related Requirements: Comply with “CALGreen VERIFICATION GUIDELINES MANDATORY CHECKLIST” requirements as indicated in Drawing Sheet G1.21.

1.3 DEFINITIONS

A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.

B. Dimension Lumber: Lumber of 2 inches nominal or greater size but less than 5 inches nominal size in least dimension.

1.4 SUBMITTALS

A. Submit in accordance with Section 013300 “Submittal Procedures.”

B. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.

4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

C. Evaluation Reports: For the following, from ICC-ES:

1. Preservative-treated wood.
2. Fire-retardant-treated wood.
3. Power-driven fasteners.
4. Post-installed anchors.
5. Metal framing anchors.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

B. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal thickness or less, 19 percent for more than 2-inch nominal thickness unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood blocking, stripping, and similar concealed members in contact with masonry or concrete.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Treatment shall not promote corrosion of metal fasteners.
2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.

C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

E. Application: Treat items indicated on Drawings, and the following:

1. Concealed blocking.
2. Wood cants, nailers, curbs, equipment support bases, blocking, and similar members in connection with roofing.

3. Plywood backing panels.

2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.

B. Dimension Lumber Items: Standard, Stud, or No. 3 grade lumber of any species.

C. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

2.5 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: Plywood, DOC PS 1, Exterior, C-C Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Screws for Fastening to Metal Framing: ASTM C 1002, length as recommended by screw manufacturer for material being fastened.

D. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

E. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 or ICC-ES AC58 as appropriate for the substrate.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry accurately to other construction. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.

D. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

F. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use inorganic boron for items that are continuously protected from liquid water.
2. Use copper naphthenate for items not continuously protected from liquid water.

G. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

H. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
2. ICC-ES evaluation report for fastener.

3.2 WOOD BLOCKING AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

3.3 WOOD FURRING INSTALLATION

A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

3.4 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect miscellaneous rough carpentry from weather. If, despite protection, miscellaneous rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION

SECTION 061500 - WOOD DECKING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Plywood decking (sheathing).

1.2 RELATED SECTIONS

A. Section 061000- Rough Carpentry.

1.3 REFERENCES

A. AITC 109 - Standard for Preservative Treatment of Structural Glued Laminated Timber; American Institute of Timber Construction.

B. AITC 111 - Recommended Practice for Protection of Structural Glued Laminated Timber During Transit, Storage and Erection; American Institute of Timber Construction.

C. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

D. AWPA C2 - Lumber, Timber, Bridge Ties and Mine Ties -- Preservative Treatment by Pressure Processes; American Wood-Preservers' Association.

E. AWPA C9 - Plywood -- Preservative Treatment by Pressure Processes; American Wood-Preservers' Association.

F. AWPA U1 - Use Category System: User Specification for Treated Wood; American Wood-Preservers' Association.

G. PS 20 - American Softwood Lumber Standard; National Institute of Standards and Technology (Department of Commerce).

H. WCLB (GR) - Standard Grading Rules for West Coast Lumber No. 17; West Coast Lumber Inspection Bureau.

I. WWPA G-5 - Western Lumber Grading Rules; Western Wood Products Association.

J. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.

1.4 SUBMITTALS

A. See Division 1 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide technical data on wood preservative materials.

1.5 QUALITY ASSURANCE

A. Comply with the following:

1. Lumber: PS 20 and approved grading rules and inspection agencies.
2. Lumber Inspection Agency: Any agency with rules approved by American Lumber Standards Committee
3. Structural Panels: As indicated in structural drawings.

B. Perform work in accordance with AITC A190.1.

1. Maintain one copy of document on site.

C. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience and certified by AITC.

D. Installer: Company specializing in performing work of the type specified in this section with minimum 2 years of experience.

E. Pressure Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

1.6 REGULATORY REQUIREMENTS

A. Conform to applicable code for fire retardant requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Plywood Decking:

1. Georgia-Pacific Corporation.
2. Louisiana-Pacific Corp; Product.
3. Weyerhaeuser Co; Product.

2.2 WOOD MATERIALS

A. Plywood Decking: As indicated in structural drawings.

B. Oriented Strand Board Decking: Substitution of plywood decking with OSB decking is not allowed. Do not use OSB decking where drawings specify plywood decking.

2.3 WOOD TREATMENT

A. Factory-Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.

B. Preservative Pressure Treatment:

1. Manufacturers:

    a. Arch Wood Protection, Inc; www.wolmanizedwood.com.
    b. Chemical Specialties, Inc; www.treatedwood.com.
    c. Osmose, Inc; www.osmose.com.
    d. Substitutions: See Section 016000- Product Requirements.

2. Preservative Pressure Treatment of Lumber Decking: AWPA Use Category UC3B, Commodity Specification A (Treatment C2) using waterborne preservative to 0.25 lb./cu ft retention.

    a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.

3. Preservative Pressure Treatment of Glued Laminated Decking: AITC 109 using waterborne preservative to 0.25 lb./cu ft retention.

    a. Kiln dry lumber after treatment and before lamination to maximum moisture content of 19 percent.

4. Preservative Pressure Treatment of Plywood Decking: AWPA Use Category UC2 and UC3B, Commodity Specification F (Treatment C9) using waterborne preservative to 0.25 lb./cu ft retention.

    a. Kiln dry plywood after treatment to maximum moisture content of 18 percent.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that support framing is ready to receive decking.

3.2 PREPARATION

A. Coordinate placement of bearing and support items.

3.3 SITE APPLIED WOOD TREATMENT

A. Apply preservative treatment in accordance with manufacturer's instructions.

B. Brush apply one coats of preservative treatment on wood in contact with cementitious materials. Treat site-sawn cuts.

C. Allow preservative to dry prior to erecting members.

3.4 INSTALLATION

A. Install decking perpendicular to framing members, with ends staggered over firm bearing.

B. Engage plywood tongue and groove edges as applicable.

C. Allow expansion space at edges and ends.

D. Attach decking with as indicated in structural drawings.

E. Use sheathing clips at unsupported edges of plywood between supporting framing members.

F. Cut decking to accommodate roof drain and flange.

END OF SECTION

SECTION 061600 - SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Wall sheathing.
2. Parapet sheathing.

B. Related Requirements:

1. Section 061053 "Miscellaneous Rough Carpentry" for plywood backing panels.
2. Comply with “CALGreen VERIFICATION GUIDELINES MANDATORY CHECKLIST” requirements as indicated in Drawing Sheet G1.21.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review air-barrier and water-resistant glass-mat gypsum sheathing requirements and installation, special details, transitions, mockups, air-leakage testing, protection, and work scheduling that covers air-barrier and water-resistant glass-mat gypsum sheathing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
2. For products receiving waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

3. For air-barrier and water-resistant glass-mat gypsum sheathing, include manufacturer's technical data and tested physical and performance properties of products.

B. Shop Drawings: For air-barrier and water-resistant glass-mat gypsum sheathing assemblies.

1. Show locations and extent of sheathing, accessories, and assemblies specific to Project conditions.
2. Include details for sheathing joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
3. Include details of interfaces with other materials that form part of air barrier.

1.5 INFORMATIONAL SUBMITTALS

A. Product Certificates: From air-barrier and water-resistant glass-mat gypsum sheathing manufacturer, certifying compatibility of sheathing accessory materials with Project materials that connect to or that come in contact with the sheathing.

B. Product Test Reports: For each air-barrier and water-resistant glass-mat gypsum sheathing assembly, indicating compliance with specified requirements, for tests performed by a qualified testing agency.

C. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated plywood.
2. Fire-retardant-treated plywood.
3. Air-barrier and water-resistant glass-mat gypsum sheathing.

D. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer of air-barrier and water-resistant glass-mat gypsum sheathing.

1. Installer shall be licensed by ABAA according to ABAA's Quality Assurance Program and shall employ ABAA-certified installers and supervisors on Project.

B. Mockups: Build mockups to set quality standards for materials and execution.

1. Build integrated mockups of exterior wall assembly, 150 sq. ft., incorporating backup wall construction, window, storefront, door frame and sill, ties and other penetrations, and flashing to demonstrate crack and joint treatment and sealing of gaps, terminations, and penetrations of air-barrier sheathing assembly.

a. Coordinate construction of mockups to permit inspection and testing of sheathing before external insulation and cladding are installed.
b. Include junction with roofing membrane, building corner condition, and foundation wall intersection.
c. If Architect determines mockups do not comply with requirements, reconstruct mockups until mockups are approved.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

C. Testing Agency Qualifications:

1. For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.
2. For testing and inspecting agency providing tests and inspections related to air-barrier and water-resistant glass-mat gypsum sheathing: an independent agency, qualified according to ASTM E329 for testing indicated, and certified by Air Barrier Association of America, Inc.

1.7 PRECONSTRUCTION TESTING

A. Mockup Testing: Air-barrier and water-resistant glass-mat gypsum sheathing assemblies shall comply with performance requirements indicated, as evidenced by reports based on mockup testing by a qualified testing agency.

1. Air-Leakage-Location Testing: Mockups will be tested for evidence of air leakage according to ASTM E1186, chamber pressurization or depressurization with smoke tracers.
2. Air-Leakage-Volume Testing: Mockups will be tested for air-leakage rate according to ASTM E783.
3. Notify Architect seven days in advance of the dates and times when mockups will be tested.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: As tested according to ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

B. Air-Barrier and Water-Resistant Glass-Mat Gypsum Sheathing Performance: Air-barrier and water-resistant glass-mat gypsum sheathing assembly, and seals with adjacent construction, shall be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, tie-ins to other installed air barriers, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

2.2 WALL SHEATHING

A. Glass-Mat Gypsum Sheathing: ASTM C1177/C1177M.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Georgia-Pacific Gypsum LLC., DensArmor Plus (BOD).

b. CertainTeed Corporation.
c. National Gypsum Company.
d. USG Corporation.
e. Or equal.

2. Type and Thickness: Type X, 5/8 inch thick.
3. Size: 48 by 96 inchesfor vertical installation.

2.3 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture. For parapet and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.

B. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

C. Screws for Fastening Sheathing to Wood Framing: ASTM C1002.

D. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached.

1. For steel framing less than 0.0329 inch thick, use screws that comply with ASTM C1002.
2. For steel framing from 0.033 to 0.112 inch thick, use screws that comply with ASTM C954.

2.4 MISCELLANEOUS MATERIALS

A. Sprayed Polyurethane Foam Sealant: 1- or 2-component, foamed-in-place, polyurethane foam sealant, 1.5 to 2.0 lb/cu. ft. (24 to 32 kg/cu. m) density; flame spread index of 25 or less according to ASTM E 162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
2. ICC-ES evaluation report for fastener.

D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

E. Coordinate wall and parapet sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer's written instructions.

1. Fasten gypsum sheathing to wood framing with screws.
2. Fasten gypsum sheathing to cold-formed metal framing with screws.
3. Install panels with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
4. Install panels with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.

C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent panels without forcing. Abut ends over centers of studs, and stagger end joints of adjacent panels not less than one stud spacing. Attach at perimeter and within field of panel to each stud.

1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of panels.
2. For sheathing under stucco cladding, panels may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

D. Vertical Installation: Install vertical edges centered over studs. Abut ends and edges with those of adjacent panels. Attach at perimeter and within field of panel to each stud.

1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of panels.
2. For sheathing under stucco cladding, panels may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

E. Glass-Mat Gypsum Sheathing:

1. Install accessory materials according to sheathing manufacturer's written instructions and details to form a seal with adjacent construction, to seal fasteners, and ensure continuity of air and water barrier.

a. Coordinate the installation of sheathing with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
b. Install transition strip on roofing membrane or base flashing, so that a minimum of 3 inches of coverage is achieved over each substrate.

2. Connect and seal sheathing material continuously to air barriers specified under other Sections as well as to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.
3. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
4. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition strip, so that a minimum of 3 inches of coverage is achieved over each substrate. Maintain 3 inches of full contact over firm bearing to perimeter frames, with not less than 1 inch of full contact.

    a. Transition Strip: Roll firmly to enhance adhesion.

5. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, doors, and miscellaneous penetrations of sheathing material with foam sealant.
6. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.
7. Seal top of through-wall flashings to sheathing with an additional 6-inch-wide, transition strip.
8. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.
9. Repair punctures, voids, and deficient lapped seams in strips and transition strips extending 6 inches beyond repaired areas in strip direction.

3.3 FIELD QUALITY CONTROL

A. ABAA Quality Assurance Program: Perform examinations, preparation, installation, testing, and inspections under ABAA's Quality Assurance Program.

B. Testing and Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections.

C. Inspections: Air-barrier and water-resistant glass-mat gypsum sheathing, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:

    1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.

2. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
3. Termination mastic has been applied on cut edges.
4. Strips and transition strips have been firmly adhered to substrate.
5. Compatible materials have been used.
6. Transitions at changes in direction and structural support at gaps have been provided.
7. Connections between assemblies (sheathing and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
8. All penetrations have been sealed.

D. Prepare test and inspection reports.

END OF SECTION

SECTION 061733 - PREFABRICATED WOOD LUMBER

PART - GENERAL

1.1 SECTION INCLUDES

A. Wood-I-Joists with wood flanges and web.

B. Prefabricated, Engineered, Laminated Veneer Lumber (LVL) such as beams, posts, studs, etc.

1.2 RELATED SECTIONS

A. Section 061000 – Rough Carpentry.

1.3 SUBMITTALS

A. See Division 1 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's literature describing materials, dimensions, allowable spans and spacing, bearing and anchor details, bridging and bracing requirements, and installation instructions; identify independent inspection agency.

C. Shop Drawings: Indicate sizes and spacing of joists, bracing and bridging, bearing stiffeners, holes to be cut (if any), and framed openings between joists. Shop drawings shall be signed and stamped by a professional engineer licensed in the state in which the project is located.

D. Certificate: Certification by joist manufacturer that products delivered are of the same design and construction as those evaluated by the independent inspection agency.

1.4 QUALITY ASSURANCE

A. Code and Reference Standards: Comply with applicable requirements and recommendations of the following:

1. Prefabricated plywood web joists shall comply with the requirements of Council of American Building Officials (CABO), report No. PFC-4354 or ICC Evaluation Services, Inc., report no. PFC-5803.
2. Structural composite lumber shall meet the requirements of CBC Section 2303A.1.9.
3. California Code of Regulations, Title 24, Part 2, 2022

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.5 DELIVERY, STORAGE AND HANDLING

A. Handle and store products with care and comply with manufacturer’s written instructions to avoid damage.

B. Inspect members showing evidence of deterioration. Discard and replace members that are damaged or defective.

1.6 SEQUENCING AND SCHEDULING

A. Time delivery and installation of wood trusses to avoid extended on-site storage and to avoid delaying progress of other trades whose work must follow installation of trusses.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Subject to compliance with requirements and furnishing a product determined to be an approved equal or better, provide products by one of the following:

1. RedBuilt LLC; www.redbuilt.com
2. Georgia-Pacific Corporation; www.gp.com.
3. Louisiana-Pacific Corp; www.lpcorp.com.

2.2 MATERIALS

A. Moisture Content: Shall not exceed 12 percent nor less than 7 percent at time of gluing.

2.3 FABRICATION

A. Prefabricated wood lumber shall be manufactured in accordance with latest and applicable ICC-ES Report.

B. For members with span greater than 25’-0”, provide manufactured camber based on radius of 2250’-0”, unless shown otherwise.

2.4 SOURCE QUALITY CONTROL

A. Continuous independent inspection of prefabricated wood lumber fabrication is not required. Ongoing quality control (QC) testing shall meet the requirements of ICC AC14, which includes the minimum requirements of ASTM D5055, Sections 8, 9 and 10. All quality control audits in compliance with Appendix B of ICC-ES AC14, resulting from unannounced audits by a third party auditor of a qualified third party inspection agency must be maintained by the manufacturers and made available to the Architect upon request

B. Where applicable, all plywood, lumber and/or OSB material used on the fabrication of prefabricated wood products shall be grade stamped by an acceptable grading agency.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install prefabricated wood products following the contract documents, approved shop drawings and manufacturer's instructions.

B. Do not install prefabricated wood products until supporting construction is in place and is braced and secured.

C. Hoist prefabricated wood products in place by lifting equipment suited to sizes and types of members required, exercising care not to damage members by out-of-plane bending or other causes.

D. Install members plumb, square, and true to line and securely fasten to supporting construction.

E. Space, adjust, and align members in location before permanently fastening.

F. For floors and roof framing, provide one row of bridging at mid-span for spans over 16 feet, where joists depth is 16 inches or greater or where the live load exceeds 40 pounds per square foot.

G. Provide connection to supports immediately after setting members as detailed on Structural Drawings. Install bridging, blocking and connections following manufacturers recommendations and as shown on drawings as erection progresses and before construction loads are placed on framing members.

H. Align top chord of joist members between supports by temporary lateral bracing until the sheathing is nailed into place.

I. Return members that are damaged or do not meet requirements to fabricator and replace with joists that do meet requirements.

    1. Do not alter members in the field.

END OF SECTION

SECTION 064023 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior standing and running trim.
2. Wood furring, blocking, shims, and hanging strips for installing interior architectural woodwork items that are not concealed within other construction.
3. Shop priming of interior architectural woodwork.

B. Related Requirements:

1. Section 061053 "Miscellaneous Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing interior architectural woodwork that are concealed within other construction before interior architectural woodwork installation.

1.3 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections, to ensure that interior architectural woodwork can be supported and installed as indicated.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For the following:

1. Anchors.
2. Adhesives.
3. Shop finishing materials.

B. Shop Drawings:

1. Include the following:

    a. Dimensioned plans, elevations, and sections.
    b. Attachment details.

2. Show large-scale details.
3. Show locations and sizes of furring, blocking, and hanging strips, including blocking and reinforcement concealed by construction and specified in other Sections.

C. Samples: For each exposed product and for each shop-applied color and finish specified.

1. Size:

    a. Panel Products: 12 inches by 12 inches.
    b. Lumber Products: Not less than 5 inches wide by 24 inches long, for each species and cut, finished on one side and one edge.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For [architectural woodwork manufacturer] [and] [Installer].

B. Product Certificates: For the following:

1. Composite wood and agrifiber products.
2. Adhesives.

C. Field quality-control reports.

1.7 CLOSEOUT SUBMITTLAS

1.8 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Build mockups of typical interior architectural woodwork as shown on Drawings.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Comply with the Architectural Woodwork Standards, Section 2.

B. Do not deliver interior architectural woodwork until painting and similar finish operations that might damage woodwork have been completed in installation areas.

C. Store woodwork in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1. Handle and store fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions.

1.10 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install interior architectural woodwork until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.

B. Field Measurements: Where interior architectural woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings.

1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being concealed by construction, and indicate measurements on Shop Drawings.

C. Established Dimensions: Where interior architectural woodwork is indicated to fit to other construction, establish dimensions for areas where woodwork is to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.11 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that architectural woodwork can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 ARCHITECTURAL WOODWORK, GENERAL

A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.

1. The Contract Documents contain requirements that are more stringent than the Architectural Woodwork Standards. Comply with Contract Documents and Architectural Woodwork Standards.

2.2 INTERIOR STANDING AND RUNNING TRIM FOR OPAQUE FINISH

A. Architectural Woodwork Standards Grade: Custom.

1. Wood Species: Eastern white pine, sugar pine, or western white pine.
2. Wood Moisture Content: 5 to 10 percent.

2.3 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Nailers: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.

B. Provide self-drilling screws for metal-framing supports, as recommended by metal-framing manufacturer.

C. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage.

1. Provide metal expansion sleeves or expansion bolts for post-installed anchors.
2. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

D. Installation Adhesive: Product recommended by fabricator for each substrate for secure anchorage.

2.4 FABRICATION

A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.

B. Fabricate interior architectural woodwork to dimensions, profiles, and details indicated.

1. Ease edges to radius indicated for the following:

a. Edges of Solid-Wood (Lumber) Members: 1/16 inch unless otherwise indicated.
b. Edges of Rails and Similar Members More Than 3/4 Inch Thick: 1/8 inch.

C. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site.

1. Disassemble components only as necessary for shipment and installation.
2. Where necessary for fitting at site, provide allowance for scribing, trimming, and fitting.

3. Notify Architect seven days in advance of the dates and times interior architectural woodwork fabrication will be complete.
4. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled.

    a. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting.
    b. Verify that parts fit as intended, and check measurements of assemblies against field measurements indicated on approved Shop Drawings before disassembling for shipment.

2.5 SHOP PRIMING

A. Preparations for Finishing: Comply with the Architectural Woodwork Standards for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing interior architectural woodwork, as applicable to each unit of work.

B. Interior Architectural Woodwork for Opaque Finish: Shop prime with one coat of wood primer as specified in Section 099123 "Interior Painting."

1. Backpriming: Apply one coat of primer, compatible with finish coats, to concealed surfaces of woodwork.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition interior architectural woodwork to humidity conditions in installation areas for not less than 72 hours prior to beginning of installation.

B. Before installing interior architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming of concealed surfaces.

3.2 INSTALLATION

A. Grade: Install interior architectural woodwork to comply with same grade as item to be installed.

B. Assemble interior architectural woodwork and complete fabrication at Project site to the extent that it was not completed during shop fabrication.

C. Install interior architectural woodwork level, plumb, true in line, and without distortion.

1. Shim as required with concealed shims.
2. Install level and plumb to a tolerance of 1/8 inch in 96 inches.

D. Scribe and cut interior architectural woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Anchor interior architectural woodwork to anchors or blocking built in or directly attached to substrates.

1. Secure with countersunk, concealed fasteners and blind nailing.
2. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with interior architectural woodwork.
3. For shop-finished items, use filler matching finish of items being installed.

F. Standing and Running Trim:

1. Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible.
2. Do not use pieces less than 60 inches long, except where shorter single-length pieces are necessary.
3. Scarf running joints and stagger in adjacent and related members.
4. Fill gaps, if any, between top of base and wall with latex sealant, painted to match wall.
5. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches.

3.3 REPAIR

A. Repair damaged and defective interior architectural woodwork, where possible, to eliminate functional and visual defects[and to result in interior architectural woodwork being in compliance with requirements of Architectural Woodwork Standards for the specified grade].

B. Where not possible to repair, replace defective woodwork.

C. Field Finish: See Section 099123 "Interior Painting" for final finishing of installed interior architectural woodwork not indicated to be shop finished.

3.4 CLEANING

A. Clean interior architectural woodwork on exposed and semiexposed surfaces.

END OF SECTION

SECTION 064069 - PHENOLIC CORE LAMINATE PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide thick phenolic core laminate panels with integral custom graphic design for interior vertical surfaces.

B. Related Sections: Coordinate with work of other sections including the following:

1. Section 064116 – Plastic Laminate Faced Architectural Cabinets.
2. Section 066400 – Plastic Paneling.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's literature including product characteristics, accessories and limitations.

B. Selection Samples: Submit samples of colors and finishes if requested by architect.

C. Verification Samples: Submit samples of selected materials specified to verify color and finish.

D. Industry Certifications and Standards: Submit copy of documentation indicating compliance.

E. Shop Drawings: Submit shop drawings indicating full extent and detailing of custom graphic panels.

F. Graphic Proof Sheets: Submit graphic proof sheets of the custom graphics for approval prior to fabrication.

1.3 QUALITY ASSURANCE

A. Manufacturer: Minimum of 5-years experience manufacturing similar products.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver materials and products in unopened factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations.

1.5 WARRANTY

A. Manufacturer's Warranty: Provide manufacturer's standard warranty against defects in manufacturing.

PART 2 - PRODUCTS

2.1 THICK PHENOLIC CORE LAMINATE PANELS

A. Manufacturer: Panolam Industries International, Inc., 1 Corporate Drive, Suite 725, Shelton, CT 06484. Tel: 877-726-6526, Fax: 203-225-0050. Web: www.panolam.com. Panels shall comply with the following:

1. Laminate Material: Complies with NEMA LD3 for Type CGS high pressure laminates.
2. Standard Grade: Compact laminate with black core and finish options selected.

3. Fire-Rated Grade: Compact laminate with Class A fire rating, with black core and finish options selected.
4. Chemical-Resistant Grade: Compact laminate with black core with ChemGuard finish engineered to resist acids, bases, solves, and chemical reagents. Provide panel which meets or exceeds the minimum performance in accordance with the chemical resistance test per SEFA-8- PL-2010.
5. Sheet Thickness: As selected from manufacturer's standard thickness of 1/8 inch (3 mm), 1/4 inch (6 mm) thickness with a tolerance of plus or minus 5 percent. Check with manufacturer for additional thicknesses.
6. Sheet Width: As selected from manufacturer's standard widths of 36 inches (914 mm), 48 inches (1219 mm), and 60 inches (1524 mm).
7. Sheet Length: As selected from manufacturer's standard lengths of 96 inches (2438 mm), 120 inches (3048 mm) and 144 inches (3658 mm).
8. Color and Finish: Refer to the Finish and Material Schedule in the drawing set.
9. Adhesive: Epoxy adhesive as recommended by manufacturer. When necessary, prepare surfaces with light sanding with 100 grit sandpaper. Contact adhesive shall only be used on sanded surfaces.
10. Edge Finishing: Sand with 80 grit coarse sandpaper followed by 180-220 grid fine sandpaper to provide a smooth appearance to edges. Higher grit sandpaper may be used on product for an even smoother finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install products in strict accordance with manufacturer's instructions and approved submittals.

1. Clean substrate of dirt, dust, waxes, and other bond breaking substances prior to beginning installation.
2. Follow adhesive manufacturer's recommendations for set and application times.
3. Apply pressure to entire panel face with laminate type roller, removing trapped air and ensure proper adhesion between surfaces.

3.3 ADJUSTING AND CLEANING

A. Replace installations out of plumb and not aligned with adjacent panels and construction.

B. Clean panel face to remove soiling, stains, dust, and dirt using clean rags, and cleaning agents as instructed by manufacturer.

C. Leave installation clean, free of residue and debris resulting from work of this section.

END OF SECTION

SECTION 064116 - PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Plastic-laminate-clad architectural cabinets.
2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-clad architectural cabinets that are not concealed within other construction.

B. Related Requirements: Section 061053 "Miscellaneous Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets that are concealed within other construction before cabinet installation.

C. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to support loads imposed by installed and fully loaded cabinets.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Sustainable Design Submittals:

1. Environmental Product Declaration: For each product.
2. Health Product Declaration: For each product.
3. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.
4. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
5. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings:

1. Include plans, elevations, sections, and attachment details.
2. Show large-scale details.
3. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
4. Show locations and sizes of cutouts and holes for items installed in plastic-laminate architectural cabinets.
5. Shop drawings shall be prepared utilizing Imperial nomenclature.

D. Samples: For each exposed product and for each color and texture specified, in manufacturer's or manufacturer's standard size.

E. Samples for Initial Selection: For each type of exposed finish.

F. Samples for Verification: For the following:

1. Plastic Laminates: 8 by 10 inches, for each type, color, pattern, and surface finish required.

a. Provide one sample applied to core material with specified edge material applied to one edge.

2. Thermoset Decorative Panels: 8 by 10 inches, for each color, pattern, and surface finish.

a. Provide edge banding on one edge.

3. Corner Pieces:

a. Cabinet-front frame joints between stiles and rails and at exposed end pieces, 18 inches high by 18 inches wide by 6 inches deep.
b. Miter joints for standing trim.

4. Exposed Cabinet Hardware and Accessories: One full-size unit for each type and finish.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer and Installer.

B. Product Certificates: For each type of product.

C. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

D. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Quality Standard Compliance Certificates: WI Certified Compliance Program certificates.

1.7 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

1. Manufacturer's Certification: Licensed participant in WI's Certified Compliance Program.

B. Installer Qualifications: Licensed participant in WI's Certified Compliance Program.

C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, Code compliance for clearances, and to set quality standards for materials and execution.

1. Build mockups of typical architectural cabinets as shown on Drawings.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver cabinets until painting and similar finish operations that might damage architectural cabinets have been completed in installation areas. Store cabinets in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.

B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Record locations of concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed/concealed by construction, and indicate measurements on Shop Drawings.
2. Identify conflicts with equipment rough-in and coordinate position adjustments as required.
3. Confirm that substrate surfaces and framing are plumb and within installation tolerances.

C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of cabinets indicated for construction, finishes, installation, and other requirements.

1. The Contract Documents contain requirements that are more stringent than the referenced quality standard. Comply with requirements of Contract Documents in addition to those of the referenced quality standard.

B. Architectural Woodwork Standards Grade: Custom.

C. Type of Construction: Frameless.

D. Door and Drawer-Front Style: Flush overlay.

E. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by quality standard.

1. Basis of Design Project: Subject to compliance with requirements, provide product indicated in “Materials and Color Schedule” on Drawings, or comparable product from one of the available manufacturers.

2. Available Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Formica Corporation.

b. Pionite; a Panolam Industries International, Inc. brand (BOD).

c. Abet Laminati Inc.

d. Lamin-Art, Inc.

e. Wilsonart LLC.

f. Or equal.

F. Laminate Cladding for Exposed Surfaces:

1. Horizontal Surfaces: Grade HGS.
2. Postformed Surfaces: Grade HGP.
3. Vertical Surfaces: Grade HGS.
4. Edges: Grade HGS.

G. Materials for Semiexposed Surfaces:

1. Surfaces Other Than Drawer Bodies: Thermoset decorative panels.

a. Edges of Plastic-Laminate Shelves: PVC tape, 0.018-inch minimum thickness, matching laminate in color, pattern, and finish.
b. Edges of Thermoset Decorative Panel Shelves: PVC or polyester edge banding.
c. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, NEMA LD 3, Grade VGS.

2. Drawer Sides and Backs: Thermoset decorative panels with PVC or polyester edge banding.
3. Drawer Bottoms: Thermoset decorative panels.

H. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.

I. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints.

J. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements: As indicated by laminate manufacturer's designations.

2.2 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated. Wood Moisture Content: 5 to 10 percent.

B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and

quality grade specified unless otherwise indicated. Recycled Content of MDF and Particleboard: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

C. Composite Wood Products: Products shall be made using ultra-low-emitting formaldehyde resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added formaldehyde.

1. Medium-Density Fiberboard (MDF): ANSI A208.2, Grade 130.
2. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.
3. Straw-Based Particleboard: ANSI A208.1, Grade M-2, except for density. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Panel Source International, Inc.

    b. Sorm Incorporated.

    c. Or equal.

4. Softwood Plywood: DOC PS 1.
5. Thermoset Decorative Panels: Particleboard or MDF finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for Test Methods 3.3, 3.4, 3.6, 3.8, and 3.10.

2.3 CABINET HARDWARE AND ACCESSORIES

A. Frameless Concealed Hinges (European Type): ANSI/BHMA A156.9, B01602, 170 degrees of opening, self-closing.

B. Wire Pulls: Back mounted, solid metal, 4 inches long, 5/16 inch in diameter.

C. Catches: Push-in magnetic catches, ANSI/BHMA A156.9, B03131.

D. Shelf Rests: ANSI/BHMA A156.9, B04013; metal.

E. Drawer Slides: ANSI/BHMA A156.9.

1. Grade 1 and Grade 2: Side mounted.

    a. Type: Full extension.
    b. Material: Zinc-plated steel with polymer rollers.

2. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-extension type; zinc-plated-steel ball-bearing slides.
3. For drawers not more than 3 inches high and not more than 24 inches wide, provide Grade 2.

4. For drawers more than 3 inches high, but not more than 6 inches high and not more than 24 inches wide, provide Grade 1HD-100.
5. For drawers more than 6 inches high or more than 24 inches wide, provide Grade 1HD-100.
6. For computer keyboard shelves, provide Grade 1.
7. For trash bins not more than 20 inches high and 16 inches wide, provide Grade 1HD-200.

F. Door Locks: ANSI/BHMA A156.11, E07121. Provide at locations as indicated on Drawings.

G. Drawer Locks: ANSI/BHMA A156.11, E07041. Provide at locations as indicated on Drawings.

H. Door and Drawer Silencers: ANSI/BHMA A156.16, L03011.

I. Grommets for Cable Passage: 2-inch OD, molded-plastic grommets and matching plastic caps with slot for wire passage. Color: Brown.

J. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with ANSI/BHMA A156.18 for ANSI/BHMA finish number indicated. Satin Stainless Steel: ANSI/BHMA 630.

K. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in ANSI/BHMA A156.9.

2.4 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln-dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

C. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

D. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.5 FABRICATION

A. Fabricate architectural cabinets to dimensions, profiles, and details indicated.

B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Notify Architect seven days in advance of the dates and times architectural cabinet fabrication will be complete.
2. Trial fit assemblies at manufacturer's shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.

C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition cabinets to humidity conditions in installation areas for not less than 72 hours.

3.2 INSTALLATION

A. Architectural Woodwork Standards Grade: Install cabinets to comply with quality standard grade of item to be installed.

B. Assemble cabinets and complete fabrication at Project site to extent that it was not completed in the shop.

C. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with wafer-head cabinet installation screws.

D. Install cabinets level, plumb, and true in line to a tolerance of 1/8 inch in 96 inches using concealed shims.

1. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
2. Install cabinets without distortion so doors and drawers fit openings and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.

3. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with toggle bolts through metal backing or metal framing behind wall finish.

3.3 FIELD QUALITY CONTROL

A. Inspections: Provide inspection of installed Work through WI's Certified Compliance Program certifying that woodwork, including installation, complies with requirements of the Architectural Woodwork Standards for the specified grade. Inspection entity shall prepare and submit report of inspection.

3.4 ADJUSTING AND CLEANING

A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects. Where not possible to repair, replace architectural cabinets. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean cabinets on exposed and semiexposed surfaces.

END OF SECTION

SECTION 064216 - FLUSH WOOD PANELING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Flush wood paneling (wood-veneer wall surfacing).
2. Fire-retardant-treated materials.
3. Installation materials.

B. Related Requirements: Section 061000 "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing paneling that is concealed within other construction before paneling installation.

1.2 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that paneling can be installed as indicated.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Shop Drawings: For flush wood paneling.

1. Include plans, elevations, sections, and attachment details.
2. Show details full size.
3. Show locations and sizes of furring and blocking, including concealed blocking specified in other Sections.
4. For paneling produced from premanufactured sets, show finished panel sizes, set numbers, sequence numbers within sets, and method of cutting panels to produce indicated sizes.

5. For paneling veneered in fabrication shop, show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.
6. Apply WI Certified Compliance Program label to Shop Drawings.

C. Samples: For each exposed product and for each color and finish specified, in manufacturer's or fabricator's standard size.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Product Certificates: For each type of product.

C. Quality Standard Compliance Certificates: [AWI Quality Certification Program] [WI Certified Compliance Program].

D. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

B. Shop Certification: WI's Certified Compliance Program licensee.

1.7 MOCKUPS

A. Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Build mockups of typical paneling as directed by Architect.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver paneling until painting and similar operations that might damage paneling have been completed in installation areas. Store paneling in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.9 FIELD CONDITIONS

A. Environmental Limitations without Humidity Control: Do not deliver or install paneling until building is enclosed, wet-work is complete, and HVAC system is operating and will maintain temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.

B. Environmental Limitations with Humidity Control: Do not deliver or install paneling until building is enclosed, wet-work is complete, and HVAC system is operating and will maintain temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.

C. Field Measurements: Where paneling is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work. Locate concealed framing, blocking, and reinforcements that support paneling by field measurements before being enclosed/concealed by construction and indicate measurements on Shop Drawings.

D. Established Dimensions: Where paneling is indicated to fit to other construction, establish dimensions for areas where woodwork is to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of paneling.

2.2 PANELING, GENERAL

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of flush wood paneling (wood-veneer wall surfacing) indicated for construction, finishes, installation, and other requirements.

1. Provide inspections of fabrication and installation together with labels and certificates from WI certification program indicating that woodwork complies with requirements of grades specified.
2. The Contract Documents contain requirements that are more stringent than the referenced woodwork quality standard. Comply with requirements of Contract Documents in addition to those of the referenced quality standard.

2.3 FLUSH WOOD PANELING (WOOD-VENEER WALL SURFACING)

A. Basis of Design Product: Subject to compliance with requirements, provide Armstrong “WOODWORKS” wall panel system. or equal.

B. Wood Species and Cut: As indicated on Drawings..

C. Panel Core Construction: Fire-retardant particleboard or fire-retardant MDF. Thickness: 3/4 inch.

D. Exposed Panel Edges: Manufacturer’s standard edge treatment.

E. Panel Reveals: As indicated on Drawings.

F. Fire-Retardant-Treated Paneling: Panels are to consist of wood-veneer and fire-retardant particleboard or fire-retardant, medium-density fiberboard (MDF). Panels are to have a flame-spread index of 25 or less and a smoke-developed index of 450 or less per ASTM E84, and be listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.

G. Assemble panels by gluing and concealed fastening.

2.4 MATERIALS

A. Materials, General: Provide materials that comply with requirements of referenced quality standard for each quality grade specified unless otherwise indicated.

B. Wood Moisture Content: 5 to 10 percent.

C. Composite Wood Products: Provide materials that comply with requirements of referenced quality standard for each quality grade specified unless otherwise indicated.

1. Composite Wood Products: Verify products are made using ultra-low-emitting formaldehyde resins, as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products," or are made with no added formaldehyde.
2. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1.

D. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.5 INSTALLATION MATERIALS

A. Hanging Strips: Manufacturer’s standard zee clip installation method..

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls.

C. Installation Adhesive: Product recommended by panel fabricator for each substrate for secure anchorage.

1. Verify adhesives have a VOC content of 70 g/L or less.
2. Verify adhesive complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.6 FABRICATION

A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.

B. Arrange paneling in shop or other suitable space in proposed sequence for examination by Architect. Mark units with temporary sequence numbers to indicate position in proposed layout.

1. Lay out one elevation at a time if approved by Architect.
2. Notify Architect seven days in advance of the date and time when layout will be available for viewing.
3. Provide lighting of similar type and level as that of final installation for viewing layout unless otherwise approved by Architect.
4. Rearrange paneling as directed by Architect until layout is approved.
5. Do not trim end units and other nonmodular-size units to less than modular size until after Architect's approval of layout.
6. Obtain Architect's approval of layout before start of assembly. Mark units and Shop Drawings with assembly sequence numbers based on approved layout.

C. Complete fabrication, including assembly, to maximum extent possible, before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting. Notify Architect seven days in advance of the dates and times paneling fabrication will be complete.

D. Shop cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and

use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

2.7 SHOP FINISHING

A. General: Finish paneling at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.

B. Transparent Finish: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition paneling to humidity conditions in installation areas.

B. Before installing paneling, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

A. Grade: Install paneling to comply with quality standard grade of paneling to be installed.

B. Install paneling level, plumb, true in line, and without distortion. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches. Install with no more than 1/16 inch in 96-inch vertical cup or bow and 1/8 inch in 96-inch horizontal variation from a true plane. For flush paneling with revealed joints, install with variations in reveal width, alignment of top and bottom edges, and flushness between adjacent panels not exceeding 1/32 inch.

C. Anchor paneling to supporting substrate with concealed panel-hanger clips. Do not use face fastening unless.

D. Complete finishing work specified in this Section to extent not completed at shop or before installation of paneling. Fill nail holes with matching filler where exposed. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats are shop applied.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective paneling, where possible, to eliminate defects. Where not possible to repair, replace paneling. Adjust for uniform appearance.

B. Clean paneling on exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 064216

SECTION 066400 - PLASTIC PANELING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes: Plastic sheet paneling.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating VOC content.
2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
3. Product Data: For sealants, indicating VOC content.
4. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.
5. Laboratory Test Reports: For wall materials, indicating compliance with requirements for low-emitting materials.

C. Samples: For plastic paneling and trim accessories, in manufacturer's standard sizes.

1.4 QUALITY ASSURANCE

A. Testing Agency: Acceptable to authorities having jurisdiction.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install plastic paneling until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain plastic paneling and trim accessories from single manufacturer.

2.2 PLASTIC SHEET PANELING

A. Glass-Fiber-Reinforced Plastic Paneling: Gelcoat-finished, glass-fiber-reinforced plastic panels complying with ASTM D5319. Panels shall be USDA accepted for incidental food contact.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Crane Composites, Inc.
    b. Glasteel.
    c. Marlite.
    d. Newcourt, Inc.
    e. Nudo Products, Inc.
    f. Parkland Plastics, Inc.

2. Wall materials shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
3. Surface-Burning Characteristics: As follows when tested by a qualified testing agency according to ASTM E84. Identify products with appropriate markings of applicable testing agency.

    a. Flame-Spread Index: 25 or less.
    b. Smoke-Developed Index: 450 or less.

4. Nominal Thickness: Not less than 0.12 inch.
5. Surface Finish: Smooth.
6. Color: White.
7. Panel Size: 48 inches by 96 inches.

2.3 ACCESSORIES

A. Trim Accessories: Manufacturer's standard one-piece vinyl extrusions designed to retain and cover edges of panels. Provide division bars, inside corners, outside corners, and caps as needed to conceal edges. Color: Match panels.

B. Exposed Fasteners: Nylon drive rivets recommended by panel manufacturer.

C. Concealed Mounting Splines: Continuous, H-shaped aluminum extrusions designed to fit into grooves routed in edges of factory-laminated panels and to be fastened to substrate.

D. Adhesive: As recommended by plastic paneling manufacturer. Adhesives shall have a VOC content of 50 g/L or less.

E. Sealant: Mildew-resistant, single-component, neutral-curing or acid-curing silicone sealant recommended by plastic paneling manufacturer and complying with requirements in Section 079200 "Joint Sealants." Sealant shall have a VOC content of 250 g/L or less.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove wallpaper, vinyl wall covering, loose or soluble paint, and other materials that might interfere with adhesive bond.

B. Prepare substrate by sanding high spots and filling low spots as needed to provide flat, even surface for panel installation.

C. Clean substrates of substances that could impair adhesive bond, including oil, grease, dirt, and dust.

D. Condition panels by unpacking and placing in installation space before installation according to manufacturer's written recommendations.

E. Lay out paneling before installing. Locate panel joints to provide equal panels at ends of walls not less than half the width of full panels.

1. Mark plumb lines on substrate at trim accessory locations for accurate installation.
2. Locate trim accessories to allow clearance at panel edges according to manufacturer's written instructions.

3.3 INSTALLATION

A. Install plastic paneling according to manufacturer's written instructions.

B. Install panels in a full spread of adhesive.

C. Install trim accessories with adhesive.

D. Fill grooves in trim accessories with sealant before installing panels, and bed inside corner trim in a bead of sealant.

E. Maintain uniform space between panels and wall fixtures. Fill space with sealant.

F. Maintain uniform space between adjacent panels and between panels and floors, ceilings, and fixtures. Fill space with sealant.

G. Remove excess sealant and smears as paneling is installed. Clean with solvent recommended by sealant manufacturer and then wipe with clean dry cloths until no residue remains.

END OF SECTION

SECTION 071413 - HOT FLUID-APPLIED RUBBERIZED ASPHALT WATERPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Rubberized-asphalt waterproofing membrane, reinforced.
2. Molded-sheet drainage panels.

B. Related Requirements:

1. Section 077600 “Unit Pavers” for paver system installed over hot fluid-applied rubberized asphalt waterproofing.
2. Section 079200 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site. Review waterproofing requirements, including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing.

B. Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins to adjoining waterproofing, and other termination conditions. Include setting drawings showing layout, sizes, sections, profiles, and joint details of pedestal-supported concrete pavers.

C. Samples: For plaza-deck pavers, full sized in each color and texture required.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and testing agency.

B. Field quality-control reports.

C. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by the manufacturer.

B. Mockups: Install waterproofing to 100 sq. ft. of deck to demonstrate surface preparation, crack and joint treatment, corner treatment, thickness, texture, and execution quality. Install pavers and paver supports to demonstrate aesthetic effects, and set quality standards for materials and execution.

1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by waterproofing manufacturer.

B. Remove and replace liquid materials that cannot be applied within their stated shelf life.

C. Protect stored materials from direct sunlight.

1.8 FIELD CONDITIONS

A. Weather Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate, or when temperature is below zero deg F. Do not apply waterproofing in snow, rain, fog, or mist.

B. Maintain adequate ventilation during application and curing of waterproofing materials.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace waterproofing and sheet flashings that do not comply with requirements or that fail to remain watertight within specified warranty period.

1. Warranty includes removing and reinstalling protection board, drainage panels, insulation, pedestals, and pedestal-mounted pavers on plaza decks.
2. Warranty insulation retains 80 percent of original published thermal value.
3. Warranty pavers do not dish or warp and do not crack, split, or disintegrate in freeze-thaw conditions.
4. Warranty Period: 10 years from date of Substantial Completion.

B. Special Installer's Warranty: In form acceptable to Owner signed by Installer, covering Work of this Section, for warranty period of two years. Warranty includes removing and reinstalling protection board, drainage panels, insulation, pedestals, and pedestal-mounted pavers on plaza decks.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain waterproofing materials sheet flashings protection course from single source from single manufacturer.

2.2 WATERPROOFING MEMBRANE

A. Hot Fluid-Applied, Rubberized-Asphalt Waterproofing Membrane: Single component; 100 percent solids; hot fluid-applied, rubberized asphalt.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. American Hydrotech, Inc.
b. Carlisle Coatings & Waterproofing Inc.
c. Henry Company.
d. Soprema, Inc.
e. Tamko Building Products, Inc.
f. Tremco Incorporated.

2.3 AUXILIARY MATERIALS

A. General: Auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with waterproofing.

B. Primer: ASTM D41/D41M, asphaltic primer.

C. Elastomeric Sheet: 50-mil-minimum, uncured sheet neoprene with manufacturer's recommended contact adhesives as follows:

1. Tensile Strength: 1400 psi minimum; ASTM D412, Die C.
2. Elongation: 300 percent minimum; ASTM D412.
3. Tear Resistance: 125 psi minimum; ASTM D624, Die C.
4. Brittleness: Does not break at minus 30 deg F; ASTM D2137.

D. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum termination bars; approximately 1 by 1/8 inch thick; with stainless-steel anchors.

E. Sealants and Accessories: Manufacturer's recommended sealants and accessories.

F. Reinforcing Fabric: Manufacturer's recommended spun-bonded polyester fabric.

G. Protection Course: ASTM D6506, semirigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners and as follows: Thickness: 1/8 inch, nominal, for vertical applications; 1/4 inch, nominal, elsewhere.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Verify that concrete has cured and aged for minimum time period recommended by waterproofing manufacturer.
2. Verify that substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D4263.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean and prepare substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

C. Close off deck drains and other deck penetrations to prevent spillage and migration of waterproofing fluids.

D. Remove grease, oil, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete. Abrasive blast clean concrete surfaces uniformly to expose top surface of fine aggregate according to ASTM D4259 with a self-contained, recirculating, blast-cleaning apparatus. Remove material to provide a sound surface free of laitance, glaze, efflorescence, curing compounds, concrete hardeners, or form-release agents. Remove remaining loose material and clean surfaces according to ASTM D4258.

E. Remove fins, ridges, and other projections, and fill honeycomb, aggregate pockets, and other voids.

3.3 JOINTS, CRACKS, AND TERMINATIONS

A. Prepare and treat substrates to receive waterproofing membrane, including joints and cracks, deck drains, corners, and penetrations according to manufacturer's written instructions.

1. Rout and fill joints and cracks in substrate. Before filling, remove dust and dirt according to ASTM D4258.
2. Adhere strip of elastomeric sheet to substrate in a layer of hot rubberized asphalt. Extend elastomeric sheet a minimum of 6 inches on each side of moving joints and cracks or joints and cracks exceeding 1/8 inch thick, and beyond deck drains and penetrations. Apply second layer of hot fluid-applied, rubberized asphalt over elastomeric sheet.
3. Embed strip of reinforcing fabric into a layer of hot rubberized asphalt. Extend reinforcing fabric a minimum of 6 inches on each side of nonmoving joints and cracks not exceeding 1/8 inch thick, and beyond roof drains and penetrations. Apply second layer of hot fluid-applied, rubberized asphalt over reinforcing fabric.

B. At expansion joints and discontinuous deck-to-wall or deck-to-deck joints, bridge joints with elastomeric sheet extended a minimum of 6 inches on each side of joints and adhere to substrates in a layer of hot rubberized asphalt. Apply second layer of hot fluid-applied, rubberized asphalt over elastomeric sheet.

3.4 FLASHING INSTALLATION

A. Install elastomeric sheets at terminations of waterproofing membrane according to manufacturer's written instructions.

B. Prime substrate with asphalt primer.

C. Install elastomeric sheet and adhere to deck and wall substrates in a layer of hot rubberized asphalt.

D. Extend elastomeric sheet up walls or parapets a minimum of 8 inches above plaza-deck pavers and 6 inches onto deck to be waterproofed.

E. Install termination bars and mechanically fasten to top of elastomeric flashing sheet at terminations and perimeter of waterproofing.

3.5 MEMBRANE APPLICATION

A. Apply primer, at manufacturer's recommended rate, over prepared substrate and allow it to dry.

B. Heat and apply rubberized asphalt according to manufacturer's written instructions. Heat rubberized asphalt in an oil- or air-jacketed melter with mechanical agitator specifically designed for heating rubberized asphalt.

C. Start application with manufacturer's authorized representative present.

D. Reinforced Membrane: Apply hot rubberized asphalt to substrates and adjoining surfaces indicated. Spread to a thickness of 90 mils; embed reinforcing fabric, overlapping sheets 2 inches; spread another 125-mil-thick layer to provide a uniform, reinforced, seamless membrane 215 mils thick.

E. Apply waterproofing over prepared joints and up wall terminations and vertical surfaces to heights indicated or required by manufacturer.

F. Cover waterproofing with protection course with overlapped joints before membrane is subject to construction or vehicular traffic.

3.6 FIELD QUALITY CONTROL

A. Engage a full-time site representative qualified by waterproofing membrane manufacturer to inspect substrate conditions; surface preparation; and application of membrane, flashings, protection, and drainage components; furnish daily reports to Architect. Site representative shall measure membrane thickness with pin tester or other suitable device at least once for every 100 sq. ft. and include measurements in reports.

B. Testing Agency: Owner will engage a qualified testing agency to inspect substrate conditions, surface preparation, waterproofing application, protection, and drainage components, and to furnish reports to Architect.

1. Flood Testing: Flood test each deck area for leaks, according to recommendations in ASTM D5957, after completing and protecting waterproofing but before overlaying construction is placed. Install temporary containment assemblies, plug or dam drains, and flood with potable water. Testing agency shall observe flood testing.

a. Flood to an average depth of 2-1/2 inches with a minimum depth of 1 inch and not exceeding a depth of 4 inches. Maintain 2 inches of clearance from top of sheet flashings.
b. Flood each area for 24 hours.
c. After flood testing, repair leaks, repeat flood tests, and make further repairs until waterproofing installation is watertight.

3.7 CLEANING AND PROTECTION

A. Protect waterproofing from damage and wear during remainder of construction period.

B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 071413

SECTION 071416 - COLD FLUID-APPLIED WATERPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Polyurethane waterproofing.
2. Protection course.
3. Molded-sheet drainage panels.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, product Installer, product system manufacturer's representative, and installers whose work interfaces with or affects system, including installers of accessories.

1. Review waterproofing requirements including, but not limited to, the following:

a. Surface preparation specified in other Sections.
b. Minimum curing period.
c. Forecasted weather conditions.
d. Special details and sheet flashings.
e. Repairs.
f. Field quality control.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, and tested physical and performance properties of waterproofing.
2. Include manufacturer's written instructions for evaluating, preparing, and treating substrate.

B. Shop Drawings:

1. Show locations and extent of waterproofing.
2. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.
3. Include setting drawings showing layout, sizes, sections, profiles, and joint details of pedestal-supported concrete pavers.

C. Samples: For each exposed product and for each color and texture specified, including the following products:

1. Flashing sheet, 8 by 8 inches.
2. Membrane-reinforcing fabric, 8 by 8 inches.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Manufacturer's letter stating that Installer is approved to install manufacturer's products.

C. Field quality-control reports.

D. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by waterproofing manufacturer.

B. Mockups: Build mockups to verify selections made under Sample submittals and to set quality standards for installation.

1. Build mockup for each typical waterproofing installation including accessories to demonstrate surface preparation, crack and joint treatments, inside and outside corner treatments, and protection.

a. Size: 100 sq. ft. in area.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended in writing by waterproofing manufacturer.

1. Do not apply waterproofing to a damp or wet substrate, when relative humidity exceeds 85 percent, or when temperatures are less than 5 deg F above dew point.
2. Do not apply waterproofing in snow, rain, fog or mist, or when such weather conditions are imminent during application and curing period.

B. Maintain adequate ventilation during application and curing of waterproofing materials.

1.8 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace waterproofing that fails in materials or workmanship within specified warranty period. Warranty Period: Five years from date of Substantial Completion.

B. Installer's Special Warranty: Specified form, signed by Installer, covering Work of this Section, for warranty period of two years. Warranty includes removing and reinstalling protection board, drainage panels, insulation, pedestals, and pavers on plaza decks.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Waterproofing System: Obtain waterproofing materials, protection course, and molded-sheet drainage panels from single source from single manufacturer.

2.2 POLYURETHANE WATERPROOFING

A. Single-Component, Modified Polyurethane Waterproofing: ASTM C836/C836M and coal-tar free.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Anti-Hydro International, Inc.

b. BASF Corporation.

c. Carlisle Coatings & Waterproofing Inc.

d. CETCO, a Minerals Technologies company.

e. MAPEI Corporation.

f. NEOGARD®, a Division of Hempel (USA), Inc.

g. Pacific Polymers®; ITW Polymers Sealants North America.

h. Polyguard Products, Inc.

i. Tremco Incorporated.

j. Or equal.

2.3 AUXILIARY MATERIALS

A. General: Provide auxiliary materials recommended in writing by waterproofing manufacturer for intended use and compatible with one another and with waterproofing. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.

B. Primer: Manufacturer's standard primer, sealer, or surface conditioner; factory-formulated.

C. Sheet Flashing: 50-mil-minimum, nonstaining, uncured sheet neoprene. Adhesive: Manufacturer's recommended contact adhesive.

D. Joint Reinforcing Strip: Manufacturer's recommended fiberglass mesh or polyester fabric.

E. Joint Sealant: Multicomponent polyurethane sealant, compatible with waterproofing; ASTM C920, Type M, Class 25 or greater; Grade NS for sloping and vertical applications and Grade P for deck applications; Use NT exposure; and as recommended by manufacturer for substrate and joint conditions. Backer Rod: Closed-cell polyethylene foam.

2.4 PROTECTION COURSE

A. Protection Course, Semirigid Sheets of Fiberglass or Mineral-Reinforced Asphaltic Core: ASTM D6506, pressure laminated between two asphalt-saturated fibrous liners and as follows:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Soprema, Inc.

b. W.R. Meadows, Inc.

c. Or equal.

2. Thickness: 1/8 inch, nominal.
3. Adhesive: Rubber-based solvent type recommended in writing by waterproofing manufacturer.

2.5 MOLDED-SHEET DRAINAGE PANELS

A. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel with Polymeric Film: Composite subsurface drainage panel consisting of a studded, nonbiodegradable, molded-plastic-sheet drainage core; with a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 sieve laminated to one side of the core and a polymeric film bonded to the other side; and with a vertical flow rate through the core of 9 to 21 gpm per ft..

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. American Hydrotech, Inc.

b. BASF Corporation.

c. Carlisle Coatings & Waterproofing Inc.

d. CETCO, a Minerals Technologies company.

e. GCP Applied Technologies Inc.

f. Polyguard Products, Inc.

g. Or equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

1. Verify that concrete has cured and aged for minimum time period recommended in writing by waterproofing manufacturer.
2. Verify that substrate is visibly dry and within the moisture limits recommended in writing by manufacturer. Test for capillary moisture by plastic sheet method in accordance with ASTM D4263.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, acid residues, and other penetrating contaminants or film-forming coatings from concrete. Abrasive blast clean concrete surfaces uniformly to expose top surface of fine aggregate according to ASTM D4259 with a self-contained, recirculating, blast-cleaning apparatus. Remove material to provide a sound surface free of laitance, glaze, efflorescence, curing compounds, concrete hardeners, or form-release agents. Remove remaining loose material and clean surfaces according to ASTM D4258.

D. Remove fins, ridges, and other projections, and fill honeycomb, aggregate pockets, holes, and other voids.

3.3 PREPARATION AT TERMINATIONS, PENETRATIONS, AND CORNERS

A. Prepare surfaces at terminations and penetrations through waterproofing and at expansion joints, drains, sleeves, and corners according to waterproofing manufacturer's written instructions and to recommendations in ASTM C1471/C1471M.

B. Apply waterproofing in two separate applications, and embed a joint reinforcing strip in the first preparation coat when recommended by waterproofing manufacturer.

3.4 JOINT AND CRACK TREATMENT

A. Prepare, treat, rout, and fill joints and cracks in substrate according to waterproofing manufacturer's written instructions and to recommendations in ASTM C1471/C1471M. Before coating surfaces, remove dust and dirt from joints and cracks according to ASTM D4258.

1. Comply with ASTM C1193 for joint-sealant installation.
2. Apply bond breaker on sealant surface, beneath preparation strip.
3. Prime substrate along each side of joint and apply a single thickness of preparation strip at least 6 inches wide along each side of joint. Apply waterproofing in two separate applications and embed a joint reinforcing strip in the first preparation coat.

3.5 INSTALLATION OF WATERPROOFING

A. Apply waterproofing according to manufacturer's written instructions and to recommendations in ASTM C1471/C1471M.

B. Start installing waterproofing in presence of manufacturer's technical representative.

C. Apply primer over prepared substrate unless otherwise instructed in writing by waterproofing manufacturer.

D. Unreinforced Waterproofing Applications: Mix materials and apply waterproofing by spray, roller, notched squeegee, trowel, or other application method suitable to slope of substrate.

1. Apply one or more coats of waterproofing to obtain a seamless membrane free of entrapped gases and pinholes, with a dry film thickness of 90 mils.
2. Apply waterproofing to prepared wall terminations and vertical surfaces.
3. Verify manufacturer's recommended wet film thickness of waterproofing every 100 sq. ft..

E. Cure waterproofing, taking care to prevent contamination and damage during application and curing.

F. Install protection course with butted joints over waterproofing before starting subsequent construction operations.

1. For horizontal applications, install protection course loose laid over fully cured membrane.
2. For vertical applications, set protection course in nominally cured membrane, which will act as an adhesive. If membrane cures before application of protection course, use adhesive.
3. Molded-sheet drainage panels may be used in place of a separate protection course for vertical applications when approved in writing by waterproofing manufacturer.

3.6 INSTALLATION OF MOLDED-SHEET DRAINAGE PANELS

A. Place and secure molded-sheet drainage panels, with geotextile facing away from wall or deck substrate, according to manufacturer's written instructions. Use adhesive or another method that does not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction. For vertical applications, install protection course before installing drainage panels.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections: Testing agency shall verify thickness of waterproofing during application for each 600 sq. ft. of installed waterproofing or part thereof.

B. Manufacturer's Field Service: Engage asite representative qualified by waterproofing membrane manufacturer to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components and to furnish daily reports to Architect.

C. Waterproofing will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.8 PROTECTION

A. Do not permit foot or vehicular traffic on unprotected membrane.

B. Protect waterproofing from damage and wear during remainder of construction period.

C. Protect installed insulation drainage panels from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

D. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

END OF SECTION

SECTION 071700 - BENTONITE WATERPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Bentonite waterproofing.
2. Molded-sheet drainage panels.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, product Installer, product system manufacturer's representative, and installers whose work interfaces with or affects system, including installers of accessories. Review requirements for products and installation, including surface preparation, substrate conditions, project and manufacturer's details, installation procedures, mockups, testing and inspection requirements, protection and repairs, and coordination and sequencing of installation with work of other Sections.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, and installation instructions.

B. Shop Drawings: Include installation details for waterproofing, penetrations, and interface with other work.

C. Samples: For each of the following products, in sizes indicated:

1. Waterproofing: 6 inches square.
2. Protection Course: 6 inches square.
3. Molded-Sheet Drainage Panels: 6 inches square.

1.5 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of waterproofing material.

B. Manufacturer’s letter stating that Installer is approved to install manufacturer’s products.

C. Preconstruction Test Reports: For water samples taken at Project site along with recommendations resulting from these tests.

D. Field quality-control reports.

E. Sample Warranty: For manufacturer's special warranty.

1.6 QUALITY ASSURANCE

A. Mockups: Build mockups to set quality standards for fabrication and installation.

1. Build mockup of installation on typical vertical and horizontal surfaces 10 sq. ft. in size.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 PRECONSTRUCTION TESTING

A. Preconstruction Testing: Engage a qualified testing agency to perform preconstruction testing on ground water.

1. Obtain water samples from Project site at approximate locations where waterproofing will be installed and test for acids, alkalis, brine, or other contaminants that may inhibit performance of waterproofing materials.
2. Comply with waterproofing manufacturer's written instructions for testing.

1.8 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit bentonite waterproofing to be installed according to manufacturer's written instructions and warranty requirements.

1. Do not apply waterproofing materials to surfaces where ice or frost is visible. Do not apply bentonite waterproofing materials in areas with standing water.
2. Do not place bentonite clay products in panel or composite form on damp surfaces unless such practice is approved in writing by manufacturer.

1.9 WARRANTY

A. Special Warranty: Manufacturer and Installer agree(s) to repair or replace components of bentonite waterproofing system that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 COMPOSITE POLYETHYLENE/BENTONITE MEMBRANE

A. Composite Polyethylene/Bentonite Membrane: Minimum 90-mil-thick membrane consisting of a polyethylene geomembrane bonded to a layer of bentonite.

1. Product Subject to compliance with requirements, Provide Tremco Commercial Sealants & Waterproofing, Paraseal LG waterproofing system, or equal.
2. Puncture Resistance: 70 lbf according to ASTM D4833 or 169 lbf according to ASTM E154.
3. Vapor Permeance: 0.03 perms according to ASTM E96/E96M.

2.2 PROTECTION COURSE

A. Protection Course: Protection mat of type and thickness as recommended in writing by waterproofing manufacturer for each Project condition.

1. Adhesive: As recommended in writing by waterproofing manufacturer.

2.3 MOLDED-SHEET DRAINAGE PANELS

A. Nonwoven-Geotextile-Faced Molded-Sheet Drainage Panels: Composite subsurface drainage panel consisting of studded, nonbiodegradable, molded-plastic-sheet drainage core; with a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 sieve laminated to one side of the core, with a polymeric film bonded to the other side; and with a vertical flow rate of 9 to 18 gpm per ft..

B. Molded-Sheet Collector-Panel System: Composite subsurface collector-panel system by same manufacturer as primary molded-sheet drainage panels; consisting of a high-profile, studded, nonbiodegradable, molded-plastic-sheet drainage core; with a woven-geotextile facing with an apparent opening size not exceeding No. 40 sieve laminated to one side of the core, with a polymeric film bonded to the other side; and with a vertical flow rate of 9 to 15 gpm per ft. Provide system with manufacturer's outlets,

connectors, tapes, and other accessories to connect primary molded-sheet drainage panels with piped subdrainage system.

2.4 ACCESSORIES

A. Granular Bentonite: Sodium bentonite clay containing a minimum of 90 percent montmorillonite (hydrated aluminum silicate), with a minimum of 90 percent passing a No. 20 sieve.

B. Bentonite Mastic: As recommended in writing by waterproofing manufacturer. Bentonite compound of trowelable consistency, specifically formulated for application at joints and penetrations.

C. Bentonite Tubes: Manufacturer's standard 2-inch-diameter, water-soluble tube containing approximately 1.5 lb/ft. of granular bentonite; hermetically sealed; designed specifically for placing on wall footings at line of joint with exterior base of wall.

D. Termination Bar: Extruded-aluminum or formed-stainless-steel bars with upper flange to receive sealant.

E. Plastic Protection Sheet: Polyethylene sheeting according to ASTM D4397; thickness as recommended in writing by waterproofing manufacturer to suit application but at least 6 mils thick.

F. Cement Grout Patching Material: Grout mix compatible with substrate being patched and recommended in writing by waterproofing manufacturer.

G. Masonry Fasteners: Case-hardened nails or hardened-steel, powder-actuated fasteners. Depending on manufacturer's written requirements, provide 1/2- or 1-inch-diameter washers under fastener heads.

H. Sealants: As recommended in writing by waterproofing manufacturer. Comply with requirements specified in Section 079200 "Joint Sealants."

I. Tapes: Waterproofing manufacturer's recommended waterproof tape for joints between sheets, membranes, or panels.

J. Adhesive: Waterproofing manufacturer's water-based adhesive used to secure waterproofing to both vertical and horizontal surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrate preparations and other conditions affecting performance of bentonite waterproofing.

B. Examine bentonite materials before installation. Reject materials that have been prematurely exposed to moisture.

C. Verify that substrate is complete and that work that will penetrate waterproofing is complete and rigidly installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean, prepare, and treat substrates according to manufacturer's written instructions.

B. Formed Concrete Surfaces: Remove fins and projections. Fill voids, rock pockets, form-tie holes, and other defects with bentonite mastic or cement grout patching material according to manufacturer's written instructions.

C. Horizontal Concrete Surfaces: Remove debris, standing water, oily substances, mud, and similar substances that could impair the bonding ability of concrete or the effectiveness of waterproofing. Fill voids, cracks greater than 1/8 inch, honeycomb areas, and other defects with bentonite mastic or cement grout patching material according to manufacturer's written instructions.

3.3 INSTALLATION, GENERAL

A. Prepare substrates, voids, cracks, and cavities; and install waterproofing and accessories according to manufacturer's written instructions.

1. Before installing, verify the correct side of waterproofing that shall face substrate surface.
2. Apply granular bentonite around penetrations in horizontal surfaces and changes in plane according to manufacturer's details in preparation for bentonite tubes and mastic.
3. Apply bentonite tubes, bentonite mastic, or both at changes of plane, construction joints in substrate, projections, and penetrations.
4. Prime concrete substrates. Primer may be omitted on concrete surfaces that comply with manufacturer's written requirements for dryness, surface texture, and freedom from imperfections.

B. Apply bentonite tubes continuously on footing against base of wall to be waterproofed.

C. Protect waterproofing from damage and wetting before and during subsequent construction operations. Repair punctures, tears, and cuts.

D. Install protection course before backfilling or placing overburden when recommended in writing by waterproofing manufacturer.

3.4 INSTALLATION OF COMPOSITE POLYETHYLENE/BENTONITE MEMBRANE

A. Install a continuous layer of waterproofing membrane, with ends and edges lapped a minimum of 4 inches unless otherwise indicated. Stagger end joints between membranes a minimum of 24 inches. Seal joints with permanent seam tape.

B. Below Structural Slabs-on-Grade: Apply waterproofing membrane with polyethylene side down, and staple ends and edges.

1. Install under footings, grade beams, and pile caps; or continue waterproofing through key joints between footings and foundation walls, and extend a minimum of 8 inches up or beyond perimeter slab forms.
2. Protect waterproofing from damage caused by reinforcing bar supports with sharp edges.

C. Concrete Walls: Apply mastic to form continuous 3/4-inch cant or fillet at intersection of footings and walls.

1. Starting at lowest point, install a layer of waterproofing membrane horizontally, extending a minimum of 6 inches onto the footing. Lap membrane ends and edges a minimum of 2 inches.
2. Secure membrane to wall.
3. Apply mastic to form continuous 3/4-inch layer around penetrations.
4. Termination at Grade: Extend waterproofing membrane to height indicated unless otherwise indicated. Secure top edge with termination bar. Apply sealant to top edge of termination bar.

3.5 INSTALLATION OF MOLDED-SHEET DRAINAGE PANELS

A. Place and secure molded-sheet drainage panels according to manufacturer's written instructions. Use adhesives or another method that does not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.

1. For vertical applications, install protection course before installing drainage panels.

B. Molded-Sheet Collector-Panel System: Install according to manufacturer's written instructions. Connect to piped subdrainage system.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect completed waterproofing installation before covering with other construction, and provide written report stating that installation complies with manufacturer's written instructions.

1. Remove and replace applications of bentonite waterproofing where inspection indicates that it does not comply with specified requirements.

END OF SECTION

SECTION 071800 - TRAFFIC COATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes traffic coatings for the following applications:

1. Equipment-room floor.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, product Installer, product system manufacturer's representative, and installers whose work interfaces with or affects system, including installers of accessories. Review requirements for products and installation, including surface preparation, substrate conditions, project and manufacturer's details, installation procedures, mockups, testing and inspection requirements, protection and repairs, and coordination and sequencing of installation with work of other Sections.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include installation instructions and details, material descriptions, dry or wet film thickness requirements, and finish.

B. Sustainable Design Submittals:

1. Product Data: For coatings, indicating VOC content.
2. Laboratory Test Reports: For coatings, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For traffic coatings.

1. Include details for treating substrate joints and cracks, flashings, deck penetrations, and other termination conditions that are not included in manufacturer's product data.

2. Include plans showing layout of pavement markings, lane separations, and defined parking spaces. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.

D. Samples for Verification: For each type of exposed finish, prepared on rigid backing.

1. Provide stepped Samples on backing to illustrate buildup of traffic coatings.

1.5 INFORMATIONAL SUBMITTALS

A. Manufacturer’s letter stating that Installer is approved to install manufacturer’s products.

B. Qualification Data: For Installer.

C. Product Certificates: For each type of traffic coating.

D. Field quality-control reports.

E. Sample Warranty: For manufacturer's warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For traffic coatings to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Mockups: Build mockups to set quality standards for materials and execution.

1. Build mockup for each traffic coating and substrate to receive traffic coatings.
2. Size: 200 sq. ft. of each substrate to demonstrate surface preparation, joint and crack treatment, thickness, texture, color, and standard of workmanship.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Apply traffic coatings within the range of ambient and substrate temperatures recommended in writing by manufacturer. Do not apply traffic coatings to damp or wet substrates, when temperatures are below 40 deg F, when

relative humidity exceeds 85 percent, or when temperatures are less than 5 deg F above dew point.

1. Do not apply traffic coatings in snow, rain, fog, or mist, or when such weather conditions are imminent during the application and curing period. Apply only when frost-free conditions occur throughout the depth of substrate.

B. Do not install traffic coating until items that penetrate membrane have been installed.

1.9 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace traffic coating that fails in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Adhesive or cohesive failures.
b. Abrasion or tearing failures.
c. Surface crazing or spalling.
d. Intrusion of water, oils, gasoline, grease, salt, deicer chemicals, or acids into deck substrate.

2. Warranty Period: Five years from date of Substantial Completion.
3. Special Warranty: Warranty in form acceptable to Owner in which Installer agrees to repair or replace components of products that fail in materials or workmanship within warranty period. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations:

1. Obtain traffic coatings from single source from single manufacturer.
2. Obtain primary traffic-coating materials, including primers, from traffic-coating manufacturer. Obtain accessory materials including aggregates, sheet flashings, joint sealants, and substrate repair materials of types and from sources recommended in writing by primary material manufacturer.
3. Obtain pavement-marking paint from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Material Compatibility: Provide primers; base coat, intermediate coat, and topcoat; and accessory materials that are compatible with one another and with substrate under

conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

2.3 TRAFFIC COATING

A. Traffic Coating: Manufacturer's standard, traffic-bearing, seamless, high-solids-content, cold liquid-applied, elastomeric, water-resistant membrane system with integral wearing surface for pedestrian traffic and equipment-room floor service condition; according to ASTM C957/C957M.

1. Product: Subject to compliance with requirements, providePLI-Dek “Inclement Weather” surfacing system, or equal.

B. Components:

1. GU80-1 Gray Base Mix: Portland cement and silicon dioxide composition that is to be combined with Pli-Dek Liquid Admixture GU80-1.
2. GU80-1 Top Coat Mix:. Portland cement and silicon dioxide composition that is to be combined with Pli-Dek Liquid Admixture GU80-1.
3. GU80-1 Custom Top Coat Mix: Portland cement and silicon dioxide composition that is to be combined with Pli-Dek Liquid Admixture GU80-1.
4. GU80-1 Liquid Admixture: An acrylic polymer emulsion.
5. GS88-1 Pigmented Sealer: A pigmented water based acrylic surface sealer.
6. Fiberglass Mat: Chopped strand .75 oz. woven mat.
7. PD Resin: A high build elastomeric acrylic resin.
8. GS13 or PD Clear Sealer: Water-based or Solvent-based, clear sealer(optional).
9. Metal Lath: 2.5 lbs/sq yd, an expanded metal lath, that is hot dipped not electrogalvanized, G90

C. Fire-Test-Response Characteristics: Provide traffic-coating materials with the fire-test-response characteristics as determined by testing identical products according to test method below for deck type and slopes indicated by an independent testing and inspecting agency that is acceptable to authorities having jurisdiction.

1. Class A roof covering according to ASTM E108.

2.4 ACCESSORY MATERIALS

A. Joint Sealants: As specified in Section 079200 "Joint Sealants."

B. Sheet Flashing: Nonstaining sheet material recommended in writing by traffic-coating manufacturer.

1. Thickness: Minimum 60 mils.

C. Adhesive: Contact adhesive recommended in writing by traffic-coating manufacturer.

D. Reinforcing Strip: Fiberglass mesh recommended in writing by traffic-coating manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, surface smoothness, and other conditions affecting performance of traffic-coating work.

B. Verify that substrates are visibly dry and free of moisture.

1. Test for moisture content by measuring with an electronic moisture meter.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of traffic-coating work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Begin coating application only after substrate construction and penetrating work have been completed.
2. Begin coating application only after minimum concrete-curing and -drying period recommended in writing by traffic-coating manufacturer has passed and after substrates are dry.
3. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Clean and prepare substrates according to ASTM C1127 and manufacturer's written instructions to produce clean, dust-free, dry substrate for traffic-coating application. Remove projections, fill voids, and seal joints if any, as recommended in writing by traffic-coating manufacturer.

B. Priming: Unless manufacturer recommends in writing against priming, prime substrates according to manufacturer's written instructions.

1. Limit priming to areas that will be covered by traffic-coating material on same day. Reprime areas exposed for more time than recommended by manufacturer.

C. Schedule preparation work so dust and other contaminants from process do not fall on wet, newly coated surfaces.

D. Mask adjoining surfaces not receiving traffic coatings to prevent overspray, spillage, leaking, and migration of coatings. Prevent traffic-coating materials from entering deck substrate penetrations and clogging weep holes and drains.

3.3 TERMINATIONS AND PENETRATIONS

A. Prepare vertical and horizontal surfaces at terminations and penetrations through traffic coatings and at expansion joints, drains, and sleeves according to ASTM C1127 and manufacturer's written instructions.

B. Provide sealant cants at penetrations and at reinforced and nonreinforced, deck-to-wall butt joints.

C. Terminate edges of deck-to-deck expansion joints with preparatory base-coat strip.

D. Install sheet flashings at deck-to-wall expansion and dynamic joints, and bond to deck and wall substrates according to manufacturer's written recommendations.

3.4 JOINT AND CRACK TREATMENT

A. Prepare, treat, rout, and fill joints and cracks in substrates according to ASTM C1127 and manufacturer's written recommendations. Before coating surfaces, remove dust and dirt from joints and cracks according to ASTM D4258.

1. Comply with recommendations in ASTM C1193 for joint-sealant installation.

B. Apply reinforcing strip in traffic-coating system where recommended in writing by traffic-coating manufacturer.

3.5 TRAFFIC-COATING APPLICATION

A. Apply traffic coating according to ASTM C1127 and manufacturer's written instructions.

B. Apply coats of specified compositions for each type of traffic coating at locations as indicated on Drawings.

C. Start traffic-coating application in presence of manufacturer's technical representative.

D. Verify that wet-film thickness of each coat complies with requirements every 100 sq. ft..

E. Uniformly broadcast and embed aggregate in each coat indicated to receive aggregate according to manufacturer's written instructions. After coat dries, sweep away excess aggregate.

F. Apply traffic coatings to prepared wall terminations and vertical surfaces to height indicated; omit aggregate on vertical surfaces.

G. Cure traffic coatings. Prevent contamination and damage during coating application and curing.

H. Traffic Coatings System Thickness: Not less than 3/16-inch.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform the following field tests and inspections:

1. Materials Testing:

a. Samples of material delivered to Project site shall be taken, identified, sealed, and certified in presence of Owner and Contractor.
b. Testing agency shall perform tests for characteristics specified, using applicable referenced testing procedures.
c. Testing agency shall verify thickness of coatings during traffic-coating application for each 600 sq. ft. of installed traffic coating or part thereof.

B. Final Traffic-Coating Inspection: Arrange for traffic-coating manufacturer's technical personnel to inspect membrane installation on completion.

1. Notify Architect or Owner 48 hours in advance of date and time of inspection.

C. Waterproofing will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.7 PROTECTING AND CLEANING

A. Protect traffic coatings from damage and wear during remainder of construction period.

B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Glass-fiber blanket.
2. Glass-fiber board.
3. Mineral-wool blanket.
4. Mineral-wool board.
5. Loose-fill insulation.

B. Related Requirements:

1. Section 092900 "Gypsum Board" for sound attenuation blanket used as acoustic insulation.

1.3 SUBMITTALS

A. Product Data: For each type of product.

B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

PART 2 - PRODUCTS

2.1 GENERAL:

A. Insulation materials shall achieve an R- value as indicated on Drawings, or if not indicated, an R-value of not less than 13.

2.2 GLASS-FIBER BLANKET

A. Glass-Fiber Blanket, Unfaced: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

2.3 GLASS-FIBER BOARD

A. Glass-Fiber Board, Unfaced: ASTM C 612, Type IA; unfaced, with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84, passing ASTM E 136 for combustion characteristics. Nominal density of 3 lb/cu. ft., thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F.

2.4 MINERAL-WOOL BLANKETS

A. Mineral-Wool Blanket, Unfaced: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

2.5 MINERAL-WOOL BOARD

A. Mineral-Wool Board, Types IA and IB, Unfaced: ASTM C 612, Types IA and IB; with maximum flame-spread and smoke-developed indexes of 15 and zero, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics. Nominal density of 4 lb/cu. ft..

2.6 LOOSE-FILL INSULATION

A. Glass-Fiber Loose-Fill Insulation: ASTM C 764, Type I for pneumatic application or Type II for poured application; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E 84.

2.7 INSULATION FASTENERS

A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.

1. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
2. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation.

B. Adhesively Attached, Angle-Shaped, Spindle-Type Anchors: Angle welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.

1. Angle: Formed from 0.030-inch-thick, perforated, galvanized carbon-steel sheet with each leg 2 inches square.
2. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation.

C. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter.

1. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:

a. Crawl spaces.
b. Ceiling plenums.
c. Attic spaces.
d. Eequipment clad with insulation.

D. Insulation Standoff: Spacer fabricated from galvanized mild-steel sheet for fitting over spindle of insulation anchor to maintain air space of 1 inch between face of insulation and substrate to which anchor is attached.

E. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates without damaging insulation, fasteners, or substrates.

2.8 ACCESSORIES

A. Insulation for Miscellaneous Voids: Glass-Fiber Insulation: ASTM C 764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E 84.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.3 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
4. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials: Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft..

C. Loose-Fill Insulation: Apply according to ASTM C 1015 and manufacturer's written instructions. Level horizontal applications to uniform thickness as indicated, lightly settle to uniform density, but do not compact excessively.

3.4 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

SECTION 072413 - POLYMER-BASED STUCCO EXTERIOR FINISH SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Polymer-based exterior finish system (EIFS).

B. Related Requirements: Section 072715 "Nonbituminous Self-Adhering Sheet Air Barriers" for self-adhering sheet air barriers composed of nonbituminous polymers applied over sheathing behind mechanically fastened EIFS.

1.2 DEFINITIONS

A. Definitions in ASTM E2110 apply to Work of this Section.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each component, trim, and accessory. Include similar Samples of exposed accessories involving color selection.

B. Samples for Verification: 24-inch-square panels for each type of finish-coat color and texture indicated, prepared using same tools and techniques intended for actual work, including custom trim, each profile, and an aesthetic reveal.

1. Include exposed trim and accessory Samples to verify color selected.
2. Include a typical control joint filled with sealant of color selected, as specified in Section 079200 "Joint Sealants."

1.5 INFORMATIONAL SUBMITTALS

A. Product Certificates: For cementitious materials and aggregates from manufacturer.

B. Field quality-control reports.

C. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: To include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, to set quality standards for materials and execution, and to set quality standards for fabrication and installation.

1. Build mockup of typical wall area as directed by Architect.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original, unopened packages with manufacturers' labels intact and clearly identifying products.

B. Store materials inside and under cover; keep them dry and protected from weather, direct sunlight, surface contamination, aging, corrosion, damaging temperatures, construction traffic, and other causes.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions and ambient outdoor air, humidity, and substrate temperatures permit system to be applied, dried, and cured according to manufacturers' written instructions and warranty requirements.

PART 2 - PRODUCTS

2.1 POLYMER-BASED STUCCO EXTERIOR FINISH SYSTEM

A. Basis of Design Manufacturer: Design is based on Sto-Corp “StoPowerwall ci” Portland cement stucco system. Subject to compliance with requirements, provide products each compatible with all components in finish system.: Installed systems shall include components itemized and comply with provisions of the “Basis of Design” profiles indicated in Drawings.

B. Source Limitations: Obtain products from single source from single manufacturer and from sources approved by system manufacturer as tested and compatible with all components.

2.2 PERFORMANCE REQUIREMENTS

A. Performance: Comply with ASTM E2568 and with the following:

1. Weathertightness: Resistant to water penetration from exterior.
2. System Fire Performance: Fire-resistance rating of wall assembly.
3. Impact Performance: ASTM E2568, Medium impact resistance unless otherwise indicated.

2.3 MATERIALS

A. Insulation Adhesive: EIFS manufacturer's standard formulation designed for indicated use; compatible with substrate and complying with one of the following:

1. Job-mixed formulation of portland cement, complying with ASTM C150/C150M, Type I, and polymer-based adhesive specified for base coat.
2. Factory-blended dry formulation of portland cement, dry polymer admixture, and fillers specified for base coat.
3. Factory-mixed noncementitious formulation designed for adhesive attachment of insulation to substrates of type indicated, as recommended by EIFS manufacturer.

B. Molded, (Expanded) Rigid Cellular Polystyrene Board Insulation: Comply with ASTM E2430/E2430M, unless otherwise noted, and the following:

1. Flame-Spread and Smoke-Developed Indexes: 25 and 450 or less, respectively, in accordance with ASTM E84.
2. Dimensions: Provide insulation boards of not more than 24 by 48 inches (610 by 1219 mm), with thickness indicated on Drawings.
3. Foam Buildouts: Provide with profiles and dimensions indicated on Drawings.

C. Flexible-Membrane Flashing: Cold-applied, self-adhering, self-healing, rubberized-asphalt and polyethylene-film composite sheet or tape and primer; manufacturer's standard or product recommended in writing by manufacturer.

D. Expanded-Metal Lath: ASTM C847, cold-rolled carbon-steel sheet with ASTM A653/A653M, G60, hot-dip galvanized-zinc coating. Diamond-Mesh Lath: Self-furring, 3.4 lb/sq. yd.

E. Reinforcing Mesh: Balanced, alkali-resistant, open-weave, glass-fiber mesh treated for compatibility with other materials, made from continuous multi-end strands with retained mesh tensile strength of not less than 120 lbf/in. in accordance with ASTM E2098/E2098M and the following:

1. Reinforcing Mesh, General: Not less than weight required to comply with impact-performance level specified in "Performance Requirements" Article.
2. Strip-Reinforcing Mesh: Not less than 3.75 oz./sq. yd..
3. Detail-Reinforcing Mesh: Not less than 4.0 oz./sq. yd..
4. Corner-Reinforcing Mesh: Not less than 7.2 oz./sq. yd..

F. Crack Defense Mesh: Nominal 4.5 oz./yd2 (153 g/m2), symmetrical, interlaced open-weave glass fiber mesh made with alkaline resistant coating for compatibility with stucco materials.

G. Base Coat: Manufacturer's standard mixture complying with the following: Factory-blended dry formulation of portland cement, dry polymer admixture, and inert fillers to which only water is added at Project site.

H. Primer: Manufacturer's standard factory-mixed, elastomeric-polymer primer for preparing base-coat surface for application of finish coat.

I. Finish Coat: Manufacturer's standard acrylic-based coating complying with the following:

1. Factory-mixed formulation of polymer-emulsion binder, colorfast mineral pigments, sound stone particles, and fillers.
2. Colors: Match Architect's sample.
3. Textures: Match Architect's sample.

J. Sealer: Manufacturer's waterproof, clear acrylic-based sealer for protecting finish coat.

K. Water: Potable.

L. Trim Accessories: Type as designated or required to suit conditions indicated and to comply with manufacturer's written instructions; manufactured from UV-stabilized PVC; and complying with ASTM D1784 and ASTM C1063.

1. Casing Bead: Prefabricated, one-piece type for attachment, of depth required to suit thickness of coating and insulation, with face leg perforated for bonding to coating and back leg.
2. Drip Screed/Track: Prefabricated, one-piece type for attachment, with face leg extended to form a drip, of depth required to suit thickness of coating and insulation, with face leg perforated for bonding to coating and back leg.
3. Expansion Joint: Closed-cell polyethylene backer rod and elastomeric sealant, 3/4-inch minimum.
4. Windowsill Flashing: Prefabricated type for both flashing and sloping sill over framing beneath windows; with end and back dams; designed to direct water to exterior.
5. Parapet Cap Flashing: Type for both flashing and covering parapet top, with design complying with ASTM C1397.

2.4 MIXING

A. Comply with manufacturer's requirements for combining and mixing materials. Do not introduce admixtures, water, or other materials, except as recommended by manufacturer. Mix materials in clean containers. Use materials within time period specified by manufacturer or discard.

2.5 SOURCE QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform shop tests and inspections indicated below and to prepare test reports:

1. Shop welds are subject to testing and inspection.
2. Testing and inspecting agency will interpret tests and report whether tested Work complies with or deviates from requirements.
3. Additional testing and inspection, at Contractor's expense, will be performed to determine compliance of corrected Work with requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roof edges, wall framing, flashings, openings, substrates, and junctures at other construction for suitable conditions where system will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Begin coating application only after surfaces are dry.
2. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Protect contiguous work from moisture deterioration and soiling caused by application of system. Provide temporary covering and other protection needed to prevent spattering of exterior finish coats on other work.

B. Protect, substrates, and wall construction behind them from inclement weather during installation. Prevent penetration of moisture behind and deterioration of substrates.

C. Prepare and clean substrates to comply with manufacturer's written instructions to obtain optimum bond between substrate and adhesive for insulation.

3.3 INSTALLATION, GENERAL

A. Comply with ASTM C1397, ASTM E2511, and manufacturer's written instructions for installation of system as applicable to each type of substrate.

3.4 APPLICATION OF SUBSTRATE PROTECTION

A. Flexible-Membrane Flashing: Apply and lap to shed water; seal at openings, penetrations, and terminations. Prime substrates with flashing primer if required and install flashing.

3.5 INSTALLATION OF TRIM

A. Trim: Apply trim accessories at perimeter of system, at expansion joints, at windowsills, and elsewhere as indicated. Coordinate with installation of insulation.

1. Drip Screed/Track: Use at bottom edges unless otherwise indicated.
2. Windowsill Flashing: Use at windows unless otherwise indicated.
3. Expansion Joint: Use where indicated on Drawings.
4. Casing Bead: Use at other locations.
5. Parapet Cap Flashing: Use where indicated on Drawings.

3.6 APPLICATION OF BASE COAT

A. Base Coat: Apply full coverage to exposed insulationwith not less than 1/16-inch dry-coat thickness.

B. Reinforcing Mesh: Embed reinforcing mesh in wet base coat to produce wrinkle-free installation with mesh continuous at corners, overlapped not less than 2-1/2 inches or otherwise treated at joints to comply with ASTM C1397. Do not lap reinforcing mesh within 8 inches of corners. Completely embed mesh, applying additional base-coat material if necessary, so reinforcing-mesh color and pattern are invisible.

C. Additional Reinforcing Mesh: Apply strip-reinforcing mesh around openings, extending 4 inches beyond perimeter. Apply additional 9-by-12-inch strip-reinforcing mesh diagonally at corners of openings (re-entrant corners). Apply 8-inch-wide, strip-reinforcing mesh at both inside and outside corners unless base layer of mesh is lapped not less than 4 inches on each side of corners.

1. At aesthetic reveals, apply strip-reinforcing mesh not less than 8 inches wide.
2. Embed strip-reinforcing mesh in base coat before applying first layer of reinforcing mesh.

D. Double Base-Coat Application: Where indicated, apply second base coat in same manner and thickness as first application, except without reinforcing mesh. Do not apply until first base coat has cured.

3.7 APPLICATION OF FINISH COAT

A. Primer: Apply over dry base coat.

B. Finish Coat: Apply full-thickness coverage over drybase coat, maintaining a wet edge at all times for uniform appearance, to produce a uniform finish of color and texture matching approved sample and free of cold joints, shadow lines, and texture variations.

C. Sealer Coat: Apply over dry finish coat, in number of coats and thickness required by manufacturer.

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. System will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.9 CLEANING AND PROTECTION

A. Remove temporary covering and protection of other work. Promptly remove coating materials from window and door frames and other surfaces outside areas indicated to receive coatings.

END OF SECTION 072413

SECTION 072715 - NONBITUMINOUS SELF-ADHERING SHEET AIR BARRIERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes: Self-adhering, vapor-permeable, nonbituminous sheet air barriers.

B. Related Requirements:

1. Section 014130 “Visual Mockups” for inclusion of sheet air barriers in mockup assembly.
2. Section 061600 "Sheathing" for wall sheathings and wall sheathing joint-and-penetration treatments.

1.3 DEFINITIONS

A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.

B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.

C. Air-Barrier Assembly: The collection of air-barrier materials and accessories applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, product Installer, product system manufacturer's representative, and installers whose work interfaces with or affects system, including installers of accessories. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product. Include manufacturer's written instructions for evaluating, preparing, and treating each substrate; technical data; and tested physical and performance properties of products.

B. Shop Drawings: For air-barrier assemblies.

1. Show locations and extent of air-barrier materials, accessories, and assemblies specific to Project conditions.
2. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
3. Include details of interfaces with other materials that form part of air barrier.

1.6 INFORMATIONAL SUBMITTALS

A. Manufacturer’s letter stating that Installer is approved to install manufacturer’s products.

B. Qualification Data: For Installer.

C. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with air barrier.

D. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.

E. Field quality-control reports.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer. Installer shall be licensed by ABAA according to ABAA's Quality Assurance Program and shall employ ABAA-certified installers and supervisors on Project.

B. Mockups: Build mockups to set quality standards for materials and execution.

1. Build integrated mockups of exterior wall assembly, 150 sq. ft., incorporating backup wall construction, external cladding, window, storefront, door frame and sill, insulation, ties and other penetrations, and flashing to demonstrate surface preparation, crack and joint treatment, application of air barriers, and sealing of gaps, terminations, and penetrations of air-barrier assembly.

a. Coordinate construction of mockups to permit inspection and testing of air barrier before external insulation and cladding are installed.
b. Include junction with roofing membrane, building corner condition, and foundation wall intersection.
c. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 PRECONSTRUCTION TESTING

A. Mockup Testing: Air-barrier assemblies shall comply with performance requirements indicated, as evidenced by reports based on mockup testing by a qualified testing agency.

1. Air-Leakage-Location Testing: Mockups will be tested for evidence of air leakage according to ASTM E1186, chamber pressurization or depressurization with smoke tracers.
2. Adhesion Testing: Mockups will be tested for required air-barrier adhesion to substrate according to ASTM D4541.
3. Notify Architect seven days in advance of the dates and times when mockups will be tested.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Remove and replace liquid materials that cannot be applied within their stated shelf life.

B. Protect stored materials from direct sunlight.

1.10 FIELD CONDITIONS

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended in writing by air-barrier manufacturer.

1. Protect substrates from environmental conditions that affect air-barrier performance.
2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Air-Barrier Performance: Air-barrier assembly and seals with adjacent construction shall be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft., when tested according to ASTM E2357.

2.3 NONBITUMINOUS SHEET AIR BARRIER

A. Vapor-Permeable Nonbituminous Sheet: Minimum 23-mil-thick, self-adhering sheet consisting of a breathable carrier film or fabric and an adhesive with release liner on adhesive side and formulated for application with primer that complies with VOC limits.

1. Basis of Design Product: Subject to compliance with requirements, provide Henry® Blueskin® VP160 Self-Adhered Water Resistive Air Barrier, or equal:
2. Physical and Performance Properties:

    a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E2178.
    b. Puncture Resistance: Minimum 40 lbf; ASTM E154/E154M.
    c. Vapor Permeance: Minimum 29 perms; ASTM E96/E96M, Desiccant Method, Procedure A.
    d. Adhesion to Substrate: Minimum 16 lbf/sq. in. when tested according to ASTM D4541 as modified by ABAA.
    e. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.4 ACCESSORY MATERIALS

A. Requirement: Provide primers, transition strips, termination strips, joint sealants, counterflashing strips, flashing sheets and metal termination bars, termination mastic,

substrate patching materials, adhesives, tapes, foam sealants, lap sealants, and other accessory materials that are recommended in writing by air-barrier manufacturer to produce a complete air-barrier assembly and that are compatible with primary air-barrier material and adjacent construction to which they may seal.

B. Primer: Polymer emulsion water based quick setting adhesive with low VOC content. Basis of Design Product: Henry® Aquatac™ Primer.

C. Aerosol spray adhesive ; Basis of Design Product: Henry® Blueskin® Spray Prep Adhesive.

D. Liquid-Applied Flashing: Moisture-curing single component elastomeric liquid-applied flashing using a highly advanced Silyl-Terminated Polyether (STPE) polymer curing to a monolithic membrane. Basis of Design Product: Henry® Air-Bloc® LF Liquid-Applied Flashing.

E. Self-Adhered Flashing: Self-adhered water resistive vapor permeable air barrier consisting of a reinforced modified polyolefin tri-laminate film surface and patented adhesive technology with split-back poly-release film. Basis of Design Product: Henry® Blueskin® VP160 Self-Adhered Water Resistive Air Barrier

F. Sealants: Provide the following:

1. Building Envelope Sealant: Moisture cure, medium modulus polymer modified sealing compound. Basis of Design Product: Henry® 925 BES Sealant.
2. Termination Sealant: One-part high performance synthetic rubber sealant. Basis of Design Product: Henry® 212 All Purpose Crystal Clear Sealant.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
2. Verify that substrates have cured and aged for minimum time recommended in writing by air-barrier manufacturer.
3. Verify that substrates are visibly dry and free of moisture. Test concrete substrates for capillary moisture by plastic sheet method according to ASTM D4263.
4. Verify that masonry joints are flush and completely filled with mortar.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Clean, prepare, treat, fill, and seal substrate and joints and cracks in substrate according to manufacturer's written instructions and details. Provide clean, dust-free, and dry substrate for air-barrier application.

B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching membrane.

E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

H. Bridge isolation joints and discontinuous wall-to-wall, deck-to-wall, and deck-to-deck joints with air-barrier accessory material that accommodates joint movement according to manufacturer's written instructions and details.

3.3 INSTALLATION

A. Install materials according to air-barrier manufacturer's written instructions and details to form a seal with adjacent construction and ensure continuity of air and water barrier. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.

B. Prepare, treat, and seal inside and outside corners and vertical and horizontal surfaces at terminations and penetrations with termination mastic.

C. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier sheet on same day. Reprime areas exposed for more than 24 hours.

D. Apply and firmly adhere air-barrier sheets over area to receive air barrier. Accurately align sheets and maintain uniform 2-1/2-inch-minimum lap widths and end laps. Overlap and seal seams, and stagger end laps to ensure airtight installation.

1. Apply sheets in a shingled manner to shed water.

2. Roll sheets firmly to enhance adhesion to substrate.

E. Apply continuous air-barrier sheets over accessory strips bridging substrate cracks, construction, and contraction joints.

F. Seal top of through-wall flashings to air-barrier sheet with an additional 6-inch-wide, transition strip.

G. Seal exposed edges of sheet at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

H. Install air-barrier sheet and accessory materials to form a seal with adjacent construction and to maintain a continuous air barrier.

1. Coordinate air-barrier installation with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
2. Install transition strip on roofing membrane or base flashing so that a minimum of 3 inches of coverage is achieved over each substrate.

I. Connect and seal exterior wall air-barrier sheet continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

J. At end of each working day, seal top edge of air-barrier material to substrate with termination mastic.

K. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

L. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition strip so that a minimum of 3 inches of coverage is achieved over each substrate. Maintain 3 inches of contact over firm bearing to perimeter frames, with not less than 1 inch of full contact. Transition Strip: Roll firmly to enhance adhesion.

M. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, doors, and miscellaneous penetrations of air-barrier material with foam sealant.

N. Repair punctures, voids, and deficient lapped seams in air barrier. Slit and flatten fishmouths and blisters. Patch with air-barrier sheet extending 6 inches beyond repaired areas in all directions.

O. Do not cover air barrier until it has been tested and inspected by testing agency.

P. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:

1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
2. Continuous structural support of air-barrier system has been provided.
3. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
4. Site conditions for application temperature and dryness of substrates have been maintained.
5. Maximum exposure time of materials to UV deterioration has not been exceeded.
6. Surfaces have been primed.
7. Laps in sheet materials have complied with the minimum requirements and have been shingled in the correct direction (or mastic applied on exposed edges), with no fishmouths.
8. Termination mastic has been applied on cut edges.
9. Air barrier has been firmly adhered to substrate.
10. Compatible materials have been used.
11. Transitions at changes in direction and structural support at gaps have been provided.
12. Connections between assemblies (air barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
13. All penetrations have been sealed.

C. Tests: As determined by testing agency from among the following tests:

1. Air-Leakage-Location Testing: Air-barrier assemblies will be tested for evidence of air leakage according to ASTM E1186, chamber pressurization or depressurization with smoke tracers.
2. Adhesion Testing: Air-barrier assemblies will be tested for required adhesion to substrate according to ASTM D4541 for each 600 sq. ft. of installed air barrier or part thereof.

D. Air barriers will be considered defective if they do not pass tests and inspections.

1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
2. Remove and replace deficient air-barrier components for retesting as specified above.

E. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

F. Prepare test and inspection reports.

3.5 CLEANING AND PROTECTION

A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

1. Protect air barrier from exposure to UV light and harmful weather exposure as recommended in writing by manufacturer. If exposed to these conditions for longer than recommended, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed materials according to air-barrier manufacturer's written instructions.
2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed Work, using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

END OF SECTION

SECTION 074213 - METAL COMPOSITE MATERIAL WALL PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes metal composite material wall panels.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, metal composite material panel Installer, metal composite material panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal composite material panels, including installers of doors, windows, and louvers.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal composite material panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect metal composite material panels.
6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
7. Review temporary protection requirements for metal composite material panel assembly during and after installation.
8. Review procedures for repair of panels damaged after installation.
9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Delegated Design Submittal: Panel assembly shall comply with a qualified product evaluation report DSA IR A-5. Applicability and anchorage shall be checked and designed by SEOR of building.

C. Shop Drawings:

1. Include fabrication and installation layouts of metal composite material panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment assembly, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of the flashing, trim and anchorage, at a scale of not less than 1-1/2 inches per 12 inches.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below. Metal Composite Material Panels: 12 inches long by actual panel width. Include fasteners, closures, and other metal composite material panel accessories.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal composite material panels to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical metal composite material panel assembly as shown on Drawings, including corner, soffits, supports, attachments, and accessories.
2. Water-Spray Test: Conduct water-spray test of mockup of metal composite material panel assembly, testing for water penetration according to AAMA 501.2.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal composite material panels, and other manufactured items so as not to be damaged or deformed. Package metal composite material panels for protection during transportation and handling.

B. Unload, store, and erect metal composite material panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal composite material panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal composite material panels to ensure dryness, with positive slope for drainage of water. Do not store metal composite material panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal composite material panels during installation.

1.8 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal composite material panels to be performed according to manufacturers' written instructions and warranty requirements.

1.9 COORDINATION

A. Coordinate metal composite material panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.10 WARRANTY

A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal composite material panel systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

    a. Structural failures including rupturing, cracking, or puncturing.
    b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: One years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal composite material panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage engineer to design metal composite wall panel system, including attachment to building construction. Engineer shall be licensed in State of California to perform engineering analysis, and seal and sign documentation.

B. Structural Performance: Provide metal composite material panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E330:

1. Wind Loads: As indicated on Structural Drawings.
2. Other Design Loads: As indicated on Structural Drawings.
3. Deflection Limits: For wind loads, no greater than 1/240 of the span.

C. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E283 at the following test-pressure difference: Test-Pressure Difference: 6.24 lbf/sq. ft..

D. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E331 at the following test-pressure difference: Test-Pressure Difference: 6.24 lbf/sq. ft..

E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

F. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

G. Fire Propagation Characteristics: Metal composite material wall panel system passes NFPA 285 testing.

2.2 METAL COMPOSITE MATERIAL WALL PANELS

A. Metal Composite Material Wall Panel Systems: Provide factory-formed and -assembled, metal composite material wall panels fabricated from two metal facings that are bonded to a solid, extruded thermoplastic core; formed into profile for installation method indicated. Include attachment assembly components, panel stiffeners, and accessories required for weathertight system.

B. Basis of Design Product: Subject to compliance with requirements, provide ALUCOBOND; 3A Composites USA, Inc., “Alucobond Plus” panel system, or approved equal. ICC-ES: 1185. DSA approval is limited to Alucobond Plus (ICC ESR 1185) only. All other products will require submittal to DSA for review and approval.

C. Acceptable Manufacturers:

1. CENTRIA Architectural Systems.

2. ALPOLIC, Division of Mitsubishi Chemical America, Inc.

3. Or equal. Or equal product proposed shall have ICC-ES report on file.

D. Composite Panel Fabricators:

1. Elward Systems Corporation. (Basis of Design).

2. Keith Panel Systems (KPS).

3. Or Equal: Other Panel Fabricators will be considered and must meet criteria of this specification.

E. Aluminum-Faced Composite Wall Panels: Formed with 0.020-inch-thick, coil-coated aluminum sheet facings.

1. Panel Thickness: 4MM (0.157 inch.
2. Core: Fire retardant.
3. Exterior Finish: Clear anodized.

F. Attachment Assembly Components: Formed from extruded aluminum.

G. Attachment Assembly: Rout and return Rainscreen principle system.

2.3 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C645, cold-formed, metallic-coated steel sheet ASTM A653/A653M, G90 coating designation or ASTM A792/A792M, Class AZ50 aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal composite material panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal composite material panels unless otherwise indicated.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal composite material panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal composite material panels.

D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal composite material panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

E. Panel Sealants: ASTM C920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal composite material panels and remain weathertight; and as recommended in writing by metal composite material panel manufacturer.

2.4 FABRICATION

A. General: Fabricate and finish metal composite material panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Fabricate metal composite material panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

C. Extrusions shall be incorporated the full perimeter of ACM panel and painted black. Configuration shall be a male-female format where panels interlock continuously at both horizontal and vertical joints, incorporate direct attachment of ACM to continuous perimeter extrusions, and extrusions leg is directly attached back to steel girts or stud framing. Guttering members shall be incorporated at horizontal panel joints to control moisture. The use of discontinuous clips at panel perimeter are not allowed.

D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.5 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Aluminum Panels and Accessories: Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal composite material panel supports, and other conditions affecting performance of the Work.

1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal composite material wall panel manufacturer.

2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal composite material wall panel manufacturer. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and assemblies penetrating metal composite material panels to verify actual locations of penetrations relative to seam locations of metal composite material panels before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C754 and metal composite material panel manufacturer's written recommendations.

3.3 METAL COMPOSITE MATERIAL PANEL INSTALLATION

A. General: Install metal composite material panels according to manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to supports unless otherwise indicated. Anchor metal composite material panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal composite material panels.
2. Flash and seal metal composite material panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal composite material panels are installed.
3. Install screw fasteners in predrilled holes.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Install flashing and trim as metal composite material panel work proceeds.
6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
7. Align bottoms of metal composite material panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners: Aluminum Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal composite material panel manufacturer.

D. Attachment Assembly, General: Install attachment assembly required to support metal composite material wall panels and to provide a complete weathertight wall system, including subgirts, perimeter extrusions, tracks, drainage channels, panel clips, and anchor channels. Include attachment to supports, panel-to-panel joinery, panel-to-dissimilar-material joinery, and panel-system joint seals.

E. Installation: Attach metal composite material wall panels to supports at locations, spacings, and with fasteners recommended by manufacturer to achieve performance requirements specified. Rainscreen Systems: Do not apply sealants to joints unless otherwise indicated.

F. Clip Installation: Attach panel clips to supports at locations, spacings, and with fasteners recommended by manufacturer. Attach routed-and-returned flanges of wall panels to panel clips with manufacturer's standard fasteners.

1. Seal horizontal and vertical joints between adjacent panels with sealant backing and sealant. Install sealant backing and sealant according to requirements specified in Section 079200 "Joint Sealants."
2. Seal horizontal and vertical joints between adjacent metal composite material wall panels with manufacturer's standard gaskets.

G. Subgirt-and-Spline Installation: Install support assembly at locations, spacings, and with fasteners recommended by manufacturer. Use manufacturer's standard subgirts and splines that provide support and complete secondary drainage assembly, draining to the exterior at horizontal joints. Attach metal composite material wall panels by interlocking perimeter extrusions attached to panels with subgirts and splines. Fully engage integral subgirt-and-spline gaskets and leave horizontal and vertical joints with open reveal. Terminate edge of panels flush with perimeter extrusions.

1. Install wall panels to allow individual panels to "free float" and be installed and removed without disturbing adjacent panels.
2. Do not apply sealants to joints unless otherwise indicated.

H. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components. Install components required for a complete metal composite material panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal composite material panel manufacturer; or, if not indicated, provide types recommended in writing by metal composite material panel manufacturer.

I. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.

1. Install exposed flashing and trim that is without buckling and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

3.4 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal composite material wall panel units within installed tolerance of 1/4 inch in 20 feet, non-accumulative, on level, plumb, and location lines as indicated, and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing agency to perform field tests and inspections.

B. Water-Spray Test: After installation, test area of assembly as directed by Architect for water penetration according to AAMA 501.2.

C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect completed metal composite material wall panel installation, including accessories.

D. Metal composite material wall panels will be considered defective if they do not pass test and inspections.

E. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal composite material panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal composite material panel

installation, clean finished surfaces as recommended by metal composite material panel manufacturer. Maintain in a clean condition during construction.

B. After metal composite material panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal composite material panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 075419 - POLYVINYL-CHLORIDE (PVC) ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Adhered polyvinyl chloride (PVC) roofing system.
2. Substrate board.
3. Vapor retarder.
4. Roof insulation.
5. Cover board.

B. Section includes installation of sound-absorbing insulation strips in ribs of roof deck. Sound-absorbing insulation strips are furnished under Section 053100 "Steel Decking."

C. Related Requirements:

1. Section 061053 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking; and for wood-based, structural-use roof deck panels.
2. Section 072100 "Thermal Insulation" for insulation beneath the roof deck.
3. Section 076200 "Sheet Metal Flashing and Trim" for metal roof flashings and counterflashings.
4. Section 079200 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.

1.3 DEFINITIONS

A. Roofing Terminology: Definitions in ASTM D1079 and glossary in NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to work of this Section.

1.4 PREINSTALLATION MEETINGS

A. Preliminary Roofing Conference: Before starting roof deck construction, conduct conference at Project site.

1. Meet with Owner, Architect, Construction Manager, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, air barrier Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review deck substrate requirements for conditions and finishes, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product. For insulation and roof system component fasteners, include copy of FM Approvals' RoofNav listing.

B. Sustainable Design Submittals:

1. Product Test Reports: For roof materials, documentation indicating that roof materials comply with Solar Reflectance Index requirements.
2. Product Data: For adhesives and sealants, indicating VOC content.
3. Laboratory Test Reports: For adhesives and sealants, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: Include roof plans, sections, details, and attachments to other work, including the following:

1. Layout and thickness of insulation.
2. Base flashings and membrane terminations.
3. Flashing details at penetrations.
4. Tapered insulation thickness and slopes.

5. Roof plan showing orientation of steel roof deck and orientation of roof membrane, fastening spacings, and patterns for mechanically fastened roofing system.
6. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
7. Tie-in with air barrier.

D. Samples for Verification: For the following products: Roof membrane and flashing, of color required.

E. Wind Uplift Resistance Submittal: For roofing system, indicating compliance with wind uplift performance requirements.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Manufacturer Certificates:

1. Performance Requirement Certificate: Signed by roof membrane manufacturer, certifying that roofing system complies with requirements specified in "Performance Requirements" Article. Submit evidence of compliance with performance requirements.
2. Special Warranty Certificate: Signed by roof membrane manufacturer, certifying that all materials supplied under this Section are acceptable for special warranty.

C. Product Test Reports: For roof membrane and insulation, tests performed by independent qualified testing agency indicating compliance with specified requirements.

D. Evaluation Reports: For components of roofing system, from ICC-ES.

E. Field Test Reports:

1. Concrete internal relative humidity test reports.
2. Fastener-pullout test results and manufacturer's revised requirements for fastener patterns.

F. Field quality-control reports.

G. Sample Warranties: For manufacturer's special warranties.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing system to include in maintenance manuals.

B. Certified statement from existing roof membrane manufacturer stating that existing roof warranty has not been affected by Work performed under this Section.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is UL listed listed in FM Approvals' RoofNav for roofing system identical to that used for this Project.

B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.10 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.11 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.

1. Special warranty includes roof membrane, base flashings, roof insulation, fasteners, cover boards, substrate board, and other components of roofing system.
2. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Installed roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roof system and flashings shall remain watertight.

1. Accelerated Weathering: Roof membrane shall withstand 2000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.
2. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D3746, ASTM D4272/D4272M, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.

B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.

C. Wind Uplift Resistance: Design roofing system to resist the following wind uplift pressures when tested according to FM Approvals 4474, UL 580, or UL 1897:

D. FM Approvals' RoofNav Listing: Roof membrane, base flashings, and component materials shall comply with requirements in FM Approvals 4450 or FM Approvals 4470 as part of a roofing system, and shall be listed in FM Approvals' RoofNav for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals Certification markings.

1. Fire/Windstorm Classification: Class 1A-105.
2. Hail-Resistance Rating: FM Global Property Loss Prevention Data Sheet 1-34 SH.

E. ENERGY STAR Listing: Roofing system shall be listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products.

F. Energy Performance: Roofing system shall have an initial solar reflectance of not less than 0.70 and an emissivity of not less than 0.75 when tested according to CRRC-1.

G. Exterior Fire-Test Exposure: ASTM E108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

H. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated. Identify products with appropriate markings of applicable testing agency.

2.2 POLYVINYL CHLORIDE (PVC) ROOFING

A. Basis of Design: Design is based on product manufactured by Sika Sarnafil. Subject to compliance with requirements, provide Sika Sarnafil. G-410 roofing system or comparable product from one of the following:

1. Carlisle SynTec Incorporated.
2. GAF.
3. Johns Manville; a Berkshire Hathaway company.
4. Soprema, Inc.
5. Or equal.

B. Material: Comply with the following:

1. PVC Sheet: ASTM D4434/D4434M, Type III, fabric reinforced.
2. Thickness: 60 mils.
3. Exposed Face Color: White.

C. Source Limitations: Obtain components for roofing system from roof membrane manufacturer or manufacturers approved by roof membrane manufacturer.

2.3 AUXILIARY ROOFING MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with other roofing components.

1. Adhesives and Sealants: Comply with VOC limits of authorities having jurisdiction.
2. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content

B. Sheet Flashing: Manufacturer's standard sheet flashing of same material, type, reinforcement, thickness, and color as PVC sheet.

C. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.

D. Bonding Adhesive: Manufacturer's standard, water based.

E. Water-Based, Fabric-Backed Membrane Adhesive: Roofing system manufacturer's standard water-based, cold-applied adhesive formulated for compatibility and use with fabric-backed membrane roofing.

F. Metal Termination Bars: Manufacturer's standard, predrilled stainless steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.

G. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch wide by 0.05 inch thick, prepunched.

H. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roofing components to substrate, and acceptable to roofing system manufacturer.

I. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.4 ROOF INSULATION

A. General: Preformed roof insulation boards manufactured or approved by PVC roof membrane manufacturer.

B. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Atlas Roofing Corporation - Polyiso.
b. Carlisle SynTec Incorporated.
c. Firestone Building Products.
d. GAF.
e. Johns Manville; a Berkshire Hathaway company.
f. Rmax, Inc.
g. Or equal.

2. Compressive Strength: 20 psi.

3. Size: 48 by 48 inches.

4. Thickness:

a. Base Layer: 1-1/2 inches.
b. Upper Layers: .1-1/2 inches

C. Tapered Insulation: Provide factory-tapered insulation boards.

1. Material: Match roof insulation.

2. Minimum Thickness: 1/4 inch.

3. Slope:

   a. Roof Field: 1/4 inch per foot unless otherwise indicated on Drawings.
   b. Saddles and Crickets: 1/2 inch per foot unless otherwise indicated on Drawings.

2.5 INSULATION ACCESSORIES

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

C. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows: Bead-applied, low-rise, one-component or multicomponent urethane adhesive.. Low-emitting adhesives and sealants: For field applications that are inside the weatherproofing system, use adhesives and sealants that comply with the limits for VOC content when calculated according to South Coast Air Quality Management District (SCAQMD) Rule #1168, requirements in effect on July 1, 2005, and rule amendment date January 7, 2005. For field applications that are inside the weatherproofing system, 90 percent of adhesives and sealants shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

D. Cover (Protection) Board: ASTM C1177/C1177M, glass-mat, water-resistant gypsum board or ASTM C1278/C1278M fiber-reinforced gypsum board.

   1. Thickness: 1/2 inch.

   2. Surface Finish: Factory primed.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Section 053100 "Steel Decking."
4. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
5. Verify that concrete substrate is visibly dry and free of moisture, and that minimum concrete internal relative humidity is not more than 75 percent, or as recommended by roofing system manufacturer, when tested according to ASTM F2170.
    a. Test Frequency: One test probe per each 1000 sq. ft. of roof deck, with no fewer than three test probes.
    b. Submit test reports within 24 hours of performing tests.
6. Verify that concrete-curing compounds that will impair adhesion of roofing components to roof deck have been removed.
7. Verify that joints in precast concrete roof decks have been grouted flush with top of concrete.
8. Verify that minimum curing period recommended by roofing system manufacturer for lightweight insulating concrete roof decks has passed.
9. Verify that any damaged sections of cementitious wood-fiber decks have been repaired or replaced.
10. Verify that adjacent cementitious wood-fiber panels are vertically aligned to within 1/8 inch

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing system installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Perform fastener-pullout tests according to roof system manufacturer's written instructions. Submit test result within 24 hours of performing tests. Include manufacturer's requirements for any revision to previously submitted fastener patterns required to achieve specified wind uplift requirements.

3.3 INSTALLATION OF ROOFING, GENERAL

A. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

B. Coordinate installation and transition of roofing system component serving as an air barrier with air barrier specified under Section 072715 "Nonbituminous Self-Adhering Sheet Air Barriers."

3.4 INSTALLATION OF INSULATION

A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at end of workday.

B. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.

3.5 INSTALLATION OF COVER (PROTECTION)BOARDS

A. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction.

1. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
2. At internal roof drains, conform to slope of drain sump. Trim cover board so that water flow is unrestricted.
3. Cut and fit cover board tight to nailers, projections, and penetrations.
4. Adhere cover board to substrate using adhesive according to FM Approvals' RoofNav listed roof assembly requirements for specified Windstorm Resistance Classification and FM Global Property Loss Prevention Data Sheet 1-29, as follows: Set cover board in a uniform coverage of bead-spread insulation adhesive, firmly pressing and maintaining insulation in place.

B. Install slip sheet over cover board and immediately beneath roof membrane.

3.6 INSTALLATION OF ADHERED ROOF MEMBRANE

A. Adhere roof membrane over area to receive roofing according to roofing system manufacturer's written instructions.

B. Unroll roof membrane and allow to relax before installing.

C. Start installation of roofing in presence of roofing system manufacturer's technical personnel Owner's testing and inspection agency.

D. Accurately align roof membrane, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

E. Bonding Adhesive: Apply to substrate and underside of roof membrane at rate required by manufacturer, and allow to partially dry before installing roof membrane. Do not apply to splice area of roof membrane.

F. Fabric-Backed Roof Membrane Adhesive: Apply to substrate at rate required by manufacturer, and install fabric-backed roof membrane.

G. In addition to adhering, mechanically fasten roof membrane securely at terminations, penetrations, and perimeter of roofing.

H. Apply roof membrane with side laps shingled with slope of roof deck where possible.

I. Seams: Clean seam areas, overlap roofing, and hot-air weld side and end laps of roof membrane and sheet flashings to ensure a watertight seam installation.

1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roof membrane and sheet flashings.
2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
3. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.
4. Spread sealant bed over deck-drain flange at roof drains, and securely seal roof membrane in place with clamping ring.

3.7 INSTALLATION OF BASE FLASHING

A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to inspect substrate conditions, surface preparation, roof membrane application, sheet flashings, protection, and drainage components, and to furnish reports to Architect.

B. Owner will engage a qualified testing agency to perform the following tests:

1. Testing: Test each roofing area for leaks, according to recommendations in ASTM D5957, after completing roofing and flashing but before overlying construction is placed. Install temporary containment assemblies, plug or dam drains, and flood with potable water.
   a. Perform tests before overlying construction is placed.
   b. After testing, repair leaks, repeat flood tests, and make further repairs until roofing and flashing installations are watertight. Cost of retesting is Contractor's responsibility.
   c. Testing agency shall prepare survey report indicating locations of initial leaks, if any, and final survey report.

2. Testing agency shall prepare survey report indicating locations of initial discontinuities, if any.

C. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion, in presence of Architect, and to prepare inspection report.

D. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.9 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing, inspect roofing system for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 075419

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Formed roof-drainage sheet metal fabrications.
2. Formed low-slope roof sheet metal fabrications.

B. Related Requirements:

1. Section 06105 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
2. Section 075423 “Thermoplastic Polyolefin (TPO) Roofing” for roofing system integrated with sheet metal flashing.

1.3 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.4 SUBMITTALS

A. Submit in accordance with Section 013300 “Submittals.”

B. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

C. Shop Drawings: For sheet metal flashing and trim. Include plans, elevations, sections, and attachment details.

1. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.
2. Include identification of material, thickness, weight, and finish for each item and location in Project.
3. Include details for forming, including profiles, shapes, seams, and dimensions.
4. Include details for joining, supporting, and securing, including layout, and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
5. Include details of termination points and assemblies.
6. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
7. Include details of roof-penetration flashing.
8. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
9. Include details of special conditions.
10. Include details of connections to adjoining work.
11. Detail formed flashing and trim at scale of not less than 3 inches per 12 inches.

D. Samples for Verification: For each type of exposed finish.

1. Sheet Metal Flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches long and in required profile. Include fasteners and other exposed accessories.

E. Qualification Data: For fabricator.

F. Product Test Reports: For each product, for tests performed by a qualified testing agency.

G. Sample Warranty: For special warranty.

H. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Build mockup of typical roof edge, including built-in gutter and fascia, approximately 10 feet long, including supporting construction cleats, seams, attachments, underlayment, and accessories.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.7 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

   a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
   b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. FM Approvals Listing: Manufacture and install copings and roof edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-105. Identify materials with name of fabricator and design approved by FM Approvals.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 316, dead soft, fully annealed; with smooth, flat surface.

1. Finish: 2D (dull, cold rolled)
2. Minimum Thickness: 0.038 inches.

C. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A 653/A 653M, G90 coating designation or aluminum-zinc alloy-coated steel sheet according to ASTM A 792/A 792M, Class AZ50 coating designation, Grade 40; prepainted by coil-coating process to comply with ASTM A 755/A 755M.

1. Minimum Thickness: 0.028 inches.
2. Surface: Smooth, flat.
3. Exposed Coil-Coated Finish: Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
4. Color: As indicated in “Finish Legend” on Drawings..
5. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl-

or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Carlisle Coatings & Waterproofing Inc.

    b. Henry Company.

    c. Or approved equal.

2. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F or higher.
3. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F or lower.

B. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. minimum.

2.4 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

    a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
    b. Blind Fasteners: Stainless-steel rivets suitable for metal being fastened.
    c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.

2. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
3. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

C. Solder:

1. For Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.

2. For Zinc-Coated (Galvanized) Steel: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead with maximum lead content of 0.2 percent.

D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

E. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

G. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.

H. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.5 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.

1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
2. Obtain field measurements for accurate fit before shop fabrication.
3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

1. Form expansion joints butted with expansion space and 6-inch-wide, concealed backup plate filled with elastomeric sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.

G. Seams: Form seams butted with expansion space and 6-inch-wide, concealed backup plate filled with elastomeric sealant concealed within joints.

H. Do not use graphite pencils to mark metal surfaces.

2.6 ROOF-DRAINAGE SHEET METAL FABRICATIONS

A. Hanging Gutters: Fabricate to cross section indicated, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch-long sections. Furnish flat-stock gutter brackets and flat-stock gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard but with thickness not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, and gutter accessories from same metal as gutters. Shop fabricate interior and exterior corners.

1. Gutter Profile: As indicated on Drawings according to cited sheet metal standard.
2. Expansion Joints: Butted type with backup plate.
3. Accessories: Continuous, removable leaf screen with sheet metal frame and hardware cloth screen.
4. Gutters: Fabricate from the following materials: Galvanized Steel: 0.040 inch thick.

B. Built-in Gutters: Fabricate to cross section required, with riveted and soldered joints, complete with end pieces, outlet tubes, and other special accessories as required. Fabricate in minimum 96-inch-long sections. Fabricate expansion joints and accessories from same metal as gutters unless otherwise indicated.

1. Fabricate gutters with built-in expansion joints.
2. Accessories: Continuous, removable leaf screen with sheet metal frame and hardware cloth screen.
3. Fabricate from the Following Materials: Stainless Steel: 0.038 inch thick.

C. Parapet Scuppers: Fabricate scuppers to dimensions required, with closure flange trim to exterior, 4-inch-wide wall flanges to interior, and base extending 4 inches beyond cant or tapered strip into field of roof.

D. Downspouts: Fabricate rectangular downspouts to dimensions indicated on Drawings, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors. Shop fabricate elbows.

2.7 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof Edge Flashing (Gravel Stop) and Fascia Cap: Fabricate in minimum 96-inch-long, but not exceeding 12-foot-long sections. Furnish with 6-inch-wide, joint backup plates. Shop fabricate interior and exterior corners.

1. Joint Style: Butted with expansion space and 6-inch-wide, concealed backup plate.
2. Fabricate from the Following Materials: Galvanized Steel: 0.028 inch thick.

B. Copings: Fabricate in minimum 96-inch-long, but not exceeding 12-foot-long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, fasten and seal watertight. Shop fabricate interior and exterior corners.

1. Joint Style: Butted with expansion space and 6-inch-wide, concealed backup plate.
2. Fabricate from the Following Materials:

    a. Galvanized Steel: 0.040 inch thick.

C. Base Flashing: Shop fabricate interior and exterior corners. Fabricate from the following materials: Galvanized Steel: 0.028 inch thick.

D. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials: Galvanized Steel: 0.028 inch thick.

E. Flashing Receivers: Fabricate from the following materials: Galvanized Steel: 0.028 inch thick.

F. Roof-Penetration Flashing: Fabricate from the following materials: Stainless Steel: 0.025 inch thick.

2.8 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Equipment Support Flashing: Fabricate from the following materials: Galvanized Steel: 0.034 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.

1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

A. Felt Underlayment: Install felt underlayment, wrinkle free, using adhesive to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.

B. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller. Cover underlayment within 14 days.

C. Apply slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.

3.3 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
5. Torch cutting of sheet metal flashing and trim is not permitted.
6. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Coat concealed side of stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious substrates, install underlayment and cover with slip sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.

1. Form expansion joints butted with expansion space and 6-inch-wide, concealed backup plate filled with elastomeric sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

D. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as required for watertight construction.

1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
2. Prepare joints and apply sealants to comply with requirements in Section 07920 "Joint Sealants."

G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets with solder to width of 1-1/2 inches; however, reduce pre-tinning where pre-tinned surface would show in completed Work.

1. Do not solder metallic-coated steel sheet.

2. Do not use torches for soldering.
3. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
4. Stainless-Steel Soldering: Tin edges of uncoated sheets, using solder for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.
5. Copper Soldering: Tin edges of uncoated sheets, using solder for copper.

3.4 ROOF-DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.

B. Hanging Gutters: Join sections with joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchor them in position. Provide end closures and seal watertight with sealant. Slope to downspouts.

1. Fasten gutter spacers to front and back of gutter.
2. Anchor back of gutter that extends onto roof deck with cleats spaced not more than 24 inches apart.
3. Anchor gutter with straps spaced not more than 24 inches apart to roof deck, unless otherwise indicated, and loosely lock to front gutter bead.
4. Install gutter with expansion joints at locations indicated, but not exceeding, 50 feet apart. Install expansion-joint caps.
5. Install continuous gutter screens on gutters with noncorrosive fasteners, removable for cleaning gutters.

C. Built-in Gutters: Join sections with joints sealed with sealant. Provide for thermal expansion. Slope to downspouts. Provide end closures and seal watertight with sealant.

1. Install underlayment layer in built-in gutter trough and extend to drip edge at eaves and under underlayment on roof sheathing. Lap sides minimum of 2 inches over underlying course. Lap ends minimum of 4 inches. Stagger end laps between succeeding courses at least 72 inches. Fasten with roofing nails. Install slip sheet over underlayment.
2. Anchor back of gutter that extends onto roof deck with cleats spaced not more than 18 inches apart.
3. Install gutter with expansion joints at locations indicated, but not exceeding, 50 feet apart. Install expansion-joint caps.
4. Anchor scupper closure trim flange to exterior wall and seal with elastomeric sealant to scupper.

3.5 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch centers.

C. Copings: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated.

1. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 16-inch centers.
2. Anchor interior leg of coping with washers and screw fasteners through slotted holes at 24-inch centers.

D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.

E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints minimum of 4 inches. Secure in waterproof manner by means of interlocking folded seam or blind rivets and sealant unless otherwise indicated.

F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

3.6 MISCELLANEOUS FLASHING INSTALLATION

A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.7 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

3.8 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.

E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 077200 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes: Roof hatches.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for metal vertical ladders, ships' ladders, and stairs for access to roof hatches.
2. Section 055213 "Pipe and Tube Railings" for safety railing systems not attached to roof-hatch curbs.
3. Section 076200 "Sheet Metal Flashing and Trim" for shop- and field-formed metal flashing, roof-drainage systems, roof expansion-joint covers, and miscellaneous sheet metal trim and accessories.

1.3 COORDINATION

A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.

B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of roof accessory. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For roof accessories. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions. Distinguish between plant- and field-assembled work.

C. Samples: For each exposed product and for each color and texture specified, prepared on Samples of size to adequately show color.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:

1. Size and location of roof accessories specified in this Section.
2. Method of attaching roof accessories to roof or building structure.
3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.
4. Required clearances.

B. Sample Warranties: For manufacturer's special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For roof accessories to include in operation and maintenance manuals.

1.7 WARRANTY

A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finishes or replace roof accessories that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Delta E units when tested according to ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

2.2 ROOF HATCHES

A. Roof Hatches: Metal roof-hatch units with lids and insulated double-walled curbs, welded or mechanically fastened and sealed corner joints, continuous lid-to-curb counterflashing and weathertight perimeter gasketing, straight sides, and integrally formed deck-mounting flange at perimeter bottom.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Babcock-Davis.
b. BILCO Company (The).
c. Dur-Red Products.
d. Kingspan Light + Air, North America.
e. Milcor; a division of Hart & Cooley, Inc.
f. Nystrom.
g. O'Keeffe's Inc.

B. Type and Size: As indicated on Drawings,.

C. Loads: Minimum 40-lbf/sq. ft. external live load and 20-lbf/sq. ft. internal uplift load.

D. Hatch Material: Zinc-coated (galvanized) steel sheet.

1. Thickness: Manufacturer's standard thickness for hatch size indicated.
2. Finish: Two-coat fluoropolymer.
3. Color: As selected by Architect from manufacturer's full range.

E. Construction:

1. Insulation: 1-inch-thick, glass-fiber board. R-Value: 4.3 according to ASTM C1363.
2. Nailer: Factory-installed wood nailer continuous around hatch perimeter.
3. Hatch Lid: Opaque, insulated, and double walled, with manufacturer's standard metal liner of same material and finish as outer metal lid.
4. Curb Liner: Manufacturer's standard, of same material and finish as metal curb.
5. Fabricate curbs to minimum height of 12 inches above roofing surface unless otherwise indicated.
6. Sloping Roofs: Where slope or roof deck exceeds 1:48, fabricate curb with perimeter curb height that is tapered to accommodate roof slope so that top surfaces of perimeter curb are level. Equip hatch with water diverter or cricket on side that obstructs water flow.

F. Hardware: Spring operators, hold-open arm, galvanized steel spring latch with turn handles, galvanized steel butt- or pintle-type hinge system, and padlock hasps inside and outside.

1. Provide two-point latch on lids larger than 84 inches.
2. Provide remote-control operation.

G. Safety Railing System: Roof-hatch manufacturer's standard system including rails, clamps, fasteners, safety barrier at railing opening, and accessories required for a complete installation; attached to roof hatch and complying with 29 CFR 1910.23 requirements and authorities having jurisdiction.

1. Height: 42 inches above finished roof deck.
2. Posts and Rails: Galvanized-steel pipe, 1-1/4 inches in diameter or galvanized-steel tube, 1-5/8 inches in diameter.
3. Flat Bar: Galvanized steel, 2 inches high by 3/8 inch thick.
4. Maximum Opening Size: System constructed to prevent passage of a sphere 21 inches in diameter.
5. Self-Latching Gate: Fabricated of same materials and rail spacing as safety railing system. Provide manufacturer's standard hinges and self-latching mechanism.
6. Post and Rail Tops and Ends: Weather resistant, closed or plugged with prefabricated end fittings.
7. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members.
8. Fabricate joints exposed to weather to be watertight.
9. Fasteners: Manufacturer's standard, finished to match railing system.
10. Finish: Manufacturer's standard. Color: As selected by Architect from manufacturer's full range.

2.3 METAL MATERIALS

A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A653/A653M, G90 coating designation.

1. Exposed Coil-Coated Finish: Prepainted by the coil-coating process to comply with ASTM A755/A755M. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions. Two-Coat Fluoropolymer Finish: AAMA 621. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight.
2. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil.

B. Steel Shapes: ASTM A36/A36M, hot-dip galvanized according to ASTM A123/A123M unless otherwise indicated.

C. Steel Tube: ASTM A500**/**A500M, round tube.

D. Galvanized-Steel Tube: ASTM A500**/**A500M, round tube, hot-dip galvanized according to ASTM A123/A123M.

E. Steel Pipe: ASTM A53/A53M, galvanized.

2.4 MISCELLANEOUS MATERIALS

A. Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Glass-Fiber Board Insulation: ASTM C726, nominal density of 3 lb/cu. ft., thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F, thickness as indicated.

C. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, acceptable to authorities having jurisdiction, containing no arsenic or chromium, and complying with AWPA C2; not less than 1-1/2 inches thick.

D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187**/**D1187M.

E. Underlayment:

1. Felt: ASTM D226**/**D226M, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
2. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.

F. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated: Fasteners for Zinc-Coated or Aluminum-Zinc Alloy-Coated Steel: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A153/A153M or ASTM F2329.

G. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.

H. Elastomeric Sealant: ASTM C920, elastomeric silicone polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.

I. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.

J. Asphalt Roofing Cement: ASTM D4586/D4586M, asbestos free, of consistency required for application.

2.5 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

C. Verify dimensions of roof openings for roof accessories.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install roof accessories according to manufacturer's written instructions.

1. Install roof accessories level; plumb; true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.
2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.

2. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of underlayment and cover with manufacturer's recommended slip sheet.
3. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.

C. Roof-Hatch Installation:

1. Verify that roof hatch operates properly. Clean, lubricate, and adjust operating mechanism and hardware.
2. Attach safety railing system to roof-hatch curb.
3. Attach ladder-assist post according to manufacturer's written instructions.

D. Seal joints with elastomeric sealant as required by roof accessory manufacturer.

3.3 REPAIR AND CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A780/A780M.

B. Clean exposed surfaces according to manufacturer's written instructions.

C. Clean off excess sealants.

D. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077200

SECTION 077600 – UNIT PAVERS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provision of contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to work of this Section.

1.02 SUMMARY

A. Perform all work required to complete as indicated by the Contract Documents and furnish all supplementary items necessary for the proper installation of Pressed Concrete Pavers.
B. Concrete paver and pedestal support systems, if used, are to be placed over roofing/waterproofing systems where indicated. Standard concrete Paver System to comply with IBC 1504.4 – ANSI/SPRI RP-4 for wind uplift.
C. Standard Concrete paver with Lok Down System to meet ultimate design wind speed of 180 mph per ASCE 7-05 Section 6.6 Method 3 using full-scale wind tests. Full-scale wind tests comply with IBC 1504.4- ANSI/SPRI RP-4 and IBC 1609.1.1.2. Pedestal components are to meet ASTM D635 burn rate category CC2.
D. Related Sections include the following:
   1. Section 033000 Cast in Place Concrete.
   2. 071413 Hot Fluid-Applied Rubberized Asphalt Waterproofing.
   3. Section 079200 Joint Sealants.

1.03 REFERENCES

A. Testing Standards

1. ASTM C-150 - Specification for Portland Cement.
2. ASTM C-127 - Test method for specific gravity and absorption of Course Aggregates.
3. ASTM C-128 - Test method for specific gravity and absorption of Fine Aggregates.
4. ASTM C-136 - Test method for sieve analysis of Fine and Coarse Aggregates.
5. ASTM C-140 - Testing for sampling and testing Concrete masonry and related units.
6. ANSI A326.3 Dynamic Coefficient of Friction.
7. ASTM C-1028 - Static Coefficient of Friction.
8. ASTM C-1262 - Test Method for Evaluating Freeze-Thaw Durability.
9. WTCL 99 Load Carrying Capacity.
10. ASTM D638-03 - Standard Test Method for Tensile Properties of Plastics.
11. ASTMD6110-10 - Standard Test Method for Determining the Charpy Impact Resistance of Notched Specimens of Plastics.

12. ASTM G155-05a - Standard practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials.
13. ASTM D1929-96 - Standard Test Method for Determining Ignition Temperature of Plastics.
14. ASTM D2843-99 - Standard Test Method for Density of Smoke from the Burning or Decomposition of Plastics.
15. ASTM D635-06 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.

1.04 SUBMITTALS

A. Submit under provisions of Section 013300.
B. Product Data:
   1. Manufacturer's data sheets on each product to be used, including preparation instructions, installation methods, storage, handling requirements and recommendations.
   2. Submit test results for compliance with performance requirements specified herein.
   3. Submit written instructions for recommended maintenance.
C. Shop Drawings:
   1. Layout drawings of each paved area showing the pattern of pressed pavers, indicate pavers requiring cutting, drainage patterns, drains and relationship of paving joints. Include details of setting beds, noting all materials and their thickness, and show details at curbs and vertical surfaces.
   2. Details of custom (nonstandard) curbs and stair tread/risers, include methods of installation.
   3. Samples: Submit sample to be selected by Architect / Engineer / Landscape Architect / Owner from manufacturer’s available standard and custom colors.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: All products covered under this Section shall be produced by a single manufacturer, unless otherwise specified, with a minimum of fifteen (15) years proven production of this concrete paver product.
B. Installer Qualifications: Installer shall have a minimum of five (5) years proven specialized construction experience with this product and be capable of estimating and building from blueprint plans and details, in addition to proper material handling. All work must comply with local, state/provincial licensing and bonding requirements.

1.06 MOCK-UP INSTALLATION

A. Prior to the start of pressed concrete paver work, construct mock-up of each type of pressed paver size and pattern area for the owner and architect to review. The mock-up will be at the project site or at a location mutually agreed to by the owner and contractor.
   1. Construct the mock-up installation in a minimum 4-foot by 4-foot area of typical concrete units and slabs with all setting beds, joints, edge and curb details as shown on the drawings.

2. After review of the mock-up, it will be retained and used as a standard of quality for the pressed concrete paver work. At completion of the work, remove the mock-up installations and related materials from the project site. If the mock-ups are incorporated in the actual construction, record their locations and sizes on the actual built record drawings for the project.

1.07 DELIVERY, STORAGE AND HANDLING

A. In accordance with provisions of Section 016000.
B. Pressed concrete pavers to be banded on pallets and delivered in original unopened packaging with legible manufacturer identification, manufacturing number and manufacture date.
C. Protect pressed concrete pavers during shipment, storage and construction against damage.

1.08 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity and ventilation). Do not install products under adverse environmental conditions.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer: Wausau Tile, Inc. | 1.800.388.8728 | info@wausautile.com | www.wausautile.com, or equal.

2.02 MATERIAL REQUIREMENTS

A. The pressed paver system shall include the following components:
   1. Portland Cement: ASTM C-150 specifications for Portland Cement,
   2. Aggregates: All aggregates are tested in accordance with ASTM C127, ASTM C128, and ASTM C-136 specifications. Aggregate shall be blended to meet individual project requirements.
   3. Coloring: Pigments used shall be inorganic and alkali resistant and used per manufacturer's recommendations.
   4. Factory Applied Sealer: Colorless slip and stain resistant penetrating or acrylic sealer.

2.03 PERFORMANCE REQUIREMENTS*

A. Performance Requirements based on 24”x24”x2” pressed paver*
   1. Compressive Strength: (ASTM C-140) The average compressive strength shall not be less than 8,000 psi with no individual unit less than 7,500 psi.
   2. Water Absorption: (ASTM C-140) The average shall not be greater than 6 percent.
   3. Flexural Strength: (ASTM C-140) Shall not be less than 1200 lbs. avg.
   4. Center Load: (WTCL 99) Pressed paver units shall have a tested center load capacity of 1,850 lbs.
   5. Freeze/Thaw: (ASTM C-1262) Durability of the pressed paver shall meet the freeze/thaw tests per Section 8, shall have no breakage and not greater than 1 percent loss in dry weight of any individual unit when subject to 100 cycles of freeze/thaw.
   6. Dynamic Coefficient of Friction: (ANSI A326.3): Wet: > 0.42
   7. Sizing Dimensions: Shall not differ by more than 1/16 inch (1.6 mm) from width, height, length or thickness. Unit shall conform to a true plane and not differ by more than 1/16 inch (1.6 mm) in either concave and/or convex warpage.

2.04 INSTALLATION MATERIALS

A. Components and Materials:
   1. Terra Stand: High impact copolymer polypropylene that adjusts from 3 to 21 inches in height. Slope compensation of up to 5/8 inch per foot. Outside base dimension of 7 inches by 7 inches provides 49 inches square of contact surface. Maximum static load per pedestal is 3000 lbs.
   2. Terra Shim Plate: 1/16-inch, 1/8-inch or 1/4-inch thick made of SBR rubber.
   3. Burn Rates of plastic Terra Stand pedestal and waffle reducer: Must meet burn rate category CC2 per ASTM D635 for plastic materials.
   4. Lok Down: The Lok Down made of high impact copolymer polypropylene. Outside base dimension of 7 inches by 7 inches providing 49 inches square of contact surface. Installed on previously established grid lines. Provide not less than one Lok Down for each paver.
   5. Terra pavers are designed for exterior application on roof decks, plazas, parking garages, terraces and other flat or sloped surfaces structurally sound with required dead load capacity.
   6. The standard paver is an open joint system and will drain all water to waterproofing/roofing system below.
   7. The Lok Down System complies with above sections.
B. Design Wind Speed
   1. Full scale wind pressure studies at the International Hurricane Research of Florida International University have shown the Wausau Tile Lok Down System to reach an ultimate design wind speed of 146 mph. The full-scale work was performed using the Wall of Wind with pressure taps, multi-dimensional wind force was used and no parapets were present on the roof deck of the full scale test model. Paver units were 2 feet by 2 feet, 2 inches thick in size.

2. The Lok Down devise provides a multiple paver static lift resistance to uplift. Factors of safety are computed based on specific wind uplift pressures generated at each paver system location on the building.
3. This full-scale wind evaluation per ASCE 7-05 Section 6.6 also meets the requirements of IBC 1504.8 – ANSI/SPRI RP-4 and IBC 1609.1.1.2.

2.5 INSTALLATION MATERIALS

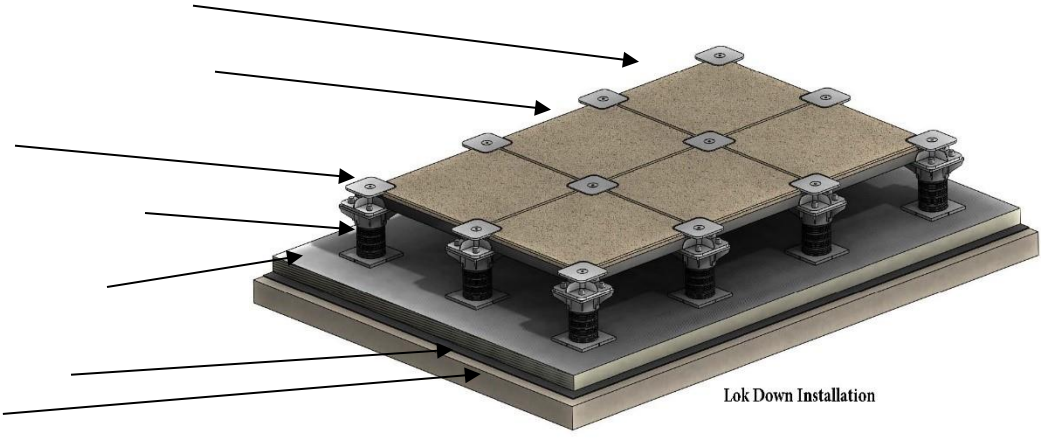
A. Pedestals and Accessories
   1. Terra-Tabs and Shim Plates:
      a. The SBR rubber Terra-Tab units provide spacing tabs, 3/16 inch or 1/8 inch, allowing for drainage and air circulation. Terra-Tabs to have a shore hardness of 70, allowing for resiliency without sound transmission. Terra-Tab sizes to correspond with various sizes of pavers.
      b. Shim plates are 1/16-inch, 1/8-inch and 1/4-inch thick and of various sizes to correspond with various size Terra-Tabs. Shim Plates to be of the same material as the Terra-Tab.
   2. Pedestal Systems:
      a. Terra-Stand Pedestals: Accommodates various pitches and height changes of the project area. Unit has outside dimension of 7 inches square and provides surface contact of 49 square inches. Unit adjusts from a minimum of 2-1/2 inches to a maximum of 21 inches and can tilt to a level plane. Units to be high impact copolymer polypropylene. Terra-Tabs are used on top of this unit.
      b. Lok Down: The Lok Down is made of a high impact copolymer polypropylene. Outside base dimension of 7 inches by 7 inches provides 49 inches square of contact surface. It is installed on previously established grid lines. An average project will require one Lok Down for each Terra Paver.
   3. Waffle Reducer:
      a. The Waffle Reducer is made of high impact copolymer polypropylene. Waffle Reducers are made to accommodate height adjustments 1/2 to 3 inches. An outside base diameter of 6 inches provides surface contact of 28 square inches. The unit consists of one base with three pieces of 3/8-inch waffle rings and two pieces of 3/4-inch waffle rings.
   4. Terra Paving Under Edge Restraint System:
      a. Edge termination system for mechanical fastening pavers in areas where the maximum wind uplift force occurs on the roof deck. The versatility of this system accommodates complex roof and parapet designs.
   5. Installation Handles:
      a. Paver Blok Handles: Units to handle paver sizes 12 inches to 24 inches nominal, allowing installing contractor to set units into proper location with 1/8-inch or 3/16-inch joint between units. Also allows for removal and reinstallation units without causing any damage to units or adjacent units, thus allowing inspection of utilities or drains at any time.

b. Big Blok Handle: Unit to handle paver sizes 24 inches to 36 inches nominal allowing installing contractor to set units reinstallation without causing any damage to units or adjacent units, thus allowing inspection of utilities or drains at any time.

PART 3 – EXECUTION

3.01 INSPECTION

A. Examine all jobsite surfaces to receive the parts of the paving materials. Notify the contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected. Installation of pressed concrete pavers and associated construction constitutes acceptance of the adjacent and underlying construction.



Wausau Tile architectural paver

Lok Down System: Terra-Stand Screw Top Pedestal

3.02 INSTALLATION OF LOK DOWN SYSTEM

A. Install in accordance with Wausau Tile Inc recommendations:
   1. Install in accordance with contributing manufacturer's instructions. Installation requirements vary for each individual project site. Pressed pavers used, pattern, grid layout, starting point and finished elevation should be shown on plan view shop drawings which have been prepared and approved by the designer, installing contractor and/or owner.
   2. Inspection of deck and fixed elevation locations. All height or location problems to be corrected before installation.
   3. Compare layout of deck to shop drawings or architectural drawings. All variances of field conditions to drawings to be reviewed and corrected prior to starting installation.

4. Set Terra Stand units or Lok Down Base as a set of grid patterns.
5. Level surface installation using Terra-Stand screw-top pedestal to follow manufacturer's installation procedures. No variances to system allowed.
6. Minor height and pitch adjustments to pedestal are handled with 1/16-inch rubber shim plates.
7. Waffle Reducer unit is used for height adjustments of between 1/2 and 3 inches in 3/8-inch increments.
8. Set Lok Down base on top of Terra Stand or Waffle Reducer with shim (see Step 6).
9. Set paver on base of Lok Down. Aligning the knob on base with recess on bottom of paver.
10. Set top plate on. Aligned flanges on top plate with flanges on bottom plate. (Top cap should fit into recess on top of the paver.)
11. Place bolt in place and tighten with the bit. Tighten to 70 psi max with torque wrench; do not over tighten. 07 76 00-4, Roof Pavers
12. Install Terra Paving Under Edge Restraint System and fasten per engineering design. B. Placement Tolerance:

1. Maximum of 1/16-inch (1.6 mm) height variation between adjacent pavers.
2. Individual pressed pavers shall not vary more than 1/16 inch (1.6 mm) from level across width of the pressed paver.
3. Paved areas shall not vary more than 1/4 inch (6 mm) in a distance of 10 feet (3 m) measured at any location and in any direction.
4. The surface elevation of pavers shall be 1/8 inch to 1/4 inch (3 mm to 6 mm) above adjacent drainage inlets, concrete collars or channels.
5. Joints between pavers to be greater than 1/16 inch (1.6 mm).

3.3 CLEANING AND PROTECTION

A. Remove and replace pressed pavers which are loose, chipped, broken, stained or otherwise damaged, or if units do not match adjoining units as intended. Provide new units to match adjoining units and install in same manner as original units with same joint treatment to eliminate evidence of replacement.
B. Wash entire surface with phosphate free neutral cleaner, rinse with clean water and allow to dry thoroughly.
C. Apply sealer in accordance with manufacturer's directions. Penetrating or topical type sealer designed especially for pressed concrete pavers.

END OF SECTION

SECTION 078123 - INTUMESCENT FIRE PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes: Mastic and intumescent fire-resistive coatings.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site. Review products, design ratings, restrained and unrestrained conditions, thicknesses, and other performance requirements.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:

1. Mastic and intumescent fire-resistive coatings.
2. Substrate primers.
3. Topcoat.

B. Shop Drawings: Framing plans or schedules, or both, indicating the following:

1. Extent of fire protection for each construction and fire-resistance rating.
2. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
3. Minimum mastic and intumescent fire-resistive coating thicknesses needed to achieve required fire-resistance rating of each structural component and assembly.
4. Treatment of mastic and intumescent fire-resistive coating after application.

C. Samples: For each exposed product and for each color and texture specified, 4 inches square in size.

1.5 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of mastic and intumescent fire-resistive coating.

B. Evaluation Reports: For mastic and intumescent fire-resistive coating, from ICC-ES.

C. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by mastic and intumescent fire-resistive coating manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements.

B. Mockups: Build mockups [to verify selections made under Sample submittals and to demonstrate aesthetic effects] [and] [to set quality standards for materials and execution].

1. Build mockup of each type of fire protection and different substrate and each required finish as shown on Drawings.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not apply fire protection when ambient or substrate temperature is 50 deg F or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.

B. Ventilation: Ventilate building spaces during and after application of fire protection, providing complete air exchanges according to manufacturer's written instructions. Use natural means or, if they are inadequate, forced-air circulation until fire protection dries thoroughly.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Assemblies: Provide fire protection, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.

B. Source Limitations: Obtain fire protection from single source.

C. Fire-Resistance Design: Indicated on Drawings, tested according to ASTM E119 or UL 263; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency. Steel members are to be considered unrestrained unless specifically noted otherwise.

D. Asbestos: Provide products containing no detectable asbestos.

2.2 MASTIC AND INTUMESCENT FIRE-RESISTIVE COATINGS

A. Mastic and Intumescent Fire-Resistive Coating: Manufacturer's standard, factory-mixed formulation, and complying with indicated fire-resistance design.

1. Product: Subject to compliance with requirements, provide CAFCO® SprayFilm® WB 5, or comparable product from one of the available manufacturers.
2. Available Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Albi Manufacturing; a division of StanChem, Inc.
    b. Carboline Company; a subsidiary of RPM International.
    c. Hilti, Inc.
    d. Sherwin-Williams Company (The).

3. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design.
4. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

    a. Flame-Spread Index: 25 or less.
    b. Smoke-Developed Index: 50 or less.

5. Hardness: Not less than 65, Type D durometer, according to ASTM D2240.
6. Finish: As selected by Architect from manufacturer's standard finishes.

    a. Color and Gloss: Match Architect's sample.

2.3 AUXILIARY MATERIALS

A. Provide auxiliary materials that are compatible with mastic and intumescent fire-resistive coating and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.

B. Substrate Primers: Primers approved by mastic and intumescent fire-resistive coating manufacturer and complying with required fire-resistance design by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

C. Topcoat: Suitable for application over mastic and intumescent fire-resistive coating; of type recommended in writing by mastic and intumescent fire-resistive coating manufacturer for each fire-resistance design.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of the Work and according to each fire-resistance design.

1. Verify that substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, paints, and encapsulants, or other foreign substances capable of impairing bond of fire protection with substrates under conditions of normal use or fire exposure.
2. Verify that objects penetrating fire protection, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
3. Verify that substrates receiving fire protection are not obstructed by ducts, piping, equipment, or other suspended construction that will interfere with fire protection application.

B. Conduct tests according to mastic and intumescent fire-resistive coating manufacturer's written instructions to verify that substrates are free of substances capable of interfering with bond.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Cover other work subject to damage from fallout or overspray of fire protection materials during application.

B. Clean substrates of substances that could impair bond of fire protection.

C. Prime substrates where included in fire-resistance design and where recommended in writing by mastic and intumescent fire-resistive coating manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive fire protection.

D. For applications visible on completion of Project, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of fire protection. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

3.3 APPLICATION

A. Construct fire protection assemblies that are identical to fire-resistance design indicated and products as specified, tested, and substantiated by test reports; for thickness, primers, topcoats, finishing, and other materials and procedures affecting fire protection Work.

B. Comply with mastic and intumescent fire-resistive coating manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fire protection; as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.

C. Coordinate application of fire protection with other construction to minimize need to cut or remove fire protection.

1. Do not begin applying fire protection until clips, hangers, supports, sleeves, and other items penetrating fire protection are in place.
2. Defer installing ducts, piping, and other items that would interfere with applying fire protection until application of fire protection is completed.

D. Install auxiliary materials as required, as detailed, and according to fire-resistance design and mastic and intumescent fire-resistive coating manufacturer's written instructions for conditions of exposure and intended use. For auxiliary materials, use attachment and anchorage devices of type recommended in writing by mastic and intumescent fire-resistive coating manufacturer.

E. Spray apply fire protection to maximum extent possible. After the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by mastic and intumescent fire-resistive coating manufacturer.

F. Extend fire protection in full thickness over entire area of each substrate to be protected.

G. Install body of fire protection in a single course unless otherwise recommended in writing by mastic and intumescent fire-resistive coating manufacturer.

H. Provide a uniform finish complying with description indicated for each type of fire protection material and matching finish approved for required mockups.

I. Cure fire protection according to mastic and intumescent fire-resistive coating manufacturer's written instructions.

J. Do not install enclosing or concealing construction until after fire protection has been applied, inspected, and tested and corrections have been made to deficient applications.

K. Finishes: Where indicated, apply fire protection to produce the following finishes:

1. Manufacturer's Standard Finishes: Finish according to manufacturer's written instructions for each finish selected.
2. Spray-Textured Finish: Finish left as spray applied with no further treatment.
3. Rolled, Spray-Textured Finish: Even finish produced by rolling spray-applied finish with a damp paint roller to remove drippings and excessive roughness.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform special inspections:

B. Perform the tests and inspections of completed Work in successive stages. Do not proceed with application of fire protection for the next area until test results for previously completed applications of fire protection show compliance with requirements. Tested values must equal or exceed values as specified and as indicated and required for approved fire-resistance design.

C. Fire protection will be considered defective if it does not pass tests and inspections.

1. Remove and replace fire protection that does not pass tests and inspections, and retest.
2. Apply additional fire protection, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest.

D. Prepare test and inspection reports.

3.5 CLEANING

A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.

3.6 PROTECTION

A. Protect fire protection, according to advice of manufacturer and Installer, from damage resulting from construction operations or other causes, so fire protection is without damage or deterioration at time of Substantial Completion.

3.7 REPAIRS

A. As installation of other construction proceeds, inspect fire protection and repair damaged areas and fire protection removed due to work of other trades.

B. Repair fire protection damaged by other work before concealing it with other construction.

C. Repair fire protection by reapplying it using same method as original installation or using manufacturer's recommended trowel-applied product.

END OF SECTION

SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Penetrations in fire-resistance-rated walls.
2. Penetrations in smoke barriers.

1.3 SUBMITTALS

A. Submit in accordance with Section 013300 “Submittals.”

B. Product Data: For each type of product.

C. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Obtain approval of authorities having jurisdiction prior to submittal.

D. Qualification Data: For Installer.

E. Product Test Reports: For each penetration firestopping system, for tests performed by a qualified testing agency.

F. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.6 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:

1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements: Penetration firestopping systems shall bear classification marking of a qualified testing agency.

    a. UL in its "Fire Resistance Directory."
    b. Intertek Group in its "Directory of Listed Building Products."
    c. FM Global in its "Building Materials Approval Guide."

2.2 PENETRATION FIRESTOPPING SYSTEMS

A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. 3M Fire Protection Products.
2. A/D Fire Protection Systems Inc.
3. Construction Solutions.
4. Hilti, Inc.
5. Or equal.

B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Penetrations in Smoke Barriers: Penetration firestopping systems with ratings determined per UL 1479, based on testing at a positive pressure differential of 0.30-inch wg. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at and no more than 50-cfm cumulative total for any 100 sq. ft. at both ambient and elevated temperatures.

D. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E 84.

E. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.

1. Permanent forming/damming/backing materials.
2. Substrate primers.
3. Collars.
4. Steel sleeves.

2.3 FILL MATERIALS

A. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

B. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

C. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced intumescent elastomeric sheet bonded to galvanized-steel sheet.

D. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.

E. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

F. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

G. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

H. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

I. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.

2.4 MIXING

A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION

A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.

C. Install fill materials by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.

3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet from end of wall and at intervals not exceeding 30 feet.

B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing and inspecting agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Engage a qualified testing agency to perform tests and inspections according to ASTM E 2174.

B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.

C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are without damage or deterioration at time of

Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

END OF SECTION

SECTION 078443 - JOINT FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Joints in or between fire-resistance-rated constructions.
2. Joints at exterior curtain-wall/floor intersections.
3. Joints in smoke barriers.

1.3 SUBMITTALS

A. Submit in accordance with Section 013300 “Submittals.”

B. Product Data: For each type of product.

C. Product Schedule: For each joint firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing agency. Engineering Judgments: Where Project conditions require modification to a qualified testing agency's illustration for a particular joint firestopping system condition, submit illustration, with modifications marked, approved by joint firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

D. Qualification Data: For Installer.

E. Product Test Reports: For each joint firestopping system, for tests performed by a qualified testing agency.

F. Installer Certificates: From Installer indicating that joint firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not install joint firestopping systems when ambient or substrate temperatures are outside limits permitted by joint firestopping system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Install and cure joint firestopping systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.6 COORDINATION

A. Coordinate construction of joints to ensure that joint firestopping systems can be installed according to specified firestopping system design.

B. Coordinate sizing of joints to accommodate joint firestopping systems.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:

1. Perform joint firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
2. Test per testing standards referenced in "Joint Firestopping Systems" Article. Provide rated systems complying with the following requirements: Joint firestopping systems shall bear classification marking of a qualified testing agency.

a. UL in its "Fire Resistance Directory."
b. Intertek Group in its "Directory of Listed Building Products."

2.2 JOINT FIRESTOPPING SYSTEMS

A. Joint Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which joint firestopping systems are installed. Joint firestopping systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

B. Joints in or between Fire-Resistance-Rated Construction: Provide joint firestopping systems with ratings determined per ASTM E 1966 or UL 2079.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. 3M Fire Protection Products.
    b. A/D Fire Protection Systems Inc.
    c. Grabber Construction Products.
    d. Hilti, Inc.
    e. Specified Technologies, Inc.
    f. Or approved equal.

2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the wall, floor, or roof in or between which it is installed.

C. Joints in Smoke Barriers: Provide fire-resistive joint systems with ratings determined per UL 2079 based on testing at a positive pressure differential of 0.30-inch wg.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. 3M Fire Protection Products.
    b. A/D Fire Protection Systems Inc.
    c. Hilti, Inc.
    d. Nelson Firestop; a brand of Emerson Industrial Automation.
    e. NUCO Inc.
    f. ROCKWOOL (ROXUL Inc.).
    g. Specified Technologies, Inc.
    h. Or approved equal.

2. L-Rating: Not exceeding 5.0 cfm/ft. of joint at both ambient and elevated temperatures.

D. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install elastomeric fill materials and to maintain ratings required. Use only components specified by joint firestopping system manufacturer and approved by the qualified testing agency for conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Before installing fire-resistive joint systems, clean joints immediately to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:

1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of elastomeric fill materials or compromise fire-resistive rating.
2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with elastomeric fill materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Prime substrates where recommended in writing by joint firestopping system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION

A. General: Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support elastomeric fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated. After installing elastomeric fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.

C. Install elastomeric fill materials for fire-resistive joint systems by proven techniques to produce the following results:

1. Elastomeric fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
2. Apply elastomeric fill materials so they contact and adhere to substrates formed by joints.
3. For elastomeric fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Joint Identification: Identify joint firestopping systems with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of joint edge so labels are visible to anyone seeking to remove or joint firestopping system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of

permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Joint Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Inspecting Agency: Engage a qualified testing agency to perform tests and inspections according to ASTM E 2393.

B. Where deficiencies are found or joint firestopping systems are damaged or removed due to testing, repair or replace joint firestopping systems so they comply with requirements.

C. Proceed with enclosing joint firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess elastomeric fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by joint firestopping system manufacturers and that do not damage materials in which joints occur.

B. Provide final protection and maintain conditions during and after installation that ensure joint firestopping systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

END OF SECTION

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Nonstaining silicone joint sealants.
3. Urethane joint sealants.
4. Mildew-resistant joint sealants.
5. Butyl joint sealants.
6. Latex joint sealants.

B. Related Requirements:

1. Section 014130 “Visual Mockups” for inclusion of sealant systems in mockup assembly.
2. Comply with “CALGreen VERIFICATION GUIDELINES MANDATORY CHECKLIST” requirements as indicated in Drawing Sheet G1.21.

1.3 SUBMITTALS

A. Product Data: For each joint-sealant product.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

D. Qualification Data: For qualified testing agency.

E. Product Test Reports: For each kind of joint sealant, for tests performed by a qualified testing agency.

F. Field-Adhesion-Test Reports: For each sealant application tested.

G. Sample Warranties: For special warranties.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

B. Product Testing: Test joint sealants using a qualified testing agency. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

1.5 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.6 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period. Warranty Period: Five years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

A. Silicone, S, NS, 100/50, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

B. Silicone, Acid Curing, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant: ASTM C 920, Type S, Grade NS, Class 25, Use NT.

2.3 NONSTAINING SILICONE JOINT SEALANTS

A. Nonstaining Joint Sealants: No staining of substrates when tested according to ASTM C 1248.

B. Silicone, Nonstaining, S, NS, 100/50, NT: Nonstaining, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

2.4 URETHANE JOINT SEALANTS

A. Urethane, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade P, Class 25, Uses T and NT.

2.5 MILDEW-RESISTANT JOINT SEALANTS

A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.

B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability,

nontraffic-use, acid-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.

2.6 BUTYL JOINT SEALANTS

A. Butyl-Rubber-Based Joint Sealants: ASTM C 1311.

2.7 LATEX JOINT SEALANTS

A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

2.8 JOINT-SEALANT BACKING

A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.9 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

    a. Concrete.
    b. Masonry.
    c. Unglazed surfaces of ceramic tile.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

    a. Metal.
    b. Glass.
    c. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.
4. Provide flush joint profile at locations indicated on Drawings according to Figure 8B in ASTM C 1193.
5. Provide recessed joint configuration of recess depth and at locations indicated on Drawings according to Figure 8C in ASTM C 1193. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:

    a. Perform 10 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.
    b. Perform one test for each 1000 feet of joint length thereafter or one test per each floor per elevation.

2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
3. Inspect tested joints and report on the following:

    a. Whether sealants filled joint cavities and are free of voids.
    b. Whether sealant dimensions and configurations comply with specified requirements.
    c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.

4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.
5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.

1. Joint Locations: Isolation and contraction joints in cast-in-place concrete slabs.
2. Joint Sealant: Urethane, M, P, 25, T, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

B. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

   a. Construction joints in cast-in-place concrete.
   b. Joints between plant-precast architectural concrete units.
   c. Control and expansion joints in unit masonry.
   d. Joints in stone cladding.
   e. Joints between metal panels.
   f. Joints between different materials listed above.
   g. Perimeter joints between materials listed above and frames of doors, windows, and louvers.
   h. Control and expansion joints in ceilings and other overhead surfaces.
   i. Other joints as indicated on Drawings.

2. Joint Sealant: Silicone, nonstaining, S, NS,100/ 50, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

C. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.

1. Joint Locations:

   a. Isolation joints in cast-in-place concrete slabs.
   b. Control and expansion joints in tile flooring.
   c. Other joints as indicated on Drawings.

2. Joint Sealant: Urethane, S, P, 25, T, NT.

3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

D. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement.

1. Joint Locations:

a. Control joints on exposed interior surfaces of exterior walls.
b. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
c. Other joints as indicated on Drawings.

2. Joint Sealant: Acrylic latex.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

E. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
b. Tile control and expansion joints.
c. Other joints as indicated on Drawings.

2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

F. Joint-Sealant Application: Concealed mastics.

1. Joint Locations:

a. Aluminum thresholds.
b. Sill plates.
c. Other joints as indicated on Drawings.

2. Joint Sealant: Butyl-rubber based.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION

SECTION 079219 - ACOUSTICAL JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes acoustical joint sealants.

B. Related Requirements: Section 079200 "Joint Sealants" for elastomeric, latex, and butyl-rubber-based joint sealants for nonacoustical applications.

1.3 SUBMITTALS

A. Product Data: For each acoustical joint sealant.

B. Samples for Verification: For each kind and color of acoustical joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

C. Acoustical-Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

D. Product Test Reports: For each kind of acoustical joint sealant, for tests performed by a qualified testing agency.

E. Sample Warranties: For special warranties.

1.4 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace acoustical joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish acoustical joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Provide acoustical joint-sealant products that effectively reduce airborne sound transmission through perimeter joints and openings in building construction, as demonstrated by testing representative assemblies according to ASTM E 90.

2.2 ACOUSTICAL JOINT SEALANTS

A. Basis of Design Products: Subject to compliance with requirements, the following are acceptable products:

1. OSI SC175 Draft &Acoustical Sound Sealant.
2. Pecora AC-20 FCR (fire and temperature rated) acoustical and insulation sealant.
3. Or Equal.

B. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex acoustical sealant complying with ASTM C 834. Colors of Exposed Acoustical Joint Sealants: As selected by State’s Engineer from manufacturer's full range of colors.

C. Acoustical Sealant for Concealed Joints: Manufacturer's standard nonsag, nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber acoustical sealant.

2.3 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by acoustical-joint-sealant manufacturer where required for adhesion of sealant to joint substrates.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive acoustical joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing acoustical joint sealants to comply with joint-sealant manufacturer's written instructions.

B. Joint Priming: Prime joint substrates where recommended by acoustical-joint-sealant manufacturer. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF ACOUSTICAL JOINT SEALANTS

A. Comply with acoustical joint-sealant manufacturer's written installation instructions unless more stringent requirements apply.

B. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical joint sealant. Install acoustical joint sealants at both faces of partitions, at perimeters, and through penetrations. Comply with ASTM C 919, ASTM C 1193, and manufacturer's written recommendations for closing off sound-flanking paths around or through assemblies, including sealing partitions to underside of floor slabs above acoustical ceilings.

C. Acoustical Ceiling Areas: Apply acoustical joint sealant at perimeter edge moldings of acoustical ceiling areas in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of acoustical joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect acoustical joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated acoustical joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION

SECTION 079513.13 - INTERIOR EXPANSION JOINT COVER ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes interior expansion joint cover assemblies.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for expansion joint cover assemblies.

B. Shop Drawings: For each expansion joint cover assembly.

1. Include plans, elevations, sections, details, splices, block-out requirement, attachments to other work, and line diagrams showing entire route of each expansion joint.
2. Where expansion joint cover assemblies change planes, provide isometric or clearly detailed drawing depicting how components interconnect.

C. Samples: For each expansion joint cover assembly and for each color and texture specified, full width by 6 inches long in size.

D. Expansion Joint Cover Assembly Schedule: Prepared by or under the supervision of the supplier. Include the following information in tabular form:

1. Manufacturer and model number for each expansion joint cover assembly.
2. Expansion joint cover assembly location cross-referenced to Drawings.
3. Nominal, minimum, and maximum joint width.
4. Movement direction.
5. Materials, colors, and finishes.
6. Product options.
7. Fire-resistance ratings.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each fire-resistance-rated expansion joint cover assembly, for tests performed by manufacturer and witnessed by a qualified testing agency or a qualified testing agency.

1.5 QUALITY ASSURANCE

A. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Build mockup of typical expansion joint cover assembly as shown on Drawings.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

A. Furnish units in longest practicable lengths to minimize field splicing.

B. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous expansion joint cover assemblies.

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Expansion joint cover assemblies shall withstand the effects of earthquake motions determined according to2019 CBC.

B. Fire-Resistance Ratings: Provide expansion joint cover assemblies with fire barriers identical to those of systems tested for fire resistance according to UL 2079 or ASTM E1966 by a qualified testing agency.

1. Hose Stream Test: Wall-to-wall and wall-to-ceiling assemblies shall be subjected to hose stream testing.

C. Expansion Joint Design Criteria:

1. Type of Movement: Seismic.

a. Joint Movement: As indicated on Drawings.

2.3 FLOOR EXPANSION JOINT COVERS

A. Metal-Plate Floor Joint Cover: Metal cover plate fixed on one side of joint gap and free to slide on other.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Construction Specialties, Inc.
    b. MM Systems Corporation.
    c. Nystrom.
    d. Or equal.

2. Application: Floor to floor and ceiling to wall.
3. Installation: Surface mounted.
4. Load Capacity:

    a. Uniform Load: 50 lb/sq. ft..
    b. Concentrated Load: 300 lb.
    c. Maximum Deflection: 0.0625 inch.

5. Fire-Resistance Rating: Not less than that of adjacent construction.
6. Cover-Plate Design: Plain.

2.4 WALL EXPANSION JOINT COVERS

A. Center-Plate Wall Joint Cover: Assembly consisting of center plate that slides over gaskets in metal frames fixed to sides of joint gaps.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Construction Specialties, Inc.
    b. MM Systems Corporation.
    c. Nystrom.
    d. Or equal.

2. Application: Wall to wall.
3. Fire-Resistance Rating: Not less than that of adjacent construction.

2.5 MATERIALS

A. Aluminum: ASTM B221, Alloy 6063-T5 for extrusions; ASTM B209, Alloy 6061-T6 for sheet and plate.

1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.

B. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304 for plates, sheet, and strips.

C. Elastomeric Seals: Manufacturer's standard preformed elastomeric membranes or extrusions to be installed in metal frames.

D. Fire Barriers: Any material or material combination, when fire tested after cycling, designated to resist the passage of flame and hot gases through a movement joint and to comply with performance criteria for required fire-resistance rating.

E. Moisture Barrier: Manufacturer's standard, flexible elastomeric material.

F. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.6 ALUMINUM FINISHES

A. Mill finish.

B. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

2.7 ACCESSORIES

A. Moisture Barriers: Manufacturer's standard continuous, waterproof membrane within joint and attached to substrate on sides of joint.

1. Provide where indicated on Drawings.

B. Manufacturer's standard attachment devices. Include anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces where expansion joint cover assemblies will be installed for installation tolerances and other conditions affecting performance of the Work.

B. Notify Architect where discrepancies occur that will affect proper expansion joint cover assembly installation and performance.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to expansion joint cover assembly manufacturer's written instructions.

B. Coordinate and furnish anchorages, setting drawings, and instructions for installing expansion joint cover assemblies. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of expansion joint cover assemblies.

3.3 INSTALLATION

A. Comply with manufacturer's written instructions for storing, handling, and installing expansion joint cover assemblies and materials unless more stringent requirements are indicated.

B. Metal Frames: Perform cutting, drilling, and fitting required to install expansion joint cover assemblies.

1. Repair or grout block out as required for continuous frame support using nonmetallic, shrinkage-resistant grout.
2. Install frames in continuous contact with adjacent surfaces.

    a. Shimming is not permitted.

3. Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
4. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation.
5. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.
6. Locate anchors at interval recommended by manufacturer, but not less than 3 inches from each end and not more than 24 inches o.c.

C. Seals: Install elastomeric seals and membranes in frames to comply with manufacturer's written instructions. Install with minimum number of end joints.

1. Provide in continuous lengths for straight sections.
2. Seal transitions. Vulcanize or heat-weld field-spliced joints as recommended by manufacturer.
3. Installation: Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.

D. Install with hairline mitered corners where expansion joint cover assemblies change direction or abut other materials.

E. Terminate exposed ends of expansion joint cover assemblies with field- or factory-fabricated termination devices.

F. Fire-Resistance-Rated Assemblies: Coordinate installation of expansion joint cover assembly materials and associated work so complete assemblies comply with performance requirements.

1. Fire Barriers: Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of joint, including transitions and field splices.

G. Moisture Barrier Drainage: If indicated, provide drainage fittings and connect to drains.

3.4 PROTECTION

A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.

B. Protect the installation from damage by work of other Sections. Where necessary due to heavy construction traffic, remove and properly store cover plates or seals and install temporary protection over expansion joint cover assemblies. Reinstall cover plates or seals prior to Substantial Completion.

END OF SECTION

SECTION 079513.16 - EXTERIOR EXPANSION JOINT COVER ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes exterior building expansion joint cover assemblies.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for expansion joint cover assemblies.

B. Shop Drawings: For each expansion joint cover assembly.

1. Include plans, elevations, sections, details, splices, block-out requirement, attachments to other work, and line diagrams showing entire route of each expansion joint.
2. Where expansion joint cover assemblies change planes, provide isometric or clearly detailed drawing depicting how components interconnect.

C. Samples: For each exposed expansion joint cover assembly and for each color and texture specified, full width by 6 inches long in size.

D. Expansion Joint Cover Assembly Schedule: Prepared by or under the supervision of the supplier. Include the following information in tabular form:

1. Manufacturer and model number for each expansion joint cover assembly.
2. Expansion joint cover assembly location cross-referenced to Drawings.
3. Nominal, minimum, and maximum joint width.
4. Movement direction.
5. Materials, colors, and finishes.
6. Product options.
7. Fire-resistance ratings.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each fire-resistance-rated expansion joint cover assembly, for tests performed by manufacturer and witnessed by a qualified testing agency or a qualified testing agency.

1.5 QUALITY ASSURANCE

A. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Build mockup of typical expansion joint cover assembly as shown on Drawings.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

A. Furnish units in longest practicable lengths to minimize field splicing.

B. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous expansion joint cover assemblies.

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Expansion joint cover assemblies shall withstand the effects of earthquake motions determined according to 2019 CBC.

B. Fire-Resistance Ratings: Provide expansion joint cover assemblies with fire barriers identical to those of systems tested for fire resistance according to UL 2079 or ASTM E1966 by a qualified testing agency. Hose Stream Test: Wall-to-wall and wall-to-soffit assemblies shall be subjected to hose stream testing.

C. Expansion Joint Design Criteria: Type of Movement: Seismic.

2.3 EXTERIOR EXPANSION JOINT COVERS

A. Exterior Metal-Plate Joint Cover: Assembly consisting of sliding metal cover plate in continuous contact with gaskets mounted on metal frames fixed to sides of joint gap.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Construction Specialties, Inc.
    b. MM Systems Corporation.
    c. Nystrom.
    d. Or equal.

2. Application: Wall to soffit.
3. Installation: Surface mounted.
4. Fire-Resistance Rating: Not less than that of adjacent construction.

2.4 MATERIALS

A. Aluminum: ASTM B221, Alloy 6063-T5 for extrusions; ASTM B209, Alloy 6061-T6 for sheet and plate. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.

B. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304 for plates, sheet, and strips.

C. Elastomeric Seals: Manufacturer's standard preformed elastomeric membranes or extrusions to be installed in metal frames.

D. Fire Barriers: Any material or material combination, when fire tested after cycling, designated to resist the passage of flame and hot gases through a movement joint and to comply with performance criteria for required fire-resistance rating.

E. Moisture Barrier: Manufacturer's standard, flexible elastomeric material.

2.5 ALUMINUM FINISHES

A. Mill finish.

B. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

2.6 ACCESSORIES

A. Moisture Barriers: Manufacturer's standard continuous, waterproof membrane within joint and attached to substrate on sides of joint. Provide where indicated on Drawings.

B. Manufacturer's stainless-steel attachment devices. Include anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces where expansion joint cover assemblies will be installed for installation tolerances and other conditions affecting performance of the Work.

B. Notify Architect where discrepancies occur that will affect proper expansion joint cover assembly installation and performance.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to expansion joint cover assembly manufacturer's written instructions.

B. Coordinate and furnish anchorages, setting drawings, and instructions for installing expansion joint cover assemblies. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of expansion joint cover assemblies.

3.3 INSTALLATION

A. Comply with manufacturer's written instructions for storing, handling, and installing expansion joint cover assemblies and materials unless more stringent requirements are indicated.

B. Metal Frames: Perform cutting, drilling, and fitting required to install expansion joint cover assemblies.

1. Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
2. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation.
3. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.
4. Install frames in continuous contact with adjacent surfaces. Shimming is not permitted.
5. Locate anchors at interval recommended by manufacturer, but not less than 3 inches from each end and not more than 24 inches o.c.

C. Seals: Install elastomeric seals and membranes in frames to comply with manufacturer's written instructions. Install with minimum number of end joints.

1. Provide in continuous lengths for straight sections.
2. Seal transitions. Vulcanize or heat-weld field-spliced joints as recommended by manufacturer.
3. Installation: Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.

D. Install with hairline mitered corners where expansion joint cover assemblies change direction or abut other materials.

E. Terminate exposed ends of expansion joint cover assemblies with field- or factory-fabricated termination devices.

F. Fire-Resistance-Rated Assemblies: Coordinate installation of expansion joint cover assembly materials and associated work so complete assemblies comply with performance requirements. Fire Barriers: Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of joint, including transitions and field splices.

G. Moisture Barrier Drainage: If indicated, provide drainage fitting and connect to drains.

3.4 CONNECTIONS

A. Transition to Roof Expansion Joint Covers: Coordinate installation of exterior wall and soffit expansion joint covers with roof expansion joint covers specified in Section 077129 "Manufactured Roof Expansion Joints." Install factory-fabricated units at transition between exterior walls and soffits and roof expansion joint cover assemblies.

3.5 PROTECTION

A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.

B. Protect the installation from damage by work of other Sections.

END OF SECTION

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Standard and custom hollow metal doors and frames.
2. Steel sidelight, borrowed lite and transom frames.
3. Louvers installed in hollow metal doors.
4. Light frames and glazing installed in hollow metal doors.

B. Related Sections:

1. Division 01 Section "General Conditions".
2. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
3. Division 08 Section “Flush Wood Doors”.
4. Division 08 Section “Integrated Door Opening Assemblies”.
5. Division 08 Section "Glazing" for glass view panels in hollow metal doors.
6. Division 08 Section "Door Hardware".
7. Division 08 Section "Access Control Hardware".
8. Division 09 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.

6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
8. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
9. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
10. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.
11. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
12. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
13. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
14. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
15. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
16. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.

B. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.

C. Shop Drawings: Include the following:

1. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of anchorages, joints, field splices, and connections.
6. Details of accessories.
7. Details of moldings, removable stops, and glazing.
8. Details of conduit and preparations for power, signal, and control systems.

D. Samples for Verification:

1. Samples are only required by request of the architect and for manufacturers that are not current members of the Steel Door Institute.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.

B. Quality Standard: In addition to requirements specified, furnish SDI-Certified manufacturer products that comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".

C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL10C (neutral pressure at 40” above sill) or UL 10C.

1. Oversize Fire-Rated Door Assemblies Construction: For units exceeding sizes of tested assemblies, attach construction label certifying doors are built to standard construction requirements for tested and labeled fire rated door assemblies except for size.
2. Temperature-Rise Limit: Where indicated and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.
3. Smoke Control Door Assemblies: Comply with NFPA 105.

    a. Smoke "S" Label: Doors to bear “S” label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.

D. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257. Provide labeled glazing material.

E. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inchhigh wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inchspace between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

B. Building Information Modeling (BIM) Support: Utilize designated BIM software tools and obtain training needed to successfully participate in the Project BIM processes. All technical disciplines are responsible for the product data integration and data reliability of their Work into the coordinated BIM applications.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide steel doors and frames from a SDI Certified manufacturer:

1. CECO Door Products (C).
2. Curries Company (CU).
3. Pioneer Industries (PI).

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 metallic coating.

C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 metallic coating.

2.3 HOLLOW METAL DOORS

A. General: Provide 1-3/4 inch doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8 and ANSI/NAAMM HMMA 867.

B. Exterior Doors: Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Design: Flush panel.
2. Core Construction: Manufacturer's standard polystyrene. Where indicated, provide doors fabricated as thermal-rated assemblies with a minimum R-value of 2.8 or better.
3. Level/Model: Level 3 and Physical Performance Level A (Extra Heavy Duty), Minimum 16 gauge (0.053-inch - 1.3-mm) thick steel, Model 2.
4. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
5. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
6. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

C. Interior Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A 1008/A 1008M. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Design: Flush panel.
2. Core Construction: Manufacturer's standard kraft-paper honeycomb, or one-piece polystyrene core, securely bonded to both faces.

a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.

3. Level/Model: Level 2 and Physical Performance Level B (Heavy Duty), Minimum 18 gauge (0.042-inch - 1.0-mm) thick steel, Model 2.
4. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet.
5. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
6. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

D. Manufacturers Basis of Design:

1. Curries Company (CU) - Polystyrene Core - 707 Series.

2.4 HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Exterior Frames: Fabricated of hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60.

1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
2. Frames: Minimum 16 gauge (0.053-inch -thick steel sheet.
3. Manufacturers Basis of Design:

a. Curries Company (CU) – M CM Series.

C. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.

1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
2. Frames: Minimum 16 gauge (0.053-inch -thick steel sheet.
3. Manufacturers Basis of Design:

a. Curries Company (CU) - C CM Series.

D. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.

E. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042 inchthick, with corrugated or perforated straps not less than 2 incheswide by 10 incheslong; or wire anchors not less than 0.177 inchthick.
2. Stud Wall Type: Designed to engage stud and not less than 0.042 inchthick.

B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inchesthick.

C. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.6 LOUVERS

A. Metal Louvers: Unless otherwise indicated provide louvers to meet the following requirements.

1. Blade Type: Vision proof inverted V or inverted Y.
2. Metal and Finish: Galvanized steel, 0.040 inchthick, factory primed for paint finish with baked enamel or powder coated finish. Match pre-finished door paint color where applicable.

B. Louvers for Fire Rated Doors: Metal louvers with fusible link and closing device, listed and labeled for use in doors with fire protection rating of 1-1/2 hours and less.

1. Manufacturers: Subject to compliance with requirements, provide louvers to meet rating indicated.
2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked enamel or powder coated finish. Match pre-finished door paint color where applicable.

2.7 LIGHT OPENINGS AND GLAZING

A. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricator’s shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.

B. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 20 gauge thick, fabricated from same material as door face sheet in which they are installed.

C. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames.

D. Preformed Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated. Match pre-finished door paint color where applicable.

2.8 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.9 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.

C. Hollow Metal Doors:

1. Exterior Doors: Provide optional weep-hole openings in bottom of exterior doors to permit moisture to escape where specified.
2. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit. Factory install glazing where indicated.
3. Astragals: Provide overlapping astragals as noted in door hardware sets in Division 08 Section "Door Hardware" on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.

D. Hollow Metal Frames:

1. Shipping Limitations: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.

    a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping

and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.

3. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
4. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.
5. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge straps for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
6. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
7. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
8. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
9. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Masonry Type: Locate anchors not more than 18 inchesfrom top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Two anchors per jamb up to 60 incheshigh.
        2) Three anchors per jamb from 60 to 90 incheshigh.
        3) Four anchors per jamb from 90 to 120 incheshigh.
        4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inchesor fraction thereof above 120 inches high.

    b. Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Three anchors per jamb up to 60 incheshigh.
        2) Four anchors per jamb from 60 to 90 incheshigh.
        3) Five anchors per jamb from 90 to 96 incheshigh.
        4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inchesor fraction thereof above 96 incheshigh.
        5) Two anchors per head for frames above 42 incheswide and mounted in metal stud partitions.

10. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".

E. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to

the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.10 STEEL FINISHES

A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for square, level, twist, and plumb condition.

C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."

D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.

1. Set frames accurately in position, plumbed, leveled, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

    a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
    b. Between Edges of Pairs of Doors: 1/8 inchplus or minus 1/16 inch.
    c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
    d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

D. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and

replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

3.5 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

END OF SECTION 081113

SECTION 081216 – PREFINISHED STEEL FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Interior door frames, and glazing frames.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, fire-resistance rating, and finishes.

B. Shop Drawings: For frames:

1. Include elevations, sections, and installation details for each wall-opening condition.
2. Include details for each frame type, including dimensioned profiles and metal thicknesses.
3. Include locations of reinforcements and preparations for hardware.
4. Include details of anchorages, joints, field splices, connections, and accessories.
5. Include details of moldings, removable stops, and glazing.

C. Samples for Verification: For each type of the following products:

1. Framing Member and Finish: 12 inches long. Include trim.
2. Corner Fabrication and Finish: 12-by-12-inch-long, full-size window corner, including full-size sections of extrusions with factory-applied color finish.
3. Door Finish: Manufacturer's standard-size unit, but not less than 3 inches square.

D. Product Schedule: For frames. Use same designations indicated on Drawings. Coordinate with door hardware schedule and glazing.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For frames to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for fabrication and installation.

1. Build mockup of each type of frame with door in typical wall area as shown on Drawings.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Product: Subject to compliance with requirements, provide frames manufactured by Timely Industries, or equal.

B. Source Limitations: Obtain frames from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Rated Frames: Frames for fire-rated door assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

1. Oversize Fire-Rated Frames: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that frames comply with standard construction requirements for tested and labeled fire-rated frames except for size.
2. Frames for Smoke- and Draft-Control Assemblies: Tested according to UL 1784 and installed in compliance with NFPA 105. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. at the tested pressure differential of 0.3-inch wg.

2.3 INTERIOR DOORS, DOOR FRAMES, AND GLAZING FRAMES

A. Door Glazing Frames: ANSI/SDI A250.8, Level 2; ANSI/SDI A250.4, Level B, , reinforced for hinges, strikes, and closers. Hot dipped galvanized steel.

B. Trim: Steel Casings formed to be applied to heat treated clips on frame face after frame is anchored to wall and without exposed fasteners.

C. Frame and Trim Finish: Prefinished with factory applied impact resistant, polyurethane baked enamel finish or optional electrostatic applied water based paint system.

2.4 ACCESSORIES

A. Fasteners: Nonmagnetic, stainless steel or other noncorrosive metal fasteners compatible with frames, stops, panels, reinforcement plates, hardware, anchors, and other items being fastened.

B. Door Silencers: Manufacturer's standard continuous vinyl seals. Color: As selected by Architect from manufacturer’s standard colors to closely match frame color.

C. Smoke Seals: Intumescent strip or fire-rated gaskets. Color: As selected by Architect from manufacturer’s standard colors to closely match frame color.

D. Glazing Gaskets: Manufacturer's standard extruded or molded rubber or plastic, to accommodate glazing thickness indicated. Color: As selected by Architect from manufacturer’s standard colors to closely match frame color.

E. Glass: As specified in Section 088000 "Glazing."

F. Door Hardware: As specified in Section 087100 "Door Hardware."

2.5 FABRICATION

A. Provide concealed corner reinforcements and alignment clips for accurately fitted hairline joints at butted and mitered connections.

B. Factory prepare frames to receive templated mortised hardware; include cutouts, reinforcements, mortising, drilling, and tapping, according to the Door Hardware Schedule and templates furnished as specified in Section 087100 "Door Hardware."

1. Locate hardware cutouts and reinforcements as required by fire-rated label for assembly.

C. Fabricate frames for glazing with removable stops to allow glazing replacement without dismantling frame.

1. Locate removable stops on the inside of spaces accessed by keyed doors.

D. Fabricate components to allow secure installation without exposed fasteners.

2.6 GENERAL FINISH REQUIREMENTS

A. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Verify that wall thickness does not exceed standard tolerances allowed by throat size of indicated aluminum frame.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install frames plumb, rigid, properly aligned, and securely fastened in place; according to manufacturer's written instructions.

1. At fire-protection-rated openings, install fire-rated frames according to NFPA 80 and NFPA 105.

B. Install frame components in the longest possible lengths with no piece less than 48 inches; components 96 inches or shorter shall be one piece.

1. Use concealed installation clips to produce tightly fitted and aligned splices and connections.
2. Secure clips to main-frame components and not to snap-in or trim members.
3. Do not leave screws or other fasteners exposed to view when installation is complete.

C. Glass: Install glass according to Section 088000 "Glazing" and aluminum-frame manufacturer's written instructions.

D. Doors: Install doors aligned with frames and fitted with required hardware.

E. Door Hardware: Install according to Section 087100 "Door Hardware" and -frame manufacturer's written instructions.

3.3 ADJUSTING

A. Inspect installation, correct misalignments, and tighten loose connections.

B. Doors: Adjust doors to operate smoothly and easily, without binding or warping. Adjust hardware to function smoothly, and lubricate as recommended by manufacturer.

C. Clean exposed frame surfaces promptly after installation, using cleaning methods recommended in writing by frame manufacturer and according to AAMA 609 & 610.

D. Touch Up: Repair marred frame surfaces to blend inconspicuously with adjacent unrepaired surface so touchup is not visible from a distance of 48 inches as viewed by Architect. Remove and replace frames with damaged finish that cannot be satisfactorily repaired.

END OF SECTION

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Five-ply flush wood doors for opaque finish.
2. Factory finishing flush wood doors.
3. Factory fitting flush wood doors to frames and factory machining for hardware.

B. Related Requirements: Section 088000 "Glazing" for glass view panels in flush wood doors.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product, including the following:

1. Door core materials and construction.
2. Door edge construction
3. Door face type and characteristics.
4. Door louvers.
5. Door trim for openings.
6. Door frame construction.
7. Factory-machining criteria.
8. Factory- finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each type of door; construction details not covered in Product Data; and the following:

1. Door schedule indicating door location, type, size, fire protection rating, and swing.
2. Door elevations, dimension and locations of hardware, lite and louver cutouts, and glazing thicknesses.

3. Dimensions and locations of blocking for hardware attachment.
4. Dimensions and locations of mortises and holes for hardware.
5. Clearances and undercuts.
6. Requirements for veneer matching.
7. Doors to be factory finished and application requirements.
8. Apply WI Certified Compliance Program label to Shop Drawings.

C. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish.
2. Corner sections of doors, approximately 8 by 10 inches, with door faces and edges representing actual materials to be used.
3. Frames for light openings, 6 inches long, for each material, type, and finish required.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Special warranties.

B. Quality Standard Compliance Certificates: WI Certified Compliance Program certificates.

C. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.7 QUALITY ASSURANCE

A. Manufacturer's Certification: Licensed participant in WI's Certified Compliance Program.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in plastic bags or cardboard cartons.

C. Mark each door on bottom rail with opening number used on Shop Drawings.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and HVAC system is operating and maintaining temperature and relative humidity at levels designed for building occupants for the remainder of construction period.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Delamination of veneer.
b. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
c. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.

2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain flush wood doors from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Rated Wood Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratingsindicated on Drawings, based on testing at positive pressure in accordance with UL 10C.

1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.

B. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing in accordance with UL 1784 and installed in compliance with NFPA 105.

2.3 FLUSH WOOD DOORS, GENERAL

A. Quality Standard: In addition to requirements specified, comply with AWI/AWMAC/WI's "Architectural Woodwork Standards."

1. Provide certificates from WI certification program indicating that doors comply with requirements of grades specified.
2. The Contract Documents contain requirements that are more stringent than the referenced quality standard. Comply with the Contract Documents in addition to those of the referenced quality standard.

B. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Composite Wood Products: Products shall be made using ultra-low-emitting formaldehyde resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added formaldehyde.

2.4 SOLID-CORE FIVE-PLY FLUSH WOOD DOORS FOR OPAQUE FINISH

A. Interior Solid-Core Doors:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Masonite Architectural.
    b. Oshkosh Door Company.
    c. VT Industries Inc.
    d. Or equal.

2. Performance Grade: ANSI/WDMA I.S. 1A Heavy Duty.
3. Architectural Woodwork Standards Grade: Custom.
4. Faces: Any closed-grain hardwood of mill option.
5. Exposed Vertical Edges: Any closed-grain hardwood.

    a. Fire-Rated Single Doors: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed vertical edges.
    b. Fire-Rated Pairs of Doors: Provide formed-steel edges and astragals with intumescent seals.

        1) Finish steel edges and astragals with baked enamel same color as doors.

c. Mineral-Core Doors: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges. Screw-Holding Capability: 475 lbf in accordance with WDMA T.M. 10.

6. Core for Non-Fire-Rated Doors:

a. ANSI A208.1, Grade LD-1 particleboard.

1) Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.
2) Provide doors with glued-wood-stave or WDMA I.S. 10 structural-composite-lumber cores instead of particleboard cores for doors scheduled to receive exit devices in Section 087100 "Door Hardware."
3) Screw Withdrawal, Door Face: 475 lbf.
4) Screw Withdrawal, Vertical Door Edge: 475 lbf.

7. Core for Fire-Rated Doors: As required to achieve fire-protection rating indicated on Drawings.

a. Blocking for Mineral-Core Doors: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated on Drawings as needed to eliminate through-bolting hardware.

8. Construction: Five plies, hot-pressed bonded (vertical and horizontal edging is bonded to core), with entire unit abrasive planed before veneering.

2.5 LIGHT FRAMES AND LOUVERS

A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.

B. Metal Frames for Light Openings in Fire-Rated Doors: Manufacturer's standard frame formed of 0.048-inch-thick, cold-rolled steel sheet; with baked-enamel- or powder-coated finish; and approved for use in doors of fire-protection rating indicated on Drawings.

C. Metal Louvers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Activar Construction Products Group, Inc.

b. Allegion plc.

c. Anemostat Products; a Mestek company.

d. ASSA ABLOY.

e. L & L Louvers, Inc.

f. McGill Architectural Products.

g. Or equal.

2. Blade Type: Vision-proof, inverted V.
3. Metal and Finish: Hot-dip galvanized steel, 0.040 inch thick, with baked-enamel- or powder-coated finish.

D. Louvers for Fire-Rated Doors: Metal louvers with fusible link and closing device, listed and labeled for use in doors with fire-protection rating of 1-1/2 hours and less.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Activar Construction Products Group, Inc.

b. Allegion plc.

c. Anemostat Products; a Mestek company.

d. ASSA ABLOY.

e. L & L Louvers, Inc.

f. McGill Architectural Products.

g. Or equal.

2. Metal and Finish: Hot-dip galvanized steel, 0.040 inch thick, with baked-enamel- or powder-coated finish.

2.6 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated.

1. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
2. Comply with NFPA 80 requirements for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied.

1. Locate hardware to comply with DHI-WDHS-3.

2. Comply with final hardware schedules, door frame Shop Drawings, ANSI/BHMA-156.115-W, and hardware templates.
3. Coordinate with hardware mortises in metal frames, to verify dimensions and alignment before factory machining.
4. For doors scheduled to receive electrified locksets, provide factory-installed raceway and wiring to accommodate specified hardware.
5. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

C. Openings: Factory cut and trim openings through doors.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 "Glazing."
3. Louvers: Factory install louvers in prepared openings.

2.7 FACTORY FINISHING

A. Comply with referenced quality standard for factory finishing.

1. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
2. Finish faces, all four edges, edges of cutouts, and mortises.

B. Opaque Finish:

1. Architectural Woodwork Standards Grade: Custom.
2. Finish: Architectural Woodwork Standards System-11, Polyurethane, Catalyzed.
3. Color: Match Architect's sample.
4. Sheen: Semigloss.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames, with Installer present, before hanging doors.

1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation, see Section 087100 "Door Hardware."

B. Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.

C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 FIELD QUALITY CONTROL

A. Inspection Agency: Owner will engage a qualified inspector to perform inspections and to furnish reports to Architect.

B. Inspections: Provide inspection of installed Work through WI's Certified Compliance Program, certifying that wood doors and frames, including installation, comply with requirements of AWI/AWMCA/WI's "Architectural Woodwork Standards" for the specified grade.

C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

3.4 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION

SECTION 081700 – INTEGRATED DOOR OPENING ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Integrated door opening assemblies including metal frame, integrated door system with operating hardware, and associated door hardware as specified in this section.
2. Factory fitting and hardware preparation for doors and frames.

B. Related Sections:

1. Division 01 Section "General Conditions".
2. Division 08 Section "Hollow Metal Doors and Frames" for integrated assembly doors installed in standard hollow metal frames.
3. Division 08 Section "Glazing" for glass view panels in integrated assemblies.
4. Division 09 Section "Interior Painting" for field painting integrated assembly doors and frames.
5. Division 26 "Electrical" Sections for electrical connections including conduit and wiring for door controls and operators installed on integrated assembly doors and frames with factory installed electrical knock out boxes.

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
3. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
4. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
5. Intertek Testing Service (ITS Warnock Hersey) - Certification Listings for Fire Doors.
6. ICC/IBC - International Building Code.
7. NFPA 70 - National Electrical Code.
8. NFPA 80 - Fire Doors and Windows.
9. NFPA 101 - Life Safety Code.
10. NFPA 105 - Installation of Smoke Door Assemblies.
11. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
12. CARB – California Air Resources Board.
13. State Building Codes, Local Amendments.

D. Standards: All hardware specified herein to comply with the current version year of the following industry standards:

1. ANSI/BHMA Certified Product Standards, A156 Series.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including integrated opening assembly construction and installation details, material descriptions, core descriptions,

hardware reinforcements, profiles, anchorage, fire resistance rating, operational descriptions and finishes.

B. Door Hardware Schedule: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule." Include the following information:

1. Type, style, function, size, label, hand, and finish of each door hardware item.
2. Manufacturer of each item.
3. Fastenings and other pertinent information.
4. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
5. Explanation of abbreviations, symbols, and codes contained in schedule.
6. Mounting locations for door hardware.

C. Shop Drawings: Include the following:

1. Elevations of each door design.
2. Details of door and frames types including dimensioned profiles and metal thicknesses.
3. Locations of reinforcement and preparations for hardware.
4. Details of anchorages, joints, field splices, and connections.
5. Details of accessories.
6. Details of moldings, removable stops, and glazing.
7. Details of conduit and preparations for power, signal, and control systems.
8. Provide all dimensions necessary required to complete recessed pockets.

D. Keying Schedule: Reference Division 08 Section "Door Hardware" for keying requirements.

E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete integrated assembly installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and contact information of the manufacturers providing the installed assemblies and their nearest service representatives. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.

F. Warranties and Maintenance: Special warranties and maintenance agreements specified in this Section.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to the project site under provisions Division 01 Section "Product Storage and Handling Requirements". Inspect doors, frames, and hardware with representatives of the supplier to verify shipment is complete and to rectify discrepancies promptly.

1. Integrated door assembly systems to be delivered to the job site complete with necessary screws, miscellaneous parts, instructions, and installation templates. Each package legibly and properly labeled to correspond to the approved Door Schedule.

B. Furnish integrated door opening assemblies with operating hardware flush to door skin, using protective wrappings and spacers between projecting hardware. Maintain and protect door assemblies using cardboard spacers and protective edge guards along the door edges, to reduce exposure to marring or damage during storage.

C. Store integrated door opening assemblies in dry and secure area. Do not store electronic access control software, credentials, or accessories at Project site without prior authorization.

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.6 COORDINATION

A. Building Information Modeling (BIM) Support: Utilize designated BIM software tools and obtain training needed to successfully participate in the Project BIM processes. All technical disciplines are responsible for the product data integration and data reliability of their Work into the coordinated BIM applications.

B. Electrical Connections: Coordinate the layout and installation of scheduled electrified hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.

1.7 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article will not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and are in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Warranty Periods: Manufacturer's standard written form, with the exceptions noted below, warranting integrated door opening assemblies to be free of defect in material or workmanship under normal use for a period of five (5) years.

1. Continuous Hinges: Ten (10) years.
2. Door Closers: Ten (10) years.

C. Warranty includes the manufacturer, at their sole option, agreeing to repair or replace products or parts found to be defective in material or workmanship according to details contained in the warranty certificate.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of integrated door opening assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Adams Rite Manufacturing (RD) - The RITE Door.

2.2 STEEL MATERIAL REQUIREMENTS

A. General:

1. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
2. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 metallic coating.

B. Hollow Metal Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A 1008/A 1008M. Provide doors complying with requirements

indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Design: Flush panel.
2. Core Construction: Manufacturer's standard kraft-paper honeycomb, or one-piece polystyrene core, securely bonded to both faces.

    a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.

3. Level/Model: Level 2 and Physical Performance Level B (Heavy Duty), Minimum 18 gauge (0.042-inch - 1.0-mm) thick steel, Model 2.
4. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet.
5. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
6. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

C. Steel Frames:
Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M. Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

1. Fabricate frames with mitered or coped corners.
2. Fabricate frames with "closed and tight" miter seams continuously welded on face, finished smooth with no visible seam unless otherwise indicated.
3. Frames for openings up to 48 inches in width: Minimum 16 gauge thick steel sheet.
4. Frames for openings 48 inches and wider in width: Minimum 14 gauge thick steel sheet.
5. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.
6. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.
7. Provide suitable adjustable type anchors for wall condition, minimum 4 each per jamb.

2.3 DOOR HARDWARE MATERIAL REQUIREMENTS:

A. Provide a complete integrated door opening assembly, including the installation and adjustment of the latching mechanism within the door construction.

B. Door hardware to include the following minimum products for each integrated door opening assembly as specified in the Door Hardware Sets under Part 3.

1. Hanging Device: Continuous Hinges (geared or pinned), Pocket Pivots, Offset/Intermediate Pivots, or Butt Hinges.
2. Integrated Locking/Latching Hardware: Exit Devices, Lever Handle Trim, or Flush Push/Pulls.

C. Integrated exit device hardware to be clean and unobtrusive in design with a minimal bar height of 2-7/16-inches. Push rails not exceed a projection of 1-1/8-inches when in the latched position and be made of heavy duty aluminum extrusion, available in

anodized and architectural finishes using metal cladding. Exit device end caps to be of metal construction, and should match the trim cover caps when available.

D. Push and pull hardware to be clean and unobtrusive in design with a maximum projection of 1/4-inches on pull side and 5/8-inches on the push side. To be used on hollow metal doors only.

E. Lever handles to be clean and unobtrusive in design with a maximum projection of 3-1/2-inches and match design of similar lever locking hardware furnished on project.

F. Door hardware may include the following optional products for each integrated door opening assembly as specified in the Door Hardware Sets under Part 3:

1. Door Closers: Surface Closer or Pocket Closer.
2. Accessory Items: Magnetic Holders, Protection Plates, Edge Guards, Astragals, Smoke Seals.

2.4 FINISH REQUIREMENTS

A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

B. HPDL Wrapped: Color and pattern as selected by the architect.

C. Embossed Wood Grain Pattern: Color and pattern as selected by the architect from the manufacturer’s standard range.

D. Hardware Finishes: As specified in Hardware Sets.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Verify the accuracy of dimensions given to the integrated door opening assembly manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).

C. Proceed with installation only after unsatisfactory conditions have been corrected. Beginning of installation indicates acceptance of the existing conditions.

D. Verify power supplies, as required, are available to power electrically operated devices.

3.2 INSTALLATION

A. General: Install integrated door opening assemblies plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; integrated locking/latching devices; closing devices; and seals.

C. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
3. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

D. Coordinate installation and interface wiring with fire alarm and smoke detection systems.

E. Remove or protect furnished hardware accessories, prior to painting or finishing completed after the installation of the hardware accessories.

3.3 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

3.4 ADJUSTMENT

A. Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Remove and replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.5 CLEANING AND PROTECTION

A. Protect all door opening assemblies and hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install hardware at the latest possible time frame.

B. Clean operating items as necessary to restore proper finish and provide final protection and maintain conditions that ensure integrated door and operating hardware is without damage or deterioration at time of owner occupancy.

C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer or finish paint.

3.6 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain integrated door opening assemblies and hardware.

3.7 HARDWARE SETS

A. The integrated door opening hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

Set: 40.0

Doors: C11|1, C12|1, C13|1, C21|1, C22|1, C23|1, C31|1, C32|1, C33|1, S11|1

2	Continuous Hinge	FM300 (By 081700)	630	MR
2	Recessed Exit	D3676 EO (by 081700)	335	RI
2	Surface Closer	D-DCT-351PKT90 (by 081700)	BSP	RI
2	Electromagnetic Holder	D-MDH (by 081700)	693	RI
1	Seal Kit	D-SS-STK-BLK (by 081700)		RI

Set: 41.0

Doors: S11|2

2	Continuous Hinge	FM300 (By 081700)	630	MR
2	Recessed Exit	D3676 (by 081700)	335	RI
2	Trim	D3080-01 (by 081700)	BSP	RI
2	Surface Closer	D-DCT-351PKT90 (by 081700)	BSP	RI
2	Electromagnetic Holder	D-MDH (by 081700)	693	RI
1	Seal Kit	D-SS-STK-BLK (by 081700)		RI

END OF SECTION 081700

SECTION 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes access doors and frames for walls and ceilings.

B. Provide and install all access doors in walls and ceilings, whether shown on the Drawings or not, where required for access to Fire/Life Safety and/or MEP devices, valves and equipment. The door size must be appropriate for clear access, and the locations must be shown on Coordination Drawings.

1.3 SUBMITTALS

A. Submit in accordance with Section 013300 “Submittals.”

B. Product Data: For each type of product. Include construction details, fire ratings, material descriptions, dimensions of individual components and profiles, and finishes.

C. Shop Drawings: Show fabrication and installation details of customized doors and frames. Include plans, elevations, sections, details, and attachment to other work. Provide coordination drawings indicating locations of access doors in reflected ceiling and floor plans.

D. Samples: For each type of access door and frame and for each finish specified, complete assembly minimum 6 by 6 inches in size.

E. Product Schedule: For access doors and frames. Provide complete schedule including types, general locations, sizes, construction details, latching or locking provisions, and other data pertinent to installations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Access Doors and Frames: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, according to NFPA 252 or UL 10B.

2.2 ACCESS DOORS AND FRAMES

A. Flush Access Doors with Concealed Flanges:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Acudor Products, Inc.
    b. Babcock-Davis.
    c. JL Industries, Inc.; a division of the Activar Construction Products Group.
    d. Karp Associates, Inc.
    e. Lane-Aire Manufacturing Corp.
    f. Larsens Manufacturing Company.
    g. Or equal.
2. Description: Face of door flush with frame; with concealed flange for gypsum board installation and concealed hinge.
3. Locations: Wall and ceiling. At exterior locations, provide weatherproof assembly, with face of door fit flush with frame and with exposed frame. Include extruded door gaskets and minimum 2-inch-thick fiberglass insulation.
4. Uncoated Steel Sheet for Door: Nominal 0.060 inch, 16 gage, factory primed. Provide at all locations except as indicated otherwise.
5. Stainless-Steel Sheet for Door: Nominal 0.062 inch, 16 gage, No. 4 finish. Provide at Restrooms and similar locations containing plumbing fixtures.
6. Frame Material: Same material and thickness as door.
7. Latch and Lock: Latch bolt, key operated.

2.3 FIRE-RATED ACCESS DOORS AND FRAMES

A. Fire-Rated, Flush Access Doors with Concealed Flanges:

1. Description: Door face flush with frame, with a core of mineral-fiber insulation enclosed in sheet metal; with concealed flange for gypsum board installation, self-closing door, and concealed hinge.
2. Locations: Wall and ceiling.
3. Fire-Resistance Rating: Not less than that of adjacent construction.
4. Uncoated Steel Sheet for Door: Nominal 0.036 inch, 20 gage, factory primed.
5. Stainless-Steel Sheet for Door: Nominal 0.038 inch, 20 gage, No. 4 finish.
6. Frame Material: Same material, thickness, and finish as door.
7. Latch and Lock: Self-closing, self-latching door hardware, operated by key.

2.4 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 or A60 metallic coating.

D. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 316. Remove tool and die marks and stretch lines, or blend into finish.

E. Frame Anchors: Same material as door face.

F. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

2.5 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish mounting holes, attachment devices and fasteners of type required to secure access doors to types of supports indicated. For concealed flanges with drywall bead, provide edge trim for gypsum panels securely attached to perimeter of frames.

D. Latch and Lock Hardware:

1. Quantity: Furnish number of latches and locks required to hold doors tightly closed.

2. Keys: Furnish two keys per lock and key all locks alike.

2.6 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish. Factory Primed: Apply manufacturer's standard, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment. Primer shall be compatible with paint finishes specified in other Sections.

E. Stainless-Steel Finishes:

1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
2. Polished Finish: No. 4 finish. Grind and polish surfaces to produce uniform finish, free of cross scratches.

    a. Run grain of directional finishes with long dimension of each piece.
    b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

3.3 ADJUSTING

A. Adjust doors and hardware, after installation, for proper operation.

END OF SECTION

SECTION 083323 - OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes: Service doors.

B. Related Requirements: Section 055000 "Metal Fabrications" for miscellaneous steel supports, door-opening framing, corner guards, and bollards.

1.3 ACTION SUBMITTALS

A. Product Data: For each type and size of overhead coiling door and accessory.

1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

1. Include plans, elevations, sections, and mounting details.
2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
4. For exterior components, include details of provisions for assembly expansion and contraction and for excluding and draining moisture to the exterior.
5. Show locations of controls, locking devices, and other accessories.
6. Include diagrams for power, signal, and control wiring.

C. Samples for Verification: For each type of exposed finish on the following components, in manufacturer's standard sizes:

1. Curtain slats.
2. Bottom bar.

3. Guides.
4. Brackets.
5. Hood.
6. Locking device(s).
7. Include similar Samples of accessories involving color selection.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Special warranty.

B. Maintenance Data: For overhead coiling doors to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of doors that fail in materials or workmanship within specified warranty period. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain overhead coiling doors from single source from single manufacturer. Obtain operators and controls from overhead coiling-door manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Structural Performance, Exterior Doors: Capable of withstanding the following design wind loads:

1. Design Wind Load: As indicated on Drawings.

2. Deflection Limits: Design overhead coiling doors to withstand design wind load without evidencing permanent deformation or disengagement of door components.
3. Operability under Wind Load: Design overhead coiling doors to remain operable under design wind load, acting inward and outward.

B. Seismic Performance: Overhead coiling doors shall withstand the effects of earthquake motions determined according to 2019 CBC.

2.3 DOOR ASSEMBLY

A. Service Door: Overhead coiling door formed with curtain of interlocking metal slats. Manufacturer: Subject to compliance with requirements, provide products manufactured by Cornell, or equal.

B. Operation Cycles: Door components and operators capable of operating for not less than 20,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

C. Air Infiltration: Maximum rate of 1.0 cfm/sq. ft. at 15 and 25 mph when tested according to ASTM E283.

D. Door Curtain Material: Galvanized steel.

E. Door Curtain Slats: Flat profile slats of 1-7/8-inch center-to-center height. Gasket Seal. Manufacturer's standard continuous gaskets between slats.

F. Bottom Bar: Two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch thick; fabricated from hot-dip galvanized steel and finished to match door.

G. Curtain Jamb Guides: Galvanized steel with exposed finish matching curtain slats.

H. Hood: Match curtain material and finish.

1. Shape: Square.
2. Mounting: Face of wall.

I. Locking Devices: Equip door with locking device assembly. Locking Device Assembly: Single-jamb side locking bars, operable from outside with cylinder.

J. Electric Door Operator:

1. Usage Classification: Heavy duty, 25 or more cycles per hour and more than 90 cycles per day.
2. Operator Location: As indicated on Drawings.
3. Motor Exposure: Exterior, wet, and humid.
4. Motor Electrical Characteristics:

a. Horsepower: As required to move door in either direction at not less than 2/3 foot nor more than 1 foot per second, but not less than 1/3 hp.
b. Voltage: 115 V ac, single phase, 60 Hz.

5. Emergency Manual Operation: Chain type.
6. Obstruction-Detection Device: Automatic photoelectric sensor.
7. Control Station(s): Where indicated on Drawings.

K. Curtain Accessories: Equip door with weatherseals.

L. Door Finish:

1. Baked-Enamel or Powder-Coated Finish: Color as selected by Architect from manufacturer's full range.
2. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face.

2.4 MATERIALS, GENERAL

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.5 DOOR CURTAIN MATERIALS AND CONSTRUCTION

A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:

1. Steel Door Curtain Slats: Zinc-coated (galvanized), cold-rolled structural-steel sheet; complying with ASTM A653/A653M, with G90 zinc coating; nominal sheet thickness (coated) of 0.028 inch; and as required.
2. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face, with minimum steel thickness of 0.010 inch.

B. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain, and a continuous bar for holding windlocks.

2.6 HOODS

A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached.

Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging. Galvanized Steel: Nominal 0.028-inch-thick, hot-dip galvanized-steel sheet with G90 zinc coating, complying with ASTM A653/A653M.

2.7 LOCKING DEVICES

A. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks. Lock Cylinders: As specified in Section 087100 "Door Hardware" and keyed to building keying system.

B. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.8 CURTAIN ACCESSORIES

A. Weatherseals for Exterior Doors: Equip each exterior door with weather-stripping gaskets fitted to entire exterior perimeter of door for a weather-resistant installation unless otherwise indicated.

1. At door head, use 1/8-inch-thick, replaceable, continuous-sheet baffle secured to inside of hood or field-installed on the header.
2. At door jambs, use replaceable, adjustable, continuous, flexible, 1/8-inch-thick seals of flexible vinyl, rubber, or neoprene.

2.9 COUNTERBALANCE MECHANISM

A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, seamless or welded carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. of span under full load.

C. Counterbalance Spring: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.

D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.

E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.10 ELECTRIC DOOR OPERATORS

A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.

1. Comply with NFPA 70.
2. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V ac or dc.

B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.

C. Door Operator Location(s): Operator location indicated for each door. Wall Mounted: Operator is mounted to the inside front wall on the left or right side of door and connected to door drive shaft with drive chain and sprockets. Side room is required for this type of mounting. Wall-mounted operator can also be mounted above or below shaft; if above shaft, headroom is required.

D. Motors: Reversible-type motor with controller (disconnect switch) for motor exposure indicated for each door assembly.

1. Electrical Characteristics: Minimum as indicated for each door assembly. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. and not more than 12 in./sec., without exceeding nameplate ratings or service factor.
2. Operating Controls, Controllers, Disconnect Switches, Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
3. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.

E. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

F. Obstruction-Detection Devices: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of door opening. For non-fire-rated doors, activation of device immediately stops and reverses downward door travel. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.

G. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure push-button control labeled "Close." Interior-Mounted Units: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.

H. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf.

I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

2.11 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.12 STEEL AND GALVANIZED-STEEL FINISHES

A. Factory Prime Finish: Manufacturer's standard primer, compatible with field-applied finish. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

B. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

B. Examine locations of electrical connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

B. Install overhead coiling doors, hoods, controls, and operators at the mounting locations indicated for each door.

C. Accessibility: Install overhead coiling doors, switches, and controls along accessible routes in compliance with the accessibility standard.

D. Power-Operated Doors: Install according to UL 325.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and to furnish reports to Architect.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative: Test door release, closing, and alarm operations when activated by smoke detector or building's fire-alarm system. Test manual operation of closed door. Reset door-closing mechanism after successful test.

C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

3.4 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. After electrical circuitry has been energized, operate doors to confirm proper motor rotation and door performance.
3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

3.5 ADJUSTING

A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion. Adjust exterior doors and components to be weather resistant.

B. Lubricate bearings and sliding parts as recommended by manufacturer.

C. Adjust seals to provide tight fit around entire perimeter.

3.6 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of coiling-door Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

1. Perform maintenance, including emergency callback service, during normal working hours.
2. Include 24-hour-per-day, seven-day-per-week, emergency callback service.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

END OF SECTION

SECTION 083400 - SPECIAL FUNCTION DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Interior sliding aluminum-framed glass doors.

B. Related Requirements:

1. Section 084113 "Aluminum-Framed Entrances and Storefronts" for coordinating finish among aluminum fenestration units on the building exterior.
2. Section 087100 "Door Hardware" for hardware not specified in Section 081816.13.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions.

B. Shop Drawings: For sliding aluminum-framed glass doors.

1. Include plans, elevations, sections, and details.
2. Detail attachments to other work, and between units, if any.
3. Include hardware and required clearances.

C. Samples for Verification: For sliding aluminum-framed glass doors and components required, prepared on Samples of size indicated below:

1. Main Framing Member: 12-inch-long section with weather stripping, glazing bead, and factory-applied color finish.
2. Hardware: Full-size units with factory-applied finish.

D. Product Schedule: For sliding aluminum-framed glass doors. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Product Test Reports: For each sliding aluminum-framed glass door, for tests performed by manufacturer and witnessed by a qualified testing agency ora qualified testing agency, and for each class and performance grade indicated, tested at AAMA gateway size.

C. Field quality-control reports.

D. Sample Warranty: For manufacturer's special warranty.

E. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

F. Regional Materials: Products shall be manufactured within 100 miles of Project site frommaterials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes, weather stripping, operable panels, and operating hardware to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer capable of fabricating sliding aluminum-framed glass doors that meet or exceed performance requirements indicated and of documenting this performance by inclusion in lists and by labels, test reports, and calculations.

B. Installer Qualifications: An installer acceptable to sliding aluminum-framed glass door manufacturer for installation of units required for this Project.

C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Build mockup for sliding aluminum-framed glass doors, as shown on Drawings.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace components of sliding aluminum-framed glass doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure to meet performance requirements.
b. Structural failures including excessive deflection.
c. Excessive air infiltration.
d. Faulty operation of movable panels and hardware.
e. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Period:

a. Sliding Door: Five years from date of Substantial Completion.
b. Aluminum Finish: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Subject to compliance with requirements, provide AD Systems Sliding Glass Framed Door assembly, or equal.

B. Source Limitations: Obtain sliding aluminum-framed glass doors from single source from single manufacturer.

C. Door Profile: As indicated in Drawings.

2.2 PERFORMANCE REQUIREMENTS

A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated. Product Certification: AAMA certified with label attached to each door.

2.3 INTERIOR SLIDING ALUMINUM-FRAMED GLASS DOORS

A. Frames and Door Panels: Fabricated from aluminum extrusions complying with AAMA/WDMA/CSA 101/I.S.2/A440.

B. Threshold and Sill Cap/Track: Provide extruded-aluminum threshold and track of thickness, dimensions, and profile indicated; designed to comply with performance requirements indicated; with manufacturer's standard finish. Low-Profile Floor Track: ADA-ABA compliant.

C. Door Trim: Manufacturer’s standard wall and ceiling trim for frame for closure at adjacent construction.

D. Brackets: Manufacturer’s standard brackets, supports, and accessories for complete installation of system components.

2.4 GLAZING

A. Glass and Glazing: Manufacturer's standard glazing system that produces weathertight seal. Comply with requirements indicated in Section 088000 "Glazing."

1. Glass: ASTM C1036, Type 1, q3, Category II safety glass complying with testing requirements in 16 CFR 1201.
2. Safety Glazing Labeling: Permanently mark safety glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or the manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
3. Tint: Clear.

2.5 HARDWARE

A. General: Provide manufacturer's standard hardware, fabricated from a corrosion-resistant material compatible with aluminum complying with AAMA 907 and designed to smoothly operate, tightly close, and securely lock sliding aluminum-framed glass doors.

B. Door Pulls: Provide manufacturer's standard pull. Color and Finish: Match door frame.

C. Lock: Install manufacturer's keyed cylinder lock and multipoint locking device on each movable panel, lockable from the inside and outside. Adjust locking device to allow unobstructed movement of the panel across adjacent panel in the direction indicated. Keying System: All cylinders keyed alike.

2.6 ACCESSORIES

A. Fasteners: Noncorrosive and compatible with door members, trim, hardware, anchors, and other components. Exposed Fasteners: Do not use exposed fasteners to the greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

B. Anchors, Clips, and Accessories: Provide anchors, clips, and accessories of aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron for sliding aluminum-framed glass doors, complying with ASTM B456 or ASTM B633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.

C. Pneumatic Slow Down Mechanism: Attached to door assembly.

2.7 FABRICATION

A. Fabricate sliding aluminum-framed glass doors in sizes indicated. Include a complete system for assembling components and anchoring doors.

B. Fabricate sliding aluminum-framed glass doors that are reglazable without dismantling panel framing.

C. Weather Stripping: Provide full-perimeter weather stripping for each door panel.

D. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation.

E. Factory-Glazed Fabrication: Glaze sliding aluminum-framed glass doors in the factory where practical and possible for applications indicated. Comply with requirements in Section 088000 "Glazing" and with AAMA/WDMA/CSA 101/I.S.2/A440.

2.8 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.9 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Verify rough opening dimensions, levelness of threshold substrate, and operational clearances.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing doors, hardware, accessories, and other components.

B. Install sliding aluminum-framed glass doors level, plumb, square, true to line, without distortion, without warp or rack of frames and panels, and without impeding thermal movement; anchored securely in place to structural support;, and other adjacent construction.

C. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.3 ADJUSTING, CLEANING, AND PROTECTION

A. Lubricate hardware and moving parts.

B. Adjust operating panels and screens to provide a tight fit at contact points and weather stripping for smooth operation, without binding. Adjust hardware for proper alignment, smooth operation, and proper latching without unnecessary force or excessive clearance.

C. Clean exposed surfaces immediately after installing sliding aluminum-framed glass doors. Avoid damaging protective coatings and finishes. Remove nonpermanent labels, excess sealants, glazing materials, dirt, and other substances.

D. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

E. Protect sliding aluminum-framed glass door surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances contact sliding aluminum-framed glass door surfaces, remove contaminants immediately according to manufacturer's written instructions.

F. Refinish or replace sliding aluminum-framed glass doors with damaged finishes.

G. Replace damaged components.

END OF SECTION 081816.13

SECTION 083483-FIRE PROTECTION CLOSURE SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes: Smoke detector activated containment screen and control system designed to provide a tight-fitting, smoke- and draft-control assembly

B. Related Requirements:

1. Division 09 Section “Non-Structural Metal Framing” for metal backing to secure housing mounting.
2. Division 26 Sections for 120VAC and control circuit power including conduit, boxes, conductors, wiring devices, and emergency power.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for closure system.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings:

1. Include plans, elevations, sections, and attachment details. Include door width and height, jamb width, jamb and head projection, screen width, mounting height, and housing width. Show and identify related work performed under other sections of the specifications
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, elevations, and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Frame details.
2. Ceilings.
3. Electrical services.

B. Qualification Data: For Installer, manufacturer, and factory-authorized service representative.

C. Evaluation Reports: From ICC-ES or comparable agency.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For closure system to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with manufacturer’s written instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Model 400 , by Smoke Guard, a CSW Industrials Company textile fire protection closure system, or equal.

B. Smoke-Protective Curtain Assemblies: Provide smoke-protective curtains listed and labeled with the letter "S" by a qualified testing agency for smoke- and draft-control based on testing in accordance with UL 1784 without an artificial bottom seal; with maximum air-leakage rate of 3.0 cfm/sq. ft. (0.01524 cu. m/s x sq. m) of opening at 0.10 inch wg (24.9 Pa) for both ambient and elevated temperature tests in accordance with ICC-ES AC77.

C. Curtain Materials: Provide manufacturer’s standard curtain complying with each of the following:

1. Flame-Spread and Smoke-Developed Indexes: No greater than 25 and 50, respectively, when tested in accordance with ASTM E84.
2. Transparent-Film Curtain: Provide curtain of transparent film in compliance with vision panel requirements of ASME A17.1.
3. Screen Reinforcement: Provide film with reinforcement to limit deflection or tearing.

D. Curtain Egress: Provide curtain that is operable from the egress side without use of keys, tools, special knowledge, or effort in excess of the opening force requirements of authorities having jurisdiction. Egress Switch: Include switch to rewind screen into housing to comply with egress requirements of ASME A17.1.

1. Switch Size and Color: Provide switch no less than 4 by 4 inches and in contrasting color with curtain.
2. Switch Operation: Provide switch operable with a closed fist or a loose grip, not requiring finger movements in compliance with the requirements of authorities having jurisdiction.
3. Switch Location: Between 15 and 48 inches above finished floor level in compliance with forward reach requirements of authorities having jurisdiction.

E. Auxiliary Rails: Provide vertical rails to create seal with curtain by magnetic adhesion.

1. Material: 16-gauge ASTM A240/240M, Type 430, ferritic stainless steel.
2. Size: At least 2 inches (51 mm) wide, 1 inch (25 mm) deep.

F. Label each closure system with following information:

1. Manufacturer’s name.
2. Maximum leakage rating at specified pressure and temperature conditions.
3. Label of quality control agency.

2.2 PERFORMANCE REQUIREMENTS

A. Air Leakage: Not to exceed 3 cfm (0.001416 m^3/s) per s.f. of door opening at 0.1 in (25 Pa) water pressure differential at ambient temperature and 400 degrees F (204 degrees C) tested per IBC 2000 714.2.3.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 COMPONENTS

A. Closure:

1. Fabric: Manufacturer’s standard textile material.
2. Side Guides: Manufacturer’s standard guides of profile indicated.

B. Housing: Manufacturer’s standard, powder coated, cold rolled steel container with dust cover and door with concealed hinges.

1. Coordinate operator wiring requirements and electrical characteristics with building electrical system.
2. Housing to inlcude electrical junction box that does require the removal of any part of the building in accordance with NFPA 70.
3. Curtain housing to contain all components required for operation.

C. Rewind Motor: NFPA 70, 90v DC.

D. Release Mechanism: Comply with UL Standard No. 864.

E. Screen Rewind Switch: Include switch to rewind screen into housing.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install closure system components in accordance with manufacturer’s installation instructions.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Prepare test and inspection reports.

3.4 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service. Complete installation and startup checks according to manufacturer's written instructions.

3.5 ADJUSTING

A. Adjust moving parts to function smoothly, and lubricate as recommended by manufacturer.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 083483

SECTION 083513.13 - MULTIPANEL FOLDING ALUMINUM-FRAMED GLASS DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Multipanel folding aluminum-framed glass doors.

B. Related Requirements:

1. Section 084113 "Aluminum-Framed Entrances and Storefronts" for coordinating finish among aluminum fenestration units on the building exterior.
2. Section 087100 "Door Hardware" for hardware not specified in this Section.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for multipanel folding aluminum-framed glass doors.

B. Shop Drawings:

1. Include plans, elevations, sections, and installation details.
2. Indicate dimensions, configuration of panels, and stacking layout.

C. Samples: For each multipanel folding aluminum-framed glass door and for each color specified, 12-inch-long section with factory-applied color finish.

D. Samples for Initial Selection: For doors and hardware with factory-applied color finish.

E. Samples for Verification: For multipanel folding aluminum-framed glass doors and components required, prepared on Samples of size indicated below:

1. Main Framing Member: 12-inch-long section with weather stripping, glazing bead and factory-applied color finish.
2. Hardware: Full-size units with factory-applied finish.

F. Product Schedule: For multipanel folding aluminum-framed glass doors. Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer and testing agency.

B. Product Test Reports: For each multipanel folding aluminum-framed glass door, for tests performed by manufacturer and witnessed by a qualified testing agency; and for each class and performance grade indicated, tested at AAMA gateway size.

C. Field quality-control reports.

D. Sample Warranty: For manufacturer's special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For multipanel folding aluminum-framed glass doors to include in maintenance manuals. Include finishes, weather stripping, operable panels, and operating hardware.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer capable of fabricating multipanel folding aluminum-framed glass doors that meet or exceed performance requirements indicated and of documenting this performance by inclusion in lists and by labels, test reports, and calculations.

B. Installer Qualifications: An installer acceptable to multipanel folding aluminum-framed glass door manufacturer for installation of units required for this Project.

1.6 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace multipanel folding aluminum-framed glass doors that fail(s) in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure to meet performance requirements.
b. Structural failures, including excess deflection.
c. Excessive water leakage or air infiltration.
d. Faulty operation of movable panels and hardware.
e. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Period: Multipanel Folding Aluminum-Framed Glass Doors: Ten year(s) from date of Substantial Completion.

B. Special Finish Warranty, Factory-Applied Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.

b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Product: Design is based on product manufactured by SolarInnovations Architectural Glazing Systems, Inc.

2.2 PERFORMANCE REQUIREMENTS

A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated. Product Certification: AAMA certified with label attached to each door.

B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:

1. Minimum Performance Class: Class AW.
2. Minimum Performance Grade: Grade 45.

C. Thermal Movements: Provide multipanel folding aluminum-framed glass doors, including anchorage, that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

D. Sound Transmission Class (STC): Rated for not less than 35 STC when tested for laboratory sound transmission loss in accordance with ASTM E90 and determined by ASTM E413.

2.3 MULTIPANEL FOLDING ALUMINUM-FRAMED GLASS DOORS

A. Multipanel Folding Aluminum-Framed Glass Doors: Provide extruded-aluminum-framed multipanel folding glass doors, complete with glazing, threshold, flashings, support, and anchorage devices.

1. Application: Exterior.
2. Stack Storage Configuration: As shown on Drawings. Hinge panels together in separate pairs.

B. Frames and Door Panels: Fabricated from aluminum extrusions complying with AAMA/WDMA/CSA 101/I.S.2/A440. Provide factory-assembled door panels that are reglazable without dismantling panel framing, and factory-assembled frames. Door Panel Design: As indicated design, with 10-inch nominal height bottom rail. Frame Width: 2-7/16 inches.

2.4 GLAZING

A. Glass and Glazing: Manufacturer's standard glazing system that produces weathertight seal. Comply with requirements indicated in Section 088000 "Glazing".

1. Glass: ASTM C1036, Type 1, q3; Category II safety glass complying with testing requirements in 16 CFR 1201.
2. Safety Glazing Labeling: Permanently mark safety glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
3. Tint: Clear.

2.5 HARDWARE

A. Provide manufacturer's standard hardware, fabricated from a corrosion-resistant material compatible with door panels and other components, and complying with AAMA 907. Provide hardware designed to smoothly operate, tightly close, and securely lock multipanel folding aluminum-framed glass doors. Size hardware to accommodate panel weights and dimensions. Provide full-perimeter weatherstripping for each door panel.

B. Panel Support System: Provide panel support system designed for size, weight, and performance requirements of multipanel folding aluminum-framed glass doors indicated. Provide carriers with sealed ball bearings.

1. Overhead Supported: Provide multiwheeled overhead carriers suspended from steel or aluminum track, with lower guide system engaged in threshold for smooth operation. Limit track deflection to no more than 0.10 inch between supports when fully loaded.
2. Adjustment: Provide panel support system capable of being adjusted for smooth operation and clearances without needing to remove panels from tracks.
3. Threshold Configuration: Extruded-aluminum threshold with recessed flush profile. Aluminum Finish: To match panel.

C. Panel Hinges: Stainless steel, multileaf hinge with painted finish to match exterior. Provide integral hangers and guides for hinges that engage panel support system.

D. Locking System:

1. Primary Entrance Panel: Provide manufacturer's standard keyed multipoint locking device, with lever handles on the interior and exterior that operate dead bolt and concealed top and bottom rods.
2. Panel Pairs: Provide manufacturer's standard handles and two-point locking device that operates concealed top and bottom rods at each panel pair.
3. Trim Design: As selected from manufacturer's full range. Finish: As selected from manufacturer's full range of finishes.
4. Cylinders: As specified in Section 087100 "Door Hardware."

2.6 ACCESSORIES

A. Trim: Provide interior and exterior casings, jamb extensions, and other components in material and finish to match door frames.

B. Fasteners: Noncorrosive and compatible with door members, trim, hardware, anchors, and other components. Exposed Fasteners: Do not use exposed fasteners to the greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

C. Anchors, Clips, and Accessories: Provide anchors, clips, and accessories of aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron for multipanel folding aluminum-framed glass doors, complying with ASTM B456 or ASTM B633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.

2.7 FABRICATION

A. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation.

B. Factory-Glazed Fabrication: Glaze sliding aluminum-framed glass doors in the factory.

2.8 GENERAL FINISH REQUIREMENTS

A. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.9 ALUMINUM FINISHES

A. High-Performance Organic Finish, Two-Coat PVDF: Fluoropolymer finish complying with AAMA 2605 and containing not less than 50 percent PVDF resin by weight in color coat.

1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
2. Color and Gloss: Match Architect's sample.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of Work.

B. Verify rough opening dimensions, levelness of threshold substrate, and operational clearances.

C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weathertight hinged-door installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing multipanel folding aluminum-framed glass doors, hardware, accessories, and other components.

B. Install multipanel folding aluminum-framed glass doors level, plumb, square, true to line; without distortion, warp, or rack of frames and panels, and without impeding thermal movement; anchored securely in place to structural support; and in proper relation to wall flashing, vapor retarders, air barriers, water/weather barriers, and other adjacent construction.

C. Set threshold members in bed of sealant or with gaskets, as indicated, to provide weathertight construction.

D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.

B. Testing Services: Test and inspect installed multipanel folding aluminum-framed glass doors as follows:

1. Testing Methodology: Test multipanel folding aluminum-framed glass doors for air infiltration and water resistance in accordance with AAMA 502.
2. Air-Infiltration Testing:

    a. Test Pressure: That required to determine compliance with AAMA/WDMA/CSA 101/I.S.2/A440 performance class indicated.
    b. Allowable Air-Leakage Rate: [**1.5**] <**Insert number**> times the applicable AAMA/WDMA/CSA 101/I.S.2/A440 rate for product type and performance class rounded down to one decimal place.

3. Water-Resistance Testing:

    a. Test Pressure: Two-thirds times test pressure required to determine compliance with AAMA/WDMA/CSA 101/I.S.2/A440 performance grade indicated.
    b. Allowable Water Infiltration: No water penetration.

4. Testing Extent: Three mockup multipanel folding aluminum-framed glass doors of each type as selected by Architect and a qualified independent testing and inspecting agency. Conduct tests after perimeter sealants have cured.
5. Test Reports: Prepared in accordance with AAMA 502.

C. Multipanel folding aluminum-framed glass door will be considered defective if it does not pass tests and inspections.

3.4 ADJUSTING

A. Adjust hardware for proper alignment, smooth operation, and proper latching without unnecessary force or excessive clearance.

B. Adjust hardware and operable panels to function smoothly, and lubricate as recommended by manufacturer.

3.5 CLEANING

A. Clean exposed surfaces immediately after installation. Avoid damaging protective coatings and finishes. Remove nonpermanent labels, excess sealants, glazing materials, dirt, and other substances.

B. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

3.6 PROTECTION

A. Protect multipanel folding aluminum-framed glass door surfaces from contact with contaminating substances resulting from construction operations. Remove contaminants immediately according to manufacturer's written instructions.

B. Refinish or replace folding aluminum-framed glass doors with damaged finishes.

END OF SECTION

SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Aluminum-framed storefront systems.

2. Aluminum-framed entrance door systems.

3. Delegated design of storefront systems.

B. Related Requirements:

1. Section 014130 “Visual Mockups” for inclusion of storefront systems in mockup assembly.

2. Section 107113 “Exterior Sun Control Devices (Brise Soleil)

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, product Installer, product system manufacturer's representative, and installers whose work interfaces with or affects system, including installers of accessories. Review requirements for products and installation, including surface preparation, substrate conditions, project and manufacturer's details, installation procedures, mockups, testing and inspection requirements, protection and repairs, and coordination and sequencing of installation with work of other Sections.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Sustainable Design Submittals:

1. Product Data: For sealants, indicating VOC content.

2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

3. Environmental Product Declaration: For each product.

4. Health Product Declaration: For each product.

5. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.

6. Environmental Product Declaration: For each product.

7. Health Product Declaration: For each product.

8. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.

C. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.

1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.

2. Include full-size isometric details of each type of vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:

a. Joinery, including concealed welds.
b. Anchorage.
c. Expansion provisions.
d. Glazing.
e. Flashing and drainage.

3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.

D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

E. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch lengths of full-size components and showing details of the following:

1. Joinery, including concealed welds.

2. Anchorage.

3. Expansion provisions.

4. Glazing.

5. Flashing and drainage.

F. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

G. Delegated-Design Submittal: For aluminum-framed entrances and storefronts including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of system.

2. Include design calculations.

1.5 INFORMATIONAL SUBMITTALS

A. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.

B. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.

B. Maintenance Data for Structural Sealant: For structural-sealant-glazed storefront to include in maintenance manuals. Include ASTM C1401 recommendations for post-installation-phase quality-control program.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E699 for testing indicated and acceptable to Owner and Architect.

B. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

C. Structural-Sealant Glazing: Comply with ASTM C1401 for design and installation of storefront systems that include structural glazing.

1.8 MOCKUPS

A. Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical wall area as directed by Architect.

2. Testing shall be performed on mockups according to requirements in "Field Quality Control" Article.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 WARRANTY

A. Special Warranty: Manufacturer and Installer agree to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures, including, but not limited to, excessive deflection.
b. Noise or vibration created by wind and thermal and structural movements.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
d. Water penetration through fixed glazing and framing areas.
e. Failure of operating components.

2. Warranty Period: Two years from date of Substantial Completion.

B. Special Finish Warranty, Painted Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of anodized finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Delta E units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.

c. Cracking, peeling, or chipping.

2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing and accessories, from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer to design aluminum-framed entrances and storefronts.

B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure, including, but not limited to, twist, column shortening, long-term creep (seismic relative displacements), and deflection from uniformly distributed and concentrated live loads.

2. Failure also includes the following:

a. Thermal stresses transferring to building structure.
b. Glass breakage.
c. Noise or vibration created by wind and thermal and structural movements.
d. Loosening or weakening of fasteners, attachments, and other components.
e. Failure of operating units.

C. Structural Loads:

1. Wind Loads: As indicated on Structural Drawings.

2. Other Design Loads: As indicated on Structural Drawings.

D. Deflection of Framing Members: At design wind pressure, as follows:

1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding 1/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.

2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch, whichever is smaller.

3. Cantilever Deflection: Where framing members overhang an anchor point, as follows: Perpendicular to Plane of Wall: No greater than 1/240 of clear span plus 1/4 inch for spans greater than 11 feet 8-1/4 inches or 1/175 times span, for spans of less than 11 feet 8-1/4 inches.

E. Structural: Test according to ASTM E330/E330M as follows:

1. When tested at positive and negative wind-load design pressures, storefront assemblies, including entrance doors, do not evidence deflection exceeding specified limits.

2. When tested at 150 percent of positive and negative wind-load design pressures, storefront assemblies, including entrance doors and anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.

3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

F. Water Penetration under Static Pressure: Test according to ASTM E331 as follows: No evidence of water penetration through fixed glazing and framing areas, when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 8 lbf/sq. ft..

G. Seismic Performance: Aluminum-framed entrances and storefronts shall withstand the effects of earthquake motions determined according to 2016 CBC. Seismic Drift Causing Glass Fallout: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.6 at design displacement and 1.5 times the design displacement.

H. Energy Performance: Certified and labeled by manufacturer for energy performance as follows:

1. Thermal Transmittance (U-factor): Fixed Glazing and Framing Areas: U-factor for the system of not more than 0.41 Btu/sq. ft. x h x deg F as determined according to NFRC 100.

2. Air Leakage:

a. Fixed Glazing and Framing Areas: Air leakage for the system of not more than 0.06 cfm/sq. ft. at a static-air-pressure differential of 6.24 lbf/sq. ft. when tested according to ASTM E283.
b. Entrance Doors: Air leakage of not more than 1.0 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft..

3. Condensation Resistance Factor (CRF): Fixed Glazing and Framing Areas: per NFRC

I. Noise Reduction: Test according to ASTM E90, with ratings determined by ASTM E1332, as follows. Outdoor-Indoor Transmission Class: Minimum 30.

J. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.

a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F.
b. Low Exterior Ambient-Air Temperature: 0 deg F.
c. Interior Ambient-Air Temperature: 75 deg F.

K. Structural-Sealant Joints: Designed to carry gravity loads of glazing.

L. Structural Sealant: ASTM C1184. Capable of withstanding tensile and shear stresses imposed by structural-sealant-glazed, aluminum-framed entrances and storefronts without failing adhesively or cohesively. When tested for preconstruction adhesion and compatibility, cohesive failure of sealant shall occur before adhesive failure.

1. Adhesive failure occurs when sealant pulls away from substrate cleanly, leaving no sealant material behind.

2. Cohesive failure occurs when sealant breaks or tears within itself but does not separate from each substrate, because sealant-to-substrate bond strength exceeds sealant's internal strength.

2.3 STOREFRONT SYSTEMS

A. Basis of Design and Permit Approval: Subject to compliance with requirements, provide Arcadia, Inc; Product AFG451T storefront system. Nominal tube dimension: 2 by 4-1/2 inch.

B. Other Acceptable Manufacturers (Substitutions):

1. Substitutions:.

a. Substitution may or may not be accepted after Architect and Owner review with complete evaluation for content and schedule impact.

b. Substitutions shall include all costs for redesign with consequential changes by other Contractor trades along with the Architect and related approvals by governing agencies.

1) Revisions to shop drawings illustrating the proposed changes is not considered adequate for DSA review and approval.
2) A minimum fee of $10,000.00 for DSA review processing by the Architect will need to be included for DSA review of any substituted system other than the basis of design.
3) An additional minimum allowance of $10,000.00 is required for Architects time to review the substituted system prior to submitting for governing agency approval.
4) The indicated fee amounts are minimums. These are subject to increase pending Architect and Agency reviews of the proposed substitution.

c. Substitutions may be acceptable, based on Architect's review and approval, for submittal to DSA. If substituted manufacturer cannot reproduce DSA design and approval in a timely manner, then they shall be subject to a time and material back charge for any delays in the project. Architect approval is required prior to DSA submittal and DSA approval is required prior to installation.

C. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Exterior Framing Construction: Thermally broken.

2. Glazing System: Retained mechanically with gaskets on four sides.

3. Glazing Plane: Front.

4. Finish: High-Performance Organic Finish. Color Black

5. Fabrication Method: Field-fabricated stick system.

6. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

D. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

E. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

2.4 ENTRANCE DOOR SYSTEMS

A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing or automatic operation.

1. Door Construction: 1-3/4-inch overall thickness, with minimum 0.188-inch-thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.

2. Door Design: Heavy Duty Wide stile; 5-inch nominal width.

3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets. Provide nonremovable glazing stops on outside of door.

4. Finish: Match adjacent storefront framing finish.

2.5 ENTRANCE DOOR HARDWARE

A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 087100 "Door Hardware."

2.6 GLAZING

A. Glazing: Comply with Section 088000 "Glazing."

B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

C. Glazing Sealants: Comply with Section 088000 "Glazing."

1. Sealant shall have a VOC content of 250 g/L or less.

2. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.7 MATERIALS

A. Sheet and Plate: ASTM B209.

B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221.

C. Extruded Structural Pipe and Tubes: ASTM B429/B429M.

D. Structural Profiles: ASTM B308/B308M.

E. Steel Reinforcement:

1. Structural Shapes, Plates, and Bars: ASTM A36/A36M.

2. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M.

3. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M.

F. Steel Reinforcement Primer: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.

2.8 ACCESSORIES

A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.

2. Reinforce members as required to receive fastener threads.

3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system , fabricated from 300 series stainless steel.

B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A123/A123M or ASTM A153/A153M requirements.

C. Concealed Flashing: Dead-soft, 0.018-inch-thick stainless steel, complying with ASTM A240/A240M, of type recommended by manufacturer.

D. Bituminous Paint: Cold-applied asphalt-mastic paint containing no asbestos, formulated for 30-mil thickness per coat.

E. Rigid PVC Filler.

2.9 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.

2. Accurately fitted joints with ends coped or mitered.

3. Physical and thermal isolation of glazing from framing members.

4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.

5. Provisions for field replacement of glazing from exterior.

6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Storefront Framing: Fabricate components for assembly using shear-block system.

F. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware. At interior and exterior doors, provide compression weather stripping at fixed stops.

G. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.

2. At exterior doors, provide weather sweeps applied to door bottoms.

H. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

I. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.10 ALUMINUM FINISHES

1. High-Performance Organic Finish, Two-Coat PVDF: Fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions for seacoast and severe environments.

2. Color and Gloss: Match Architect's sample.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Comply with manufacturer's written instructions.

B. Do not install damaged components.

C. Fit joints to produce hairline joints free of burrs and distortion.

D. Rigidly secure nonmovement joints.

E. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.

F. Seal perimeter and other joints watertight unless otherwise indicated.

G. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.

2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

H. Set continuous sill members and flashing in full sealant bed, as specified in Section 079200 "Joint Sealants," to produce weathertight installation.

I. Install joint filler behind sealant as recommended by sealant manufacturer.

J. Install components plumb and true in alignment with established lines and grades.

3.3 INSTALLATION OF GLAZING

A. Install glazing as specified in Section 088000 "Glazing."

3.4 INSTALLATION OF WEATHERSEAL SEALANT

A. After structural sealant has completely cured, remove temporary retainers and insert backer rod between lites of glass as recommended by sealant manufacturer.

B. Install weatherseal sealant to completely fill cavity, according to sealant manufacturer's written instructions, to produce weatherproof joints.

3.5 INSTALLATION OF ALUMINUM-FRAMED ENTRANCE DOORS

A. Install entrance doors to produce smooth operation and tight fit at contact points.

1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.

2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.6 ERECTION TOLERANCES

A. Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.

2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.

3. Alignment:

a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.

4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Field Quality-Control Testing: Testing will include representative areas of aluminum-framed entrances and storefronts.

1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.

a. Perform a minimum of three tests in areas as directed by Architect.
b. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to 10, 35, and 70 percent completion.

C. Aluminum-framed entrances and storefronts will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.8 MAINTENANCE SERVICE

A. Entrance Door Hardware Maintenance: Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of entrance door hardware.

END OF SECTION

SECTION 085313 - VINYL WINDOWS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes vinyl-framed windows.

B. Related Requirements: Section 014130 “Visual Mockups” for inclusion of window systems in mockup assembly.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, product Installer, product system manufacturer's representative, and installers whose work interfaces with or affects system, including installers of accessories.

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review, discuss, and coordinate the interrelationship of vinyl windows with other exterior wall components. Include provisions for anchoring, flashing, weeping, sealing perimeters, and protecting finishes.
3. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.
4. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for vinyl windows.

B. Shop Drawings: For vinyl windows.

1. Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.

C. Samples: For each exposed product and for each color specified, 2 by 4 inches in size.

D. Product Schedule: For vinyl windows. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer and Installer.

B. Product Test Reports: For each type of vinyl window, for tests performed by a qualified testing agency.

C. Field quality-control reports.

D. Sample Warranties: For manufacturer's warranties.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer capable of fabricating vinyl windows that meet or exceed performance requirements indicated and of documenting this performance by test reports and calculations.

B. Installer Qualifications: An installer acceptable to vinyl window manufacturer for installation of units required for this Project.

C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Build mockup of typical wall area as shown on Drawings.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace vinyl windows that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure to meet performance requirements.

b. Structural failures including excessive deflection, water leakage, and air infiltration.
c. Faulty operation of movable sash and hardware.
d. Deterioration of materials and finishes beyond normal weathering.
e. Failure of insulating glass.

2. Warranty Period:

a. Window: 10 years from date of Substantial Completion.
b. Glazing Units: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain vinyl windows from single source from single manufacturer.

2.2 WINDOW PERFORMANCE REQUIREMENTS

A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated. Window Certification: WDMA certified with label attached to each window.

B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:

1. Minimum Performance Class, Single Hung: LC-40.
2. Minimum Performance Grade, Casement: C-C60.

C. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.30 Btu/sq. ft. x h x deg F.

D. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of 0.27.

E. Sound Transmission Class (STC): Rated for not less than 28, 30, and 36 STC at locations indicated on Drawings when tested for laboratory sound transmission loss according to ASTM E90 and determined by ASTM E413. Refer to Drawings for locations of specific STC requirements.

F. Operable window controls shall comply with 2019 CBC, 11B.309.

2.3 VINYL WINDOWS

A. Basis of Design Product Subject to compliance with requirements, provide VPI Quality Windows, Endurance Series, or comparable product from one of the following:

1. Andersen Windows; Andersen Corporation.

2. Jeld-Wen, Inc.

3. Pella Corporation.

4. Weather Shield Mfg., Inc.

5. Or equal.

B. Operating Types: Provide the following operating types in locations indicated on Drawings:

1. Casement: Project out.
2. Hopper.
3. Single hung.
4. Trickle vent.
5. Fixed.

C. Frames and Sashes: Impact-resistant, UV-stabilized PVC complying with AAMA/WDMA/CSA 101/I.S.2/A440.

1. Finish: Integral color, black.
2. Gypsum Board Returns: Provide at interior face of frame.

D. Insulating-Glass Units: ASTM E2190.

1. Glass: ASTM C1036, Type 1, Class 1, q3.

a. Tint: Clear.
b. Kind: Fully tempered where required by application. .

2. Lites: Two.
3. Thickness Each Lite: 3mm.
4. Filling: Fill space between glass lites with argon.
5. Low-E Coating: Type 336 sputtered on second surface.

E. Hardware, General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with adjacent materials; designed to smoothly operate, tightly close, and securely lock windows, and sized to accommodate sash weight and dimensions.

1. Exposed Hardware Color and Finish: As selected by Architect from manufacturer's full range.

F. Projected Window Hardware:

1. Gear-Type Rotary Operators: Complying with AAMA 901 when tested according to ASTM E405, Method A. Provide operators that function without requiring the removal of interior screens or using screen wickets.

    a. Type and Style: As selected by Architect from manufacturer's full range of types and styles.

2. Hinges: Manufacturer's standard type for sash weight and size indicated. Capable of pivoting frame to facilitate washing window from building interior.
3. Single-Handle Locking System: Operates positive-acting arms that pull sash into locked position. Provide one arm on sashes up to 29 inches tall and two arms on taller sashes.
4. Limit Devices: Concealed friction adjustor, adjustable stay bar limit devices designed to restrict sash opening.

    a. Limit clear opening to 4 inches for ventilation; with custodial key release.

G. Hung Window Hardware:

1. Counterbalancing Mechanism: Complying with AAMA 902, concealed, of size and capacity to hold sash stationary at any open position.
2. Locks and Latches: Allow unobstructed movement of the sash across adjacent sash in direction indicated and operated from the inside only.

H. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.

I. Trickle Vent: Incorporate manufacturer’s standard trickle vent in window system to provide room relief ventilation.

J. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.

1. Exposed Fasteners: Do not use exposed fasteners to greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

2.4 INSECT SCREENS

A. General: Fabricate insect screens to integrate with window frame. Provide screen for each operable exterior sash. Screen wickets are not permitted.

1. Type and Location: Full, inside for project-out and Half, outside for single-hung sashes.

B. Aluminum Frames: Manufacturer's standard aluminum alloy complying with SMA 1004 or SMA 1201. Fabricate frames with mitered or coped joints or corner extrusions, concealed fasteners, and removable PVC spline/anchor concealing edge of frame.

1. Tubular Framing Sections and Cross Braces: Roll formed from aluminum sheet.
2. Finish for Interior Screens: Baked-on organic coating in color selected by Architect from manufacturer's full range.
3. Finish for Exterior Screens: Baked-on organic coating in color selected by Architect from manufacturer's full range Matching color and finish of cladding.

C. Glass-Fiber Mesh Fabric: 18-by-14 or 18-by-16 mesh of PVC-coated, glass-fiber threads; woven and fused to form a fabric mesh resistant to corrosion, shrinkage, stretch, impact damage, and weather deterioration. Comply with ASTM D3656/D3656M.

1. Mesh Color: Manufacturer's standard.

2.5 FABRICATION

A. Fabricate vinyl windows in sizes indicated. Include a complete system for installing and anchoring windows.

B. Glaze vinyl windows in the factory.

C. Weather strip each operable sash to provide weathertight installation.

D. Mullions: Provide mullions and cover plates, compatible with window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections. Provide mullions and cover plates capable of withstanding design wind loads of window units. Provide manufacturer's standard finish to match window units.

E. Hardware: Mount hardware through double walls of vinyl extrusions or provide corrosion-resistant reinforcement.

F. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation. Allow for scribing, trimming, and fitting at Project site.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.

C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E2112.

B. Install windows level, plumb, square, true to line, without distortion, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.

C. Install flashings at windows as indicated on Drawings.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.

B. Testing Services: Testing and inspecting of installed windows shall take place as follows:

1. Testing Methodology: Testing of windows for air infiltration and water resistance shall be performed according to AAMA 502.
2. Air-Infiltration Testing:

    a. Test Pressure: That required to determine compliance with AAMA/WDMA/CSA 101/I.S.2/A440 performance class indicated.
    b. Allowable Air-Leakage Rate: [**1.5**] <**Insert number**> times the applicable AAMA/WDMA/CSA 101/I.S.2/A440 rate for product type and performance class rounded down to one decimal place.

3. Water-Resistance Testing:

    a. Test Pressure: Two-thirds times test pressure required to determine compliance with AAMA/WDMA/CSA 101/I.S.2/A440 performance grade indicated.
    b. Allowable Water Infiltration: No water penetration.

4. Testing Extent: Three windows of each type as selected by Architect and a qualified independent testing and inspecting agency. Windows shall be tested after perimeter sealants have cured.
5. Test Reports: Prepared according to AAMA 502.

C. Windows will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.4 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.

B. Clean exposed surfaces immediately after installing windows. Remove excess sealants, glazing materials, dirt, and other substances.

1. Keep protective films and coverings in place until final cleaning.

C. Remove and replace sashes if glass has been broken, chipped, cracked, abraded, or damaged during construction period.

D. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written instructions.

END OF SECTION

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes commercial door hardware for the following:

1. Swinging doors.
2. Sliding doors.
3. Other doors to the extent indicated.

B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical door hardware.
3. Automatic operators.

C. Related Sections:

1. Division 08 Section “Hollow Metal Doors and Frames”.
2. Division 08 Section “Flush Wood Doors”.
3. Division 08 Section “Aluminum-Framed Entrances and Storefronts”.
4. Division 08 Section “Automatic Door Operators”.
5. Division 28 Section “Access Control Hardware Devices”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. UL/ULC and CSA C22.2 - Standards for Automatic Door Operators Used on Fire and Smoke Barrier Doors and Systems of Doors.
8. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:

1. ANSI/BHMA Certified Product Standards - A156 Series.
2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
3. ANSI/UL 294 - Access Control System Units.
4. UL 305 - Panic Hardware.
5. ANSI/UL 437- Key Locks.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing, fabrication and assembly of door hardware, as well as procedures and diagrams.

Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
3. Content: Include the following information:

    a. Type, style, function, size, label, hand, and finish of each door hardware item.
    b. Manufacturer of each item.
    c. Fastenings and other pertinent information.
    d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
    e. Explanation of abbreviations, symbols, and codes contained in schedule.
    f. Mounting locations for door hardware.
    g. Door and frame sizes and materials.
    h. Warranty information for each product.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Shop Drawings: Details of electrified access control hardware indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

    a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
    b. Complete (risers, point-to-point) access control system block wiring diagrams.
    c. Wiring instructions for each electronic component scheduled herein.

2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

E. Proof of Compliance: (California located Projects): Provide a list of product(s) containing chemicals known to cause cancer or reproductive toxicity as defined by the Office of Environmental Health Hazard Assessment (OEHHA) under Proposition 65 (CA Code of Regulations, Title 27, Section 27001). The list includes the specific chemical(s), if the chemical will be exposed to consumers, the means of warning, and an illustration of the label.

F. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

G. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

1.4 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).

C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

E. Automatic Operator Supplier Qualifications: Power operator products and accessories are required to be supplied and installed through the Norton Preferred Installer (NPI) program. Suppliers are to be factory trained, certified, and a direct purchaser of the specified power operators and be responsible for the installation and maintenance of the units and accessories indicated for the Project.

F. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

G. California Building Code: Provide hardware that complies with CBC Section 11B.

1. All openings as a part of an accessible route shall comply with CBC Section 11B-404.
2. The clear opening width for a door shall be 32” minimum. For a swinging door it shall be measured between the face of the door and the stop, with the door open 90 degrees. There shall be no projections into it below 34” and 4” maximum projections into it between 34” and 80” above the finish floor or ground. Door closers and stops shall be permitted to be 78” minimum above the finish floor or ground. CBC Section 11B-404.2.3.
3. Operable hardware on accessible doors shall comply with CBC Section 11B-309.4 and shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. Operable parts of such hardware shall be 34” minimum and 44” maximum above finish floor or ground. Where sliding doors are in the fully open position, operating hardware shall be exposed and usable from both sides.
4. Hardware (including panic hardware) shall not be provided with “nightlatch” function for any accessible doors or gates unless the following conditions are met:

    a. Such hardware has a ‘dogging’ feature and is dogged during the time the facility is open.
    b. All ‘dogging’ operation is performed only by employees as their job function (non-public use).

5. The force for pushing or pulling open a door shall be in accordance with CBC Section 11B-404.2.9.

    a. Interior hinged doors, sliding or folding doors, and exterior hinged doors: 5 pounds (22.2 N) maximum. Required fire doors: the minimum opening force allowable by the DSA authority, not to exceed 15 pounds (66.7N). These forces do not apply to the force required to retract latch bolts or disengage other devices that hold the door in a closed position.
    b. The force required for activating any operable parts, such as lever hardware, or disengaging other devices shall be 5 pounds (22.2N) maximum to comply with CBC Section 11B-309.4.
    c. The 5 pound (22.2 N) maximum force shall be validated for the size of the door used. The Building Materials Listing of the California State Fire Marshal shall indicate that the door hardware meets the 5 pound (22.2 N) force and shall also list the largest door that can be used.

6. Door closing speed shall comply with CBC Section 11B-404.2.8. Closers shall be adjusted so that the required time to move a door from an open position of 90 degrees to a position of 12 degrees from the latch is 5 seconds minimum. Spring hinges shall be adjusted so that the required time to move a door from an open position of 70 degrees to the closed position is 1.5 seconds minimum.
7. Floor stops shall not be located in the path of travel and 4” maximum from walls.
8. Thresholds shall comply with CBC Section 11B-404.2.5.

H. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.

I. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:

1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

J. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

K. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with

required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.

C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:

    a. Two Hinges: For doors with heights up to 60 inches
    b. Three Hinges: For doors with heights 61 to 90 inches
    c. Four Hinges: For doors with heights 91 to 120 inches
    d. For doors with heights more than 120 inchesprovide 4 hinges, plus 1 hinge for every 30 inchesof door height greater than 120 inches

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

    a. Widths up to 3’0”: 4-1/2” standard or heavy weight as specified.
    b. Sizes from 3’1” to 4’0”: 5” standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

    a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
    b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following:

    a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.

5. Manufacturers:

    a. McKinney (MK) - TA/T4A Series, 5 knuckle.

B. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 continuous geared hinge. with minimum 0.120-inch thick extruded 6063-T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.

1. Where specified, provide modular continuous geared hinges that ship in two or three pieces and form a single continuous hinge upon installation.
2. Manufacturers:.

    a. Pemko (PE).

C. Pin and Barrel Continuous Hinges: ANSI/BHMA A156.26 Grade 1-600 pin and barrel continuous hinges with minimum 14 gauge Type 304 stainless steel hinge leaves, concealed stainless pin, and twin self-lubricated nylon bearings at each knuckle separation. Factory trim hinges to suit door height and prepare for electrical cut-outs.

1. Manufacturers:

a. Markar Products; ASSA ABLOY Architectural Door Accessories (MR).
b. Pemko (PE).

D. Floor Closers (Heavy Duty, Offset Hung, Single Acting): Provide ANSI/BHMA A156.4 Grade 1 Certified Products Directory (CPD) listed floor closers available for fire rated openings up to 3-hour assemblies to accommodate a door width up to 48" and weight up to 450 pounds with the top pivot included. Floor closers shall be available in non-hold open or selective hold open with a built-in positive dead stop that prevents they door from swinging beyond the desired opening degree and shall have separate and independent valves for closing speed, latch speed and backcheck. Floor closers shall have a 10-year warranty.

1. Provide optional features as specified:

a. Delayed action (non-hold open closers only).
b. Cold weather fluid (not available for closers with delayed action).
c. Sealed closer.
d. Lead lined for use with openings up to 1500 pounds; provided with lead lined top and bottom pivots.
e. Models that meet ICC/ANSI A117.1 for low opening force requirements.

2. Manufacturers:

a. Norton Rixson (RF) - 27 Series.
b. No Substitution.

E. Floor Closers (Standard Duty, Offset Hung, Single Acting): Provide floor closers available for fire rated openings up to 3-hour assemblies to accommodate a door width up to 36" and weight up to 200 pounds with the top pivot included. Floor closers shall have a single valve for adjusting closing speed with a built-in hydraulic backcheck. Floor closers shall have a 10-year warranty.

1. Provide optional features as specified:

a. Models that meet ICC/ANSI A117.1 for low opening force requirements.

2. Manufacturers:

a. Norton Rixson (RF) - 20 Series.
b. No Substitution.

F. Floor Closers (Heavy Duty, Center Hung, Single Acting): ANSI/BHMA A156.4 Grade 1 Certified Products Directory (CPD) listed floor closers to accommodate a door width up to 48" and weight up to 350 pounds standard and 1000 pounds when specified with the top pivot included. Floors closers shall be available in non-hold open or selective hold open with a built-in positive dead stop prevents door from swinging beyond the desired opening degree and have separate and independent valves for closing speed, latch speed and backcheck. Floor closers shall have a 10-year warranty.

1. Provide optional features as specified:

a. Delayed action (non-hold open closers only).

b. Cold weather fluid (not available for closers with delayed action).
c. Sealed closer.
d. Models that meet ICC/ANSI A117.1 for low opening force requirements.

2. Manufacturers:

a. Norton Rixson (RF) - 28 Series.
b. No Substitution.

G. Floor Closers (Heavy Duty, Center Hung, Double Acting): Provide floor closers to accommodate a door width up to 48” and weight up to 300 pounds standard and 1000 pounds when specified with the top pivot included. Floor closers shall be available in non-hold open or automatic hold open with adjustable closing speed valves for each direction of door swing. Floor closers shall have a 10-year warranty.

1. Provide optional features as specified:

a. Cold weather fluid available.
b. Sealed closer.
c. Models available to meet ICC/ANSI A117.1 low opening force requirements.

2. Manufacturers:

a. dormakaba (DO) - BTS80 Series.
b. Norton Rixson (RF) - 40 Series.
c. No Substitution.

H. Floor Closers (Standard Duty, Center Hung, Double Acting): Provide floor closer to accommodate a door width up to 48” and weight up to 200 pounds with the top pivot included. Floor closers shall be available in non-hold open or automatic hold open with adjustable closing speed valves for each direction of door swing. Floor closers shall have a 10-year warranty.

1. Provide optional features as specified:

a. Cold weather fluid available.
b. Sealed closer.

2. Manufacturers:

a. dormakaba (DO) - BTS80 Series.
b. Norton Rixson (RF) - 30 Series.
c. No Substitution.

I. Floor Closers (Heavy Duty, Independently Hung, Single Acting): Provide floor closers available for fire rated openings up to 3-hour assemblies to accommodate a door width up to 48” and weight up to 250 pounds for use on doors independently hung with butt hinges, pocket pivots, or continuous hinges. Floor closers shall have separate and independent valves for closing speed, latch speed and backcheck. Floor closers shall have a 10-year warranty.

1. Provide optional features as specified:

a. Cold weather fluid available.
b. Sealed closer.

2. Manufacturers:

a. Norton Rixson (RF) - F327 Series.
b. No Substitution.

J. Floor Closers (Shallow Depth, Offset Hung, Single Acting): Provide floor closers available for fire rated openings up to 3-hour assemblies to accommodate a door width up to 48” and weight up to 250 pounds with the top pivot included. Floor closers shall be available non-hold open or automatic hold open with separate and independent valves for closing speed, latch speed and backcheck. Floor closers shall have a 2-year warranty.

1. Provide optional features as specified:

a. Delayed action (non-hold open closers only).

2. Manufacturers:

a. Norton Rixson (RF) - 51 Series.
b. No Substitution.

K. Floor Closers (Shallow Depth, Center Hung, Single Acting): Provide floor closers to accommodate a door width up to 48” and weight up to 250 pounds with the top and pivot included. Floor closers shall fit within a 2” maximum floor depth and be available non-hold open or automatic hold open with separate and independent valves for closing speed, latch speed and backcheck. Floor closers shall have a 2-year warranty.

1. Provide optional features as specified:

a. Delayed action (non-hold open closers only).

2. Manufacturers:

a. Norton Rixson (RF) - 50 Series.
b. No Substitution.

L. Floor Closers (Shallow Depth, Center Hung, Double Acting): Provide floor closers to accommodate a door width up to 48” and weight up to 250 pounds with the top and pivot included. Floor closers shall fit within a 2” maximum floor depth and be available non-hold open or automatic hold open with separate and independent valves for closing speed, latch speed and backcheck. Floor closers shall have a 2-year warranty.

1. Provide optional features as specified:

a. Delayed action (non-hold open closers only).

2. Manufacturers:

a. Norton Rixson (RF) - 5020 Series.

b. No Substitution.

M. Floor Closers (Shallow Depth, Independently Hung, Single Acting): Provide floor closers available for fire rated openings up to 3-hour assemblies to accommodate a door width up to 48” and weight up to 250 pounds for use on doors independently hung with butt hinges, pocket pivots, or continuous hinges. Floor closers shall fit within a 2” maximum floor depth and have separate and independent valves for closing speed, latch speed and backcheck. Floor closers shall have a 2-year warranty.

1. Manufacturers:

a. Norton Rixson (RF) - F53 Series.
b. No Substitution.

N. Security Floor Closers (Heavy Duty, Offset Hung, Single Acting): Provide floor closers available for fire rated openings up to 3-hour assemblies to accommodate a door width up to 48” and weight up to 650 pounds with the top pivot included. Floor closers shall be sealed standard with a heavy-duty forged arm, adjustable closing speed and be furnished standard with Torx screws. Floor closers shall have a 10-year warranty.

1. Manufacturers:

a. Norton Rixson (RF) - SEC27-180 Series.
b. No Substitution.

O. Sliding and Folding Door Hardware: Hardware is to be of type and design as specified and should conform with ANSI/BHMA A156.14.

1. Sliding Bi-Passing Pocket Door Hardware: Provide complete sets consisting of track, hangers, stops, bumpers, floor channel, guides, and accessories indicated.
2. Manufacturers:

a. Hafele Manufacturing (HF).
b. Pemko (PE).

2.3 POWER TRANSFER DEVICES

A. Concealed Quick Connect Electric Power Transfers: Provide concealed wiring pathway housing mortised into the door and frame for low voltage electrified door hardware. Furnish with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Manufacturers:

a. Pemko (PE) - EL-CEPT Series.
b. Securitron (SU) - EL-CEPT Series.

B. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire

nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.

1. Provide one each of the following tools as part of the base bid contract:

    a. McKinney (MK) - Electrical Connecting Kit: QC-R001.
    b. McKinney (MK) - Connector Hand Tool: QC-R003.

2. Manufacturers:

    a. McKinney (MK) - QC-C Series.

2.4 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: Provide products conforming to ANSI/BHMA A156.3 and A156.16, Grade 1.

1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
2. Furnish dust proof strikes for bottom bolts.
3. Surface bolts to be minimum 8” in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
5. Manufacturers:

    a. Burns Manufacturing (BU).
    b. Door Controls International (DC).
    c. Rockwood (RO).

B. Coordinators: ANSI/BHMA A156.3 door coordinators consisting of active-leaf, hold-open lever and inactive-leaf release trigger. Model as indicated in hardware sets.

1. Manufacturers:

    a. Burns Manufacturing (BU).
    b. Door Controls International (DC).
    c. Rockwood (RO).

C. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
2. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
3. Pulls, where applicable, shall be provided with a 10” clearance from the finished floor on the push side to accommodate wheelchair accessibility.
4. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.

5. Manufacturers:

    a. Burns Manufacturing (BU).
    b. Hiawatha, Inc. (HI).
    c. Rockwood (RO).

2.5 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:

1. Threaded mortise cylinders with rings and cams to suit hardware application.
2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
4. Tubular deadlocks and other auxiliary locks.
5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
6. Keyway: Match Facility Standard.

C. Keying System: Each type of lock and cylinders to be factory keyed.

1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
3. Existing System: Field verify and key cylinders to match Owner's existing system.

D. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).

E. Construction Keying: Provide construction master keyed cylinders.

F. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

2.6 KEY CONTROL

A. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.

1. Manufacturers:

    a. Lund Equipment (LU).
    b. MMF Industries (MM).
    c. Telkee (TK).

2.7 MECHANICAL LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.

1. Heavy duty mortise locks shall have a ten-year warranty.
2. Manufacturers:

a. Corbin Russwin Hardware (RU) - ML2000 Series.
b. Sargent Manufacturing (SA) - 8200 Series.

B. Cylindrical Locksets, Grade 2 (Standard Duty): ANSI/BHMA A156.2, Series 4000, Grade 2 Certified Products Directory (CPD) listed. Locks are to be non-handed and fully field reversible.

1. Standard duty cylindrical locks shall have a five-year warranty.
2. Manufacturers:

a. Corbin Russwin Hardware (RU) - CL3800 Series.
b. Sargent Manufacturing (SA) - 6500.

2.8 AUXILIARY LOCKS

A. Narrow Case Deadlocks and Deadlatches: ANSI/BHMA 156.13 Series 1000 Grade 1 narrow case deadlocks and deadlatches for swinging or sliding door applications. All functions shall be manufactured in a single sized case formed from 12 gauge minimum, corrosion resistant steel (option for fully stainless steel case and components). Provide minimum 2 7/8" throw laminated stainless steel bolt. Bottom rail deadlocks to have 3/8” diameter bolts.

1. Manufacturers:

a. Adams Rite Manufacturing (AD) - MS1850S / MS1950 Series.

2.9 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.10 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. Exit devices shall have a five-year warranty.
2. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
3. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer’s catalog and template book for specific requirements.
4. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
5. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
6. Flush End Caps: Provide flush end caps made of architectural metal in the same finish as the devices as in the Hardware Sets. Plastic end caps will not be acceptable.
7. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.

    a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
    b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.

8. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
9. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2” wide stiles.
10. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
11. Rail Sizing: Provide exit device rails factory sized for proper door width application.
12. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.

1. Manufacturers:

    a. Corbin Russwin Hardware (RU) - ED4000 / ED5000 Series.
    b. Sargent Manufacturing (SA) - 80 Series.

C. Tube Steel Removable Mullions: ANSI/BHMA A156.3 removable steel mullions with malleable-iron top and bottom retainers and a primed paint finish.

1. Provide keyed removable feature where specified in the Hardware Sets.
2. Provide stabilizers and mounting brackets as required.
3. Provide electrical quick connection wiring options as specified in the hardware sets.
4. Manufacturers:

a. Same as exit device manufacturer.

2.11 ELECTROMECHANICAL EXIT DEVICES

A. Electromechanical Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices subject to same compliance standards and requirements as mechanical exit devices. Electrified exit devices to be of type and design as specified below and in the hardware sets.

1. Energy Efficient Design: Provide devices which have a holding current draw of 15mA maximum, and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.
2. Where conventional power supplies are not sufficient, include any specific controllers required to provide the proper inrush current.
3. Motorized Electric Latch Retraction: Devices with an electric latch retraction feature must use motors which have a maximum current draw of 600mA. Solenoid driven latch retraction is not acceptable.
4. Manufacturers:

a. Corbin Russwin Hardware (RU) - ED5000 Series.
b. Sargent Manufacturing (SA) - 80 Series.

2.12 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.

1. Heavy duty surface mounted door closers shall have a 30-year warranty.
2. Manufacturers:

a. Corbin Russwin Hardware (RU) - DC6000 Series.
b. Norton Rixson (NO) - 7500 Series.
c. Sargent Manufacturing (SA) - 351 Series.

C. Door Closers, Surface Mounted (Commercial Duty): ANSI/BHMA 156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, institutional grade door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck, closing sweep, and latch speed control valves. Provide non-handed units standard.

1. Manufacturers:

a. Corbin Russwin Hardware (RU) - DC6000 Series.
b. Norton Rixson (NO) - 8500 Series.
c. Sargent Manufacturing (SA) - 1431 Series.

2.13 ELECTROMECHANICAL DOOR OPERATORS

A. General: Provide low energy operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for compliance with UL 325. Coordinate operator mechanisms with door operation, hinges, and activation devices.

1. Fire-Rated Doors: Provide door operators for fire-rated door assemblies that comply with NFPA 80 for fire-rated door components and are listed and labeled by a qualified testing agency.

B. Standard: Conforming to ANSI/BHMA A156.19.

C. Performance Requirements:

1. Opening Force if Power Fails: Not more than 15 lbfrequired to release a latch if provided, not more than 30 lbfrequired to manually set door in motion, and not more than 15 lbfrequired to fully open door.
2. Entrapment Protection: Not more than 15 lbfrequired to prevent stopped door from closing or opening.

D. Configuration: Surface mounted or in-ground as required. Door operators to control single swinging and pair of swinging doors.

E. Operation: Power opening and spring closing operation capable of meeting ANSI A117.1 accessibility guideline. Provide time delay for door to remain open before initiating closing cycle as required by ANSI/BHMA A156.19.

F. Features: Operator units to have full feature adjustments for door opening and closing force and speed, backcheck, motor assist acceleration from 0 to 30 seconds, time delay, vestibule interface delay, obstruction recycle, and hold open time from 0 up to 30 seconds.
G. Provide outputs and relays on board the operator to allow for coordination of exit device latch retraction, electric strikes, magnetic locks, card readers, safety and motion sensors and specified auxiliary contacts.
H. Brackets and Reinforcements: Manufacturer's standard, fabricated from aluminum with nonferrous shims for aligning system components.
I. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Besam Automated Entrance Systems (BE) - SW200i Series.

2.14 SURFACE MOUNTED CLOSER HOLDERS

A. Electromagnetic Door Holders: ANSI A156.15 electromagnetic door holder/releases with a minimum 20 to 40 pounds holding power and single coil construction able to accommodate.12VDC, 24VAC, 24VDC and 120VAC. Coils to be independently wound, employing an integral fuse and armatures to include a positive release button.

1. Manufacturers:

a. Norton Rixson (RF) - 980/990 Series.
b. Sargent Manufacturing (SA) - 1560 Series.

2.15 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1” LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
3. Where plates are applied to fire rated doors with the top of the plate more than 16” above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer’s catalog and template book for specific requirements for size and applications.
4. Protection Plates: ANSI/BHMA A156.6 protection plates (kick, armor, or mop), fabricated from the following:

a. Stainless Steel: 300 grade, 050-inch thick.

5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
6. Manufacturers:

a. Burns Manufacturing (BU).
b. Hiawatha, Inc. (HI).
c. Rockwood (RO).

2.16 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Manufacturers:

a. Burns Manufacturing (BU).
b. Hiawatha, Inc. (HI).
c. Rockwood (RO).

2.17 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Manufacturers:

1. Pemko (PE).
2. Reese Enterprises, Inc. (RE).

2.18 ELECTRONIC ACCESSORIES

A. Key Switches: Key switches furnished standard with stainless steel single gang face plate with a 12/24VDC bi-color LED indicator. Integral backing bracket permits integration with any 1 1/4" or 1 1/2" mortise type cylinder. Key switches available as momentary or maintained action and in narrow face plate options.

1. Manufacturers:

a. Alarm Controls (AK) - MCK Series.
b. Securitron (SU) - MK Series.

B. Door Position Switches: Door position magnetic reed contact switches specifically designed for use in commercial door applications. On recessed models the contact and magnetic housing snap-lock into a 1" diameter hole. Surface mounted models include wide gap distance design complete with armored flex cabling. Provide SPDT, N/O switches with optional Rare Earth Magnet installation on steel doors with flush top channels.

1. Manufacturers:

a. Securitron (SU) - DPS Series.

C. Intelligent Switching Power Supplies: Provide power supplies with single, dual or multi-voltage configurations at 12 and/or 24VDC. Power Supply shall have battery backup function with an integrated battery charging circuit. The power supply shall have a standard, integrated Fire Alarm Interface (FAI). The power supply shall provide capability for secondary voltage, power distribution, direct lock control and network monitoring through add on modules. The power supply shall be expandable up to 16 individually protected outputs. Output modules shall provide individually protected, continuous outputs and/or individually protected, relay controlled outputs. Network modules shall provide remote monitoring functions such as status reporting, fault reporting and information logging.

1. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.
2. Manufacturers:

a. Securitron (SU) - AQL Series.

2.19 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.20 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. DHI TDH-007-20: Installation Guide for Doors and Hardware.
3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.
2. The supplier is responsible for handing and sizing all products.
3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

B. Manufacturer’s Abbreviations:

1. MK - McKinney
2. OM - Omnia Industries Inc
3. PE - Pemko
4. MR - Markar
5. SU - Securitron
6. RO - Rockwood
7. SA - SARGENT
8. AD - Adams Rite
9. RI - RITE Door
10. OT - Other
11. BM - Besam
12. RF - Rixson

Hardware Sets

Set: 2.0

Doors: B250|1, B350|1, C11|3, C22|2, C23|2, C31|2

1	Continuous Hinge	BSPFM__HD1 PT		PE
1	Electric Power Transfer	CEPT-NW	BSP	SU

1	Access Control Rim Exit	43 IN220-8877 BIP B OA LC 5CH 525 ETP	BSP	SA
1	Rim Cylinder	34	BSP	SA
1	Surface Closer	351 CPS	BSP	SA
1		Drop Plate & Bracket as Req'd		SA
1	Threshold	Per Sill Detail		PE
1	Rain Guard	346BSP (Omit at Overhang)		PE
1	Sweep	18062BSPNB		PE
1	Gasketing & Astragal	By Door/Frame Manufacturer		OT

Notes: Wiring and electrical interface by Security Contractor. Terminate Cat-5 cable at exit device.
Door typically closed and locked. Presenting valid credential will momentarily release lever allowing entry. In case of fire alarm or power loss door will remain locked (fail secure). Free egress at all times.

Set: 3.0

Doors: A100|1, A100A|1, B150|1

1	Continuous Hinge	BSPFM__HD1		PE
1	Continuous Hinge	BSPFM__HD1 PT		PE
1	Electric Power Transfer	EL-CEPT	630	SU
1	Concealed Vert Rod Exit, Exit Only	43 5CH 525 AD8610 EO	BSP	SA
1	Concealed Vert Rod Exit, Nightlatch, ELR	43 5CH 525 55 56 AD8610 106 x Less Trim	BSP	SA
1	Door Pull	BF158	BSP	RO
2	Activation Switch	Wikk Ingress'r (by 087113)		OT
1	Single Door Operator	SW200i (surface single) (by 087113)	689	BM
1	Threshold	Per Sill Detail		PE
1	Rain Guard	346BSP (Omit at Overhang)		PE
2	Sweep	18062BSPNB		PE
1	ElectroLynx Frame Harness	QC-C1500P		MK
1	ElectroLynx Door Harness	QC-C__P		MK
1	Position Switch	DPS-M/W		SU
1	Keyswitch	MKA2		SU
1	Power Supply w/ Power Distribution Board	AQL Series-R8E1 as required		SU
1	Gasketing & Astragal	By Door/Frame Manufacturer		OT

Notes: Card reader, wiring and electrical interface by Security Contractor. Doors are normally closed and locked. Presenting valid credential will momentarily retract latch bolt at active leaf to allow entry. In case of fire alarm or power loss, door will remain locked (fail secure). Free egress at all times.

From Exterior: Auto door operator can be utilized by pressing activation switch after presenting credential.
From Interior: Auto door operator can be utilized by pressing activation switch Door operator may be disabled by key switch.

Set: 4.0

Doors: C21|2

1	Continuous Hinge	BSPFM__HD1 PT		PE
1	Electric Power Transfer	EL-CEPT	630	SU
1	Rim Exit Device, ELR	43 5CH 525 55 56 8804 x Less Trim	BSP	SA
1	Door Pull	BF158	BSP	RO
2	Activation Switch	Wikk Ingress'r (by 087113)		OT
1	Single Door Operator	SW200i (surface single) (by 087113)	689	BM
1	Threshold	Per Sill Detail		PE
1	Rain Guard	346BSP (Omit at Overhang)		PE
1	Sweep	18062BSPNB		PE
1	ElectroLynx Frame Harness	QC-C1500P		MK
1	ElectroLynx Door Harness	QC-C__P		MK
1	Position Switch	DPS-M/W		SU
1	Keyswitch	MKA2		SU
1	Power Supply w/ Power Distribution Board	AQL Series-R8E1 as required		SU
1	Gasketing	By Door/Frame Manufacturer		OT

Notes: Card reader, wiring and electrical interface by Security Contractor. Doors are normally closed and locked. Presenting valid credential will momentarily retract latch bolt at allow entry. In case of fire alarm or power loss, door will remain locked (fail secure). Free egress at all times.

From Exterior: Auto door operator can be utilized by pressing activation switch after presenting credential.
From Interior: Auto door operator can be utilized by pressing activation switch Door operator may be disabled by key switch.

Set: 5.0

Doors: A300|1

1	Continuous Hinge	BSPFM__HD1		PE
1	Mortise Deadlock	MS1850S	628	AD
1	Mortise Cylinder	41 101	BSP	SA
1	Door Pull	BF158	BSP	RO
1	Surface Closer	351 CPS	BSP	SA
1		Drop Plate & Bracket as Req'd		SA
1	Threshold	Per Sill Detail		PE
1	Gasketing	By Door/Frame Manufacturer		OT
1	Decal (Door to remain unlocked during ....)	660		RO

Set: 6.0

Doors: S11|3

1	Continuous Hinge	BSPFM__HD1		PE
1	Rim Exit Device, Exit Only	43 5CH 525 8810 EO	BSP	SA
1	Surface Closer	351 CPS	BSP	SA
1		Drop Plate & Bracket as Req'd		SA
1	Threshold	Per Sill Detail		PE
1	Rain Guard	346BSP (Omit at Overhang)		PE
1	Sweep	18062BSPNB		PE
1	Gasketing	By Door/Frame Manufacturer		OT

Set: 7.0

Doors: A106B|2

6	Hinge, Full Mortise, Hvy Wt	T4A3386 (NRP)	BSP	MK
1	Electric Power Transfer	CEPT-NW	BSP	SU
1	Mullion	L980S	PC	SA
1	Access Control Rim Exit	43 IN220-8877 BIP B OA LC 5CH 525 ETP	BSP	SA
1	Rim Exit Device, Exit Only	43 5CH 525 8810 EO	BSP	SA
1	Rim Cylinder	34	BSP	SA
2	Surface Closer	351 CPS	BSP	SA
1	Threshold	Per Sill Detail		PE
1	Gasketing (Head)	2891BSPS		PE
1	Gasketing (Jambs)	290BSPS		PE
1	Rain Guard	346BSP (Omit at Overhang)		PE
2	Sweep	18062BSPNB		PE

1	Meeting Astragal (set)	18041BSPNB	PE
2	Position Switch	DPS-M/W	SU

Notes: Wiring and electrical interface by Security Contractor. Terminate Cat-5 cable at exit device.
Door typically closed and locked. Presenting valid credential will momentarily release lever allowing entry. In case of fire alarm or power loss door will remain locked (fail secure). Free egress at all times.

Set: 8.0

Doors: S21|1

3	Hinge, Full Mortise, Hvy Wt	T4A3386 (NRP)	BSP	MK
1	Electric Power Transfer	CEPT-NW	BSP	SU
1	Access Control Rim Exit	43 IN220-8877 BIP B OA LC 5CH 525 ETP	BSP	SA
1	Rim Cylinder	34	BSP	SA
1	Surface Closer	351 CPS	BSP	SA
1	Kick Plate	K1050 10" High CSK BEV	BSP	RO
1	Threshold	Per Sill Detail		PE
1	Gasketing (Head)	2891BSPS		PE
1	Gasketing (Jambs)	290BSPS		PE
1	Rain Guard	346BSP (Omit at Overhang)		PE
1	Sweep	18062BSPNB		PE

Notes: Wiring and electrical interface by Security Contractor. Terminate Cat-5 cable at exit device.
Door typically closed and locked. Presenting valid credential will momentarily release lever allowing entry. In case of fire alarm or power loss door will remain locked (fail secure). Free egress at all times.

Set: 9.0

Doors: B150B|2

6	Hinge, Full Mortise, Hvy Wt	T4A3386 (NRP)	BSP	MK
1	Mullion	L980S	PC	SA
1	Rim Exit Device, Exit Only	43 5CH 525 8810 EO	BSP	SA
1	Rim Exit Device, Storeroom	43 5CH 525 8804 ETP	BSP	SA
2	Surface Closer	351 CPS	BSP	SA
1	Threshold	Per Sill Detail		PE

1 Gasketing (Head)	2891BSPS		PE
1 Gasketing (Jambs)	290BSPS		PE
1 Rain Guard	346BSP (Omit at Overhang)		PE
2 Sweep	18062BSPNB		PE
1 Meeting Astragal (set)	18041BSPNB		PE
1 Position Switch	DPS-M/W		SU

Set: 10.0
Doors: S31|2, S41|2

3 Hinge, Full Mortise, Hvy Wt	T4A3386 (NRP)	BSP	MK
1 Rim Exit Device, Exit Only	43 5CH 525 8810 EO	BSP	SA
1 Surface Closer	351 CPS	BSP	SA
1 Kick Plate	K1050 10" High CSK BEV	BSP	RO
1 Threshold	Per Sill Detail		PE
1 Gasketing (Head)	2891BSPS		PE
1 Gasketing (Jambs)	290BSPS		PE
1 Rain Guard	346BSP (Omit at Overhang)		PE
1 Sweep	18062BSPNB		PE
1 Position Switch	DPS-M/W		SU

Notes:

Set: 11.0
Doors: S22|1, S23|1

3 Hinge, Full Mortise, Hvy Wt	T4A3386 (NRP)	BSP	MK
1 Rim Exit Device, Passage	43 5CH 525 8815 ETP	US32D	SA
1 Surface Closer	351 O	BSP	SA
1 Kick Plate	K1050 10" High CSK BEV	BSP	RO
1 Door Stop	441	BSP	RO
1 Threshold	Per Sill Detail		PE
1 Gasketing (Head)	2891BSPS		PE
1 Gasketing (Jambs)	290BSPS		PE
1 Rain Guard	346BSP (Omit at Overhang)		PE
1 Sweep	18062BSPNB		PE

Notes:

Set: 12.0

Doors: A351A|1

6	Hinge, Full Mortise	TA2314 (NRP)	BSP	MK
1	Flush Bolt (Top Bolt Only)	2805/2905	BSP	RO
1	Storeroom/Closet Lock	8204 LNP	BSP	SA
1	Coordinator	2672	Black	RO
2	Surface Closer	351 CPS	BSP	SA
1	Threshold	Per Sill Detail		PE
1	Gasketing (Head)	2891BSPS		PE
1	Gasketing (Jambs)	290BSPS		PE
1	Rain Guard	346BSP (Omit at Overhang)		PE
2	Sweep	18062BSPNB		PE
1	Astragal	357SP		PE

Set: 13.0
Doors: A247|1, A347|1 401|1

3	Hinge, Full Mortise	TA2314 (NRP)	BSP	MK
1	Storeroom/Closet Lock	8204 LNP	BSP	SA
1	Surface Closer	351 O	BSP	SA
1	Kick Plate	K1050 10" High CSK BEV	BSP	RO
1	Door Stop	441	BSP	RO
1	Threshold	Per Sill Detail		PE
1	Gasketing (Head)	2891BSPS		PE
1	Gasketing (Jambs)	290BSPS		PE
1	Rain Guard	346BSP (Omit at Overhang)		PE
1	Sweep	18062BSPNB		PE

Set: 14.0
Doors: A106C|1, A143|1

3	Hinge, Full Mortise	TA2314 (NRP)	BSP	MK
1	Storeroom/Closet Lock	8204 LNP	BSP	SA
1	Surface Closer	351 CPS	BSP	SA
1	Threshold	Per Sill Detail		PE
1	Gasketing (Head)	2891BSPS		PE
1	Gasketing (Jambs)	290BSPS		PE
1	Rain Guard	346BSP (Omit at Overhang)		PE
1	Sweep	18062BSPNB		PE

Set: 15.0

Doors: A123A|1, B150E|1

3	Hinge, Full Mortise	TA2314 (NRP)	BSP	MK
1	Storeroom/Closet Lock	8204 LNP	BSP	SA
1	Surface Closer	351 CPS	BSP	SA
1	Threshold	Per Sill Detail		PE
1	Gasketing (Head)	2891BSPS		PE
1	Gasketing (Jambs)	290BSPS		PE
1	Rain Guard	346BSP (Omit at Overhang)		PE
1	Sweep	18062BSPNB		PE
1	Position Switch	DPS-M/W		SU

Set: 16.0

Doors: A123|2, A144|1

6	Hinge, Full Mortise	TA2314 (NRP)	BSP	MK
1	Flush Bolt	2845/2945	BSP	RO
1	Dust Proof Strike	570	BSP	RO
1	Passage Latch	8215 LNP	BSP	SA
1	Coordinator	2672	Black	RO
2	Surface Closer	351 CPS	BSP	SA
2	Kick Plate	K1050 10" High CSK BEV	BSP	RO
1	Threshold	Per Sill Detail		PE
1	Gasketing (Head)	2891BSPS		PE
1	Gasketing (Jambs)	290BSPS		PE
1	Rain Guard	346BSP (Omit at Overhang)		PE
2	Sweep	18062BSPNB		PE
1	Astragal	357SP		PE

Set: 17.0

Doors: A300A|1, A300B|1

3	Hinge, Full Mortise	TA2714 (NRP)	BSP	MK
1	Passage Latch	8215 LNP	BSP	SA
1	Surface Closer	351 O	BSP	SA
1		Drop Plate & Bracket as Req'd		SA
1	Door Stop	441	BSP	RO
1	Gasketing	By Door/Frame Manufacturer		OT

Set: 18.0

Doors: A106A|1

3	Hinge, Full Mortise, Hvy Wt	T4A3786 (NRP)	BSP	MK
1	Electric Power Transfer	CEPT-NW	BSP	SU
1	Access Control Rim Exit	12 43 IN220-8877 BIP B OA LC 5CH 525 ETP	US32D	SA
1	Rim Cylinder	34	BSP	SA
1	Surface Closer	351 CPS	BSP	SA
1	Kick Plate	K1050 10" High CSK BEV	BSP	RO
1	Gasketing	S88BL		PE

Notes: Wiring and electrical interface by Security Contractor. Terminate Cat-5 cable at exit device.
Door typically closed and locked. Presenting valid credential will momentarily release lever allowing entry. In case of fire alarm or power loss door will remain locked (fail secure). Free egress at all times.

Set: 19.0

Doors: B150B|1

3	Hinge, Full Mortise, Hvy Wt	T4A3786 (NRP)	BSP	MK
1	Rim Exit Device, Storeroom	12 43 5CH 525 8804 ETP	BSP	SA
1	Surface Closer	351 O	BSP	SA
1	Door Stop	441	BSP	RO
1	Gasketing	S88BL		PE

Set: 20.0

Doors: A106B|1, S31|1, S41|1

3	Hinge, Full Mortise, Hvy Wt	T4A3786 (NRP)	BSP	MK
1	Rim Exit Device, Passage	12 43 5CH 525 8815 ETP	BSP	SA
1	Surface Closer	351 O	BSP	SA
1	Kick Plate	K1050 10" High CSK BEV	BSP	RO
1	Wall Stop	400	BSP	RO
1	Gasketing	S88BL		PE

Set: 20.1

Doors: S12|1, S13|1, S32|1, S33|1, S42|1, S43|1

3	Hinge, Full Mortise, Hvy Wt	T4A3786 (NRP)	BSP	MK
1	Rim Exit Device, Passage	43 5CH 525 8815 ETP	US32D	SA
1	Surface Closer	351 O	BSP	SA
1	Kick Plate	K1050 10" High CSK BEV	BSP	RO
1	Wall Stop	400	BSP	RO
3	Silencer	608-RKW		RO

Set: 21.0

Doors: A102|1, A103|1, A110|1, A123|1, A130|1, A131|1, A200A|1, A200B|1, A203|1, A208|1, A244|1, A303|1, A308|1, B150A|1, B250A|1, B350A|1, B350C|1

3	Hinge, Full Mortise	TA2714 (NRP)	BSP	MK
1	Electric Power Transfer	CEPT-NW	BSP	SU
1	Access Control Mort Lock	IN220-82278 BIP B OA LNP LC WBS	BSP	SA
1	Mortise Cylinder	41	BSP	SA
1	Surface Closer	351 O	BSP	SA
1	Kick Plate	K1050 10" High CSK BEV	BSP	RO
1	Door Stop	441	BSP	RO
3	Silencer	608-RKW		RO

Notes: Wiring and electrical interface by Security Contractor. Terminate Cat-5 cable at lock set. Door typically closed and locked. Presenting valid credential will momentarily release lever allowing entry. In case of fire alarm or power loss door will remain locked (fail secure). Free egress at all times.

Set: 22.0

Doors: A243|1, A343|1, B150C|1, B250C|1

3	Hinge, Full Mortise	TA2714 (NRP)	BSP	MK
1	Electric Power Transfer	CEPT-NW	BSP	SU
1	Access Control Mort Lock	IN220-82278 BIP B OA LNP LC WBS	BSP	SA
1	Mortise Cylinder	41	BSP	SA
1	Surface Closer	351 O	BSP	SA
1	Kick Plate	K1050 10" High CSK BEV	BSP	RO
1	Door Stop	441	BSP	RO
1	Gasketing	S88BL		PE

Notes: Wiring and electrical interface by Security Contractor. Terminate Cat-5 cable at lock set. Door typically closed and locked. Presenting valid credential will momentarily release lever

allowing entry. In case of fire alarm or power loss door will remain locked (fail secure). Free egress at all times.

Set: 23.0
Doors: A100D|1, A229|1, A329|1

6	Hinge, Full Mortise	TA2714 (NRP)	BSP	MK
1	Flush Bolt	555	BSP	RO
1	Storeroom/Closet Lock	8204 LNP	BSP	SA
2	Door Stop	441	BSP	RO
2	Silencer	608-RKW		RO

Set: 24.0
Doors: A100B|1

6	Hinge, Full Mortise, Hvy Wt	T4A3786 (NRP)	BSP	MK
1	Flush Bolt (Top Bolt Only)	2805/2905	BSP	RO
1	Storeroom/Closet Lock	8204 LNP	BSP	SA
1	Coordinator	2672	Black	RO
2	Surface Closer	351 O	BSP	SA
2	Kick Plate	K1050 10" High CSK BEV	BSP	RO
2	Electromagnetic Holder	998M	693	RF
1	Gasketing	S88BL		PE
1	Astragal	357SP		PE

Set: 25.0
Doors: A202A|1, A302|1, A302A|1, A344|1

3	Hinge, Full Mortise	TA2714 (NRP)	BSP	MK
1	Storeroom/Closet Lock	8204 LNP	BSP	SA
1	Surface Closer	351 O	BSP	SA
1	Kick Plate	K1050 10" High CSK BEV	BSP	RO
1	Door Stop	441	BSP	RO
3	Silencer	608-RKW		RO

Set: 26.0
Doors: B250D|1, B350D|1

3	Hinge, Full Mortise	TA2714 (NRP)	BSP	MK

1	Storeroom/Closet Lock	8204 LNP	BSP	SA
1	Surface Closer	351 CPS	BSP	SA
3	Silencer	608-RKW		RO

Set: 27.0
Doors: A202|1, A202C|1, A302C|1, B250B|1, B350B|1

3	Hinge, Full Mortise	TA2714 (NRP)	BSP	MK
1	Storeroom/Closet Lock	8204 LNP	BSP	SA
1	Surface Closer	351 O	BSP	SA
1	Kick Plate	K1050 10" High CSK BEV	BSP	RO
1	Door Stop	441	BSP	RO
1	Gasketing	S88BL		PE

Set: 28.0
Doors: A104A|1

3	Hinge, Full Mortise	TA2714 (NRP)	BSP	MK
1	Storeroom/Closet Lock	8204 LNP	BSP	SA
1	Surface Closer	351 CPS	BSP	SA
3	Silencer	608-RKW		RO

Set: 30.0
Doors: A132A|1, A132B|1, A134A|1

3	Hinge, Full Mortise	TA2714 (NRP)	BSP	MK
1	Office/Entry Lock	8205 LNP	BSP	SA
1	Surface Closer	351 O	BSP	SA
1	Door Stop	441	BSP	RO
1	Gasketing	S88BL		PE

Set: 31.0
Doors: A134C|1

3	Hinge, Full Mortise	TA2714 (NRP)	BSP	MK
1	Classroom Lock	8237 LNP	BSP	SA
1	Surface Closer	351 O	BSP	SA
1	Kick Plate	K1050 10" High CSK BEV	BSP	RO
1	Door Stop	441	BSP	RO
1	Gasketing	S88BL		PE

Set: 32.0

Doors: A134B|1, A300C|1, B150D|1

3	Hinge, Full Mortise	TA2714 (NRP)	BSP	MK
1	Privacy Lock x Indicator	LB V21 8266 LE1P	BSP	SA
1	Surface Closer	351 O	BSP	SA
1	Kick Plate	K1050 10" High CSK BEV	BSP	RO
1	Mop Plate	K1050 6" High CSK BEV	BSP	RO
1	Door Stop	441	BSP	RO
1	Gasketing	S88BL		PE

Set: 32.1

Doors: A130|10, A130|12, A130|13, A130|14, A130|19, A130|21, A130|22, A130|23, A130|24, A130|26, A130|27, A130|28, A130|33, A130|35, A130|36, A130|37

3	Hinge, Full Mortise	TA2714 (NRP)	BSP	MK
1	Privacy Lock x Indicator	LB V21 8266 LE1P	BSP	SA
1	Kick Plate	K1050 10" High CSK BEV	BSP	RO
1	Mop Plate	K1050 6" High CSK BEV	BSP	RO
1	Door Stop	441	BSP	RO
1	Gasketing	S88BL		PE

Set: 33.0

Doors: A200C|1

3	Hinge, Full Mortise	TA2714 (NRP)	BSP	MK
1	Privacy Lock x Indicator	LB V21 8266 LE1P	BSP	SA
1	Surface Closer	351 CPS	BSP	SA
1	Mop Plate	K1050 6" High CSK BEV	BSP	RO
1	Gasketing	S88BL		PE

Set: 34.0

Doors: R11|1, R12|1, R13|1, R21|1, R22|1, R23|1

3	Hinge, Full Mortise	TA2714 (NRP)	BSP	MK
1	Passage Latch	8215 LNP	BSP	SA
1	Surface Closer	351 O	BSP	SA
1	Kick Plate	K1050 10" High CSK BEV	BSP	RO
1	Door Stop	441	BSP	RO

1	Privacy Seal Set	PEMKOSFSET1x3684BL		PE

Set: 35.0

Doors: A130|15, S31.10, S31.11, S31.12, S31.13, S31.14, S31.15, S31.16, S31.17, S31.18, S31.19, S31.20, S31.21, S31.22, S31.23, S31.24, S31.25, S31.26, S31.27, S31.28, S31.29, S31.30, S31.31, S31.7, S31.8, U1

3	Hinge, Full Mortise	TA2714 (NRP)	BSP	MK
1	Access Control Mort Lock	IN220-82278 BIP B OA LNP LC WBS	BSP	SA
1	Mortise Cylinder	41	BSP	SA
1	Surface Closer	1431 O	BSP	SA
1	Door Stop	441	BSP	RO
1	Threshold	Per Sill Detail		PE
1	Gasketing	S44BL		PE
1	Door Bottom	411ARL		PE
1	Viewer	622	CRM	RO

Notes: Wiring and electrical interface by Security Contractor. Terminate Cat-5 cable at lock set. Install (2) viewers at accessible units.
Door typically closed and locked. Presenting valid credential will momentarily release lever allowing entry. In case of fire alarm or power loss door will remain locked (fail secure). Free egress at all times.

Set: 36.0

Doors: U6

8	Hinge, Full Mortise	TA2714 (NRP)	BSP	MK
1	Flush Bolt	555	BSP	RO
1	Classroom Lock	65G37 KP	BSP	SA
2	Silencer	608-RKW		RO

Set: 37.0

Doors: C21|6, S31.32, S31.33, S31.34, S31.35, S31.36, S31.37, S31.38, S31.39, S31.40, S31.41, S31.42, S31.43, S31.44, S31.45, S31.46, S31.47, S31.48, S31.49, S31.50, S31.51, S31.52, S31.53, S31.54, S31.55, U1, U2, U3

3	Hinge, Full Mortise	TA2714 (NRP)	BSP	MK
1	Privacy Lock	65U65 KP	BSP	SA
1	Door Stop	441	BSP	RO

Set: 38.0
Doors: U5

1	Sliding Door Hdwe	HBP200A		PE
2	Flush Pull	860	BSP	RO

Set: 39.0
Doors: U4

1	Side Wall Track Kit	280C-SWTKIT		PE
1	Sliding Door Lockset	SDL19-ADA		PE
2	Door Pull	107 Mtg-Type 5	BSP	RO
1	Privacy Seal Set	PEMKOSFSET1x3684BL		PE

Set: 40.0
Doors: C11|1, C12|1, C13|1, C21|1, C22|1, C23|1, C31|1, C32|1, C33|1, S11|1

2	Continuous Hinge	FM300 (By 081700)	630	MR
2	Recessed Exit	D3676 EO (by 081700)	335	RI
2	Surface Closer	D-DCT-351PKT90 (by 081700)	BSP	RI
2	Electromagnetic Holder	D-MDH (by 081700)	693	RI
1	Seal Kit	D-SS-STK-BLK (by 081700)		RI

Set: 41.0
Doors: S11|2

2	Continuous Hinge	FM300 (By 081700)	630	MR
2	Recessed Exit	D3676 (by 081700)	335	RI
2	Trim	D3080-01 (by 081700)	BSP	RI
2	Surface Closer	D-DCT-351PKT90 (by 081700)	BSP	RI
2	Electromagnetic Holder	D-MDH (by 081700)	693	RI
1	Seal Kit	D-SS-STK-BLK (by 081700)		RI

Set: 42.0
Doors: A143|2

1		Hardware by Door Supplier		OT

Set: G.01
Doors: G-01, G-03

2	Gate Hinge/Closer	Locinox Mammoth 180		OM
1	Concealed Vert Rod Exit, Exit Only	CPC WH NB 43 5CH 525 MD8610 EO	BSP	SA
1	Concealed Vert Rod Exit, Nightlatch, ELR	CPC WH NB 43 5CH 525 55 56 MD8610 106 x Less Trim	BSP	SA
1	Vandal Resistant Trim	VRT22 C	US32D	RO
2	Door Stop	466-RKW	Black	RO
1	ElectroLynx Frame Harness	QC-C1500P		MK
1	ElectroLynx Door Harness	QC-C__P		MK
1	Power Supply w/ Power Distribution Board	AQL Series-R8E1 as required		SU
1		Balance of Hardware by Gate Supplier		OT

Notes: Wiring and electrical interface by Security Contractor. Gate typically closed and locked. Presenting valid credential will momentarily retract latch bolt at active leaf allowing entry. In case of fire alarm or power loss door will remain locked (fail secure). Free egress at all times.

Set: G.02

Doors: G-02

1	Gate Hinge/Closer	Locinox Mammoth 180		OM
1	Rim Exit Device, Storeroom, ELR	CPC WH 43 5CH 525 55 56 8804 Less Trim	US32D	SA
1	Vandal Resistant Trim	VRT22 C	US32D	RO
1	Door Stop	466-RKW	Black	RO
1	ElectroLynx Frame Harness	QC-C1500P		MK
1	ElectroLynx Door Harness	QC-C__P		MK
1	Power Supply w/ Power Distribution Board	AQL Series-R8E1 as required		SU
1		Balance of Hardware by Gate Supplier		OT

Notes: Wiring and electrical interface by Security Contractor. Gate typically closed and locked. Presenting valid credential will momentarily retract latch bolt at active leaf allowing entry. In case of fire alarm or power loss door will remain locked (fail secure). Free egress at all times.

END OF SECTION 087100

SECTION 087113 – AUTOMATIC DOOR OPERATORS

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes the following types of automatic door operators:

1. Low energy and power assist door operators for swinging doors.

B. Related Sections:

1. Division 7 Sections for caulking to the extent not specified in this section.
2. Division 8 Section “Aluminum-Framed Entrances and Storefronts” for entrances furnished separately in Division 8 Section.
3. Division 8 Section “Door Hardware” for hardware to the extent not specified in this Section.
4. Division 26 and 28 Sections for electrical connections including conduit and wiring for automatic entrance door operators and access control devices.

1.2 REFERENCES

A. References: Refer to the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.

B. American National Standards Institute (ANSI) / Builders Hardware Manufacturers Association (BHMA).

1. ANSI/BHMA A156.10 American National Standard for Power Operated Pedestrian Doors.
2. ANSI/BHMA A156.19 Standards for Power Assist and Low Energy Power Operated Doors.

C. Underwriters Laboratories (UL).

1. UL Listed R-9469 Fire Door Operator with Automatic Closer.
2. UL10C – Positive Pressure Fire Tests of Door Assemblies.
3. UL 325 Standard for Safety for Door, Drapery, Gate, Louver and Window Operators and Systems.
4. UL991 Listed - Tests for Safety-Related Controls Employing Solid-State Device.

5. UL244A – Solid – State Controls for Appliances.
6. UL1998 – Software in Programmable Components.
7. UL1310 – Class 2 Power Units.

D. American Association of Automatic Door Manufacturers (AAADM).

E. American Society for Testing and Materials (ASTM).

1. ASTM B221 Standard Specification for Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.
2. ASTM B209 Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate.

F. American Architectural Manufacturers Association (AAMA).

1. AAMA 611 Voluntary Specification for Anodized Architectural Aluminum.

G. National Association of Architectural Metal Manufacturers (NAAMM).

1. Metal Finishes Manual for Architectural Metal Products.

H. International Code Council (ICC).

1. CBC: California Building Code.

1.3 DEFINITIONS

A. Activation Device: Device that, when actuated, sends an electrical signal to the door operator to activate the operation of the door.

1. Knowing act: Consciously initiating the opening of a power operated door using acceptable methods including wall mounted switches such as push plates and controlled access devices such as keypads, card readers and key switches.

B. Safety Device: A device that detects the presence of an object or person within a zone where contact could occur and provides a signal to stop the movement of the door.

1.4 PERFORMANCE REQUIREMENTS

A. Automatic door equipment accommodates medium to heavy pedestrian traffic.

B. Opening Force Requirements: Doors shall open with a manual force, not to exceed 30lbf (133N) to set the door in motion and 15 lbf to fully open the door applied at 1” (25 mm) from the latch edge of the door. The force required to prevent a stopped door from opening or closing shall not exceed 15 lbf (67 N) measured 1” (25 mm) from the latch edge of the door at any point during opening or closing.

C. Closing Time:

1. Doors shall be field adjustable to close from 90 degrees to 10 degrees in 2 seconds or longer as applicable per ANSI/BHMA A156.10 standards.
2. Doors shall be field adjustable to close from 90 degrees to 10 degrees in 3 seconds or longer as applicable per ANSI/BHMA A156.19 standards.
3. Doors shall be field adjusted to close from 10 degrees to fully closed in not less than 1.5 seconds.

1.5 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, fabrication, operational descriptions and finishes.

B. Shop Drawings: Submit manufacturer’s shop drawings, including elevations, sections and details, indicating dimensions, materials, operator, motion /presence sensor control device, anchors, hardware, finish, options and accessories.

1. Indicate required clearances, and location and size of each field connection.
2. Indicate locations and elevations of entrances showing activation and safety devices.
3. Wiring Diagrams: For power, signal, and activation / safety device wiring.

C. Samples: Submit manufacturer’s samples of aluminum finish.

D. Manufacturers Field Reports: Submit manufacturer’s field reports from AAADM certified technician of inspection and approval of doors for compliance with ANSI/BHMA after completion of installation.

E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the work of this section in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and contact information of the manufacturers providing the operators and their nearest service representatives. The final copies delivered after completion of the installation test to include spare parts list.

F. Warranties and Maintenance: Special warranties and maintenance agreements specified in this Section.

1.6 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 10 years of documented experience in manufacturing of doors and equipment of similar to that indicated for this Project and that have a proven record of successful in-service performance. Manufacturer to have a company certificate issued by AAADM.

B. Installer Qualifications: Installers, trained by the primary product manufacturers, with a minimum 3 years documented experience installing and maintenance of units similar in

material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

C. Certified Inspector Qualifications: Certified by AAADM.

D. Source Limitations for Automatic Door Operators: Obtain each type of door, frame, operator and sensor components specified in this Section from a single source, same manufacturer unless otherwise indicated.

E. Certifications: Operators shall be certified by the manufacturer to meet performance design criteria in accordance with the following standards.

1. ANSI/BHMA A156.10 American National Standard for Power Operated Pedestrian Doors.
2. ANSI/BHMA A156.19 American National Standard for Power Assist and Low Energy Operated Doors.
3. NFPA 101 - Life Safety Code.

F. Emergency Exit Door Requirements: Comply with requirements of authorities having jurisdiction for automatic entrance doors serving as a required means of egress.

1.7 COORDINATION

A. Coordinate door operators with doors, frames and related work to ensure proper size, thickness, hand, function and finish. Coordinate hardware for automatic entrances with hardware required for rest of the project.

B. Electrical System Roughing-in: Coordinate layout and installation of power door operators with connections to power supplies and access control system as applicable.

1.8 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Automatic Door Operators shall be free of defects in material and workmanship for a period of one (1) year from the date of substantial completion.

C. During the warranty period a factory-trained technician shall perform service and affect repairs. An inspection shall be performed after each adjustment or repair.

D. During the warranty period all warranty work, including but not limited to emergency service, shall be performed during normal business hours.

E. Manufacturer shall have in place a dispatch procedure that shall be available 24 hours a Day, 7 Days a week for emergency call back service.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Manufacturer: ASSA ABLOY Entrance Systems, 1900 Airport Road, Monroe, NC 28110. Toll Free (877) SPEC-123. Fax (704) 290- 5555 Website www.assaabloyentrance.com contact: specdesk.na.aaes@assaabloy.com

B. Project Local Contact
Blue Bank
714-469-1745; Blue.bank@assaabloy.com

C. Substitutions: Not Permitted.

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, as indicated below:

1. Extruded Aluminum, Alloy 6063-T5.

2.3 SWING DOOR OPERATORS

A. Model: Besam ASSA ABLOY SW200i low energy automatic door operator (Basis of Design):

1. Reference Standard: ANSI/BHMA A156.19.
2. Configuration: Operator to control single swinging doors and pairs of swinging doors as indicated on the drawings and specified below:

   a. Traffic Pattern: Two way.
   b. Pairs of Doors: Simultaneous swing.

3. Automatic Door Operator: Electro-mechanical, non-handed operator, powered by 24 volt, 1/4 hp motor. Operator shall be adjustable to compensate for different manual push forces as required.

   a. Automatic operator shall be capable of operating and controlling up to a 700 pound (317.5 kg) door, 48 inches (1219 mm) in width.
   b. Surface Mounted:

1) Side Access Operator Housing: Operator is contained in 5-1/8" (130.2 mm) deep x 4 5/16" (110 mm) high extruded aluminum housing with a removable cover.
2) Surface Mounted Housing: Continuous for full width of door.
3) Connecting Hardware: Surface mounted operators to have a steel arm from the operator, mounted to the top face of the swing door.
4) UL Listed R-9469 Fire Door Operator with Automatic Closer (surface mounted operator).

c. Operator shall be field switchable between an ANSI/BHMA A156.19 and an ANSI/BHMA A156.10 compliant operator and vice versa. Addition of the required safety sensors, activation devices and guard rails may be required to comply with the applicable standard.
d. Operator Temperature Range: Capable of operating within temperature ranges of -31° F to 160° F (-35° C to 71° C).
e. Electrical Characteristics: Maximum power consumption is 300 watts (2.5 amps at 120 VAC), 50/60hz, built-in thermal overload protection.

4. Door Operation:

a. Opening Cycle The adjustable speed operator mechanically powers the drive shaft and the torque control maintains constant speed throughout the opening cycle regardless of stack pressures or wind speed. Operator shall allow manual door operation with operational forces as indicated to fully open the door applied at 1" (25 mm) from the latch edge of the door.

1) Manual push force shall be adjustable from 5 lbf to 15 lbf maximum.

b. Hold Open: The operator shall stop and hold the door open at the selected door opening angle for an adjustable period of time (1.5 seconds to 30 seconds).
c. Closing Cycle: Spring close with speed controlled power assist.

1) Upon loss of power, dynamic braking will control the door insuring controlled closing.
2) Selectable Torque Control: Automatically adjusts torque without changing the closing speed of the operator.

a) When the torque control is activated, the closing speed shall remain constant regardless of stack pressures or wind speed.
b) Torque Cancellation: The torque control is deactivated whenever there is a signal received from door mounted sensors.
c) The torque control is disabled during manual use of the door.

d. Wind Force Dampening: The operator electromechanically counteracts wind forces, slowing down the door movement to safely open or close the door.

e. Stack Pressure Compensation: Operator shall counteract positive stack pressures, negative stack pressures, and sudden changes of stack pressures. The operator never allows the door to open or close faster than the speed control settings, regardless of pressures.
f. Obstruction Control: The operator will stop and reverse the door movement.
g. Electric Lock Management:

1) Internal module for electrified locking integration.
2) Electric Lock Output: Selectable 12 VDC, maximum 1200 mA / 24 VDC, maximum 600 mA.
3) Lock monitoring prevents operator(s) from opening door(s) until release of electrified lock.
4) Operator pulls door closed before opening, automatically unjamming electric latch hardware.
5) Sequenced operation between operators for pairs of doors allowing lock release and astragal coordination.

h. Lock Retry Circuit: If attempt to fully close the door is unsuccessful, the operator will automatically reverse open 10 degrees and reclose in an attempt to successfully close the door.
i. Selectable Alarm Reset: The operator can be field set so that after receiving an alarm signal, the operator will not accept any activation impulses and will operate only as a manual door closer until manually reset.
j. Electronic Controls: Solid state integrated circuit controls the operation and switching of the swing power operator. The electronic control provides low voltage power supply for all means of actuation. The controls include time delay (1 to 30 seconds) for normal cycle.
k. Control Switch: Automatic door operators shall be equipped with the following type of multi-position function switch:

1) Three position rocker switch mounted on end cap (On-Off-Hold).

5. Operator Interface:

a. Safety Sensor Integration for overhead presence safety device and door mounted reactivation safety sensors.

2.4 ACTIVATION BY SMOKE EVACUATION SYSTEM

A. General: Provide activation by the smoke evacuation system and/or fire detection system. Coordinate other required activation devices and safety devices with door operation and door operator mechanisms.

B. Activation: Smoke evacuation system and/or fire detection system shall provide activation of the operator by means of a normally open maintained contact to control the opening and closing of the door systems in the event of an alarm condition. Doors are to be held open until the smoke evacuation/fire detection system is reset.

2.5 ACTIVATION DEVICES

A. General: Provide activation devices in accordance with ANSI/BHMA standards, for condition of exposure and for long-term, maintenance-free operation under normal traffic load for type of occupancy indicated. Coordinate activation and safety devices with door operation and door operator mechanisms.

B. Knowing Act Activation Device:

1. Push Plate: Hard wired, 4-1/2 inch square stainless steel push plate switches engraved with "Push to Open" with a blue handicap logo.

C. Card Reader Activation:

1. Card reader to provide signal for activation of automatic entrance when entrance is locked.
2. Access control systems, including card readers, shall be provided by others.

2.6 SAFETY DEVICES

A. General: Provide safety devices in accordance with ANSI/BHMA A156.10 standards, for condition of exposure and for long-term, maintenance-free operation under normal traffic load for type of occupancy indicated. Coordinate safety devices with door operation and door operator mechanisms.

B. Safety Devices:

1. Door Mounted Presence Sensor (DMPS): Shall be the ASSA ABLOY door mounted infrared presence safety device (mounted at top of each door); adjustable to provide detection field sizes and functions required by ANSI/BHMA A156.10.

a. Unit to provide detection during the travel of the door.
b. Upon detection, the sensor shall provide a signal to stop or reverse the door action.

2.7 ALUMINUM FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Automatic Door Operator Enclosure:

1. Anodized Finish:

a. AAMA 611, Clear, AA- M12C22A41, Class I, 0.018 mm.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, wall and floor construction, and other conditions affecting performance of swinging power operated doors.

B. Examine roughing-in for electrical source power to verify actual locations of wiring connections.

C. Proceed only after such discrepancies or conflicts have been resolved.

3.2 INSTALLATION

A. Do not install damaged components. Fit joints to produce hairline joints free of burrs and distortion. Rigidly secure non-movement joints.

B. Operators: Install automatic door operators plumb and true in alignment with established lines and grades without warp or rack of framing members and doors. Anchor securely in place.

1. Install surface mounted hardware using concealed fasteners to greatest extent possible.
2. Set headers, carrier assemblies, tracks, operating brackets and guides level and true to location with anchorage for permanent support.

C. Door Operators: Connect door operators to electrical power distribution system including smoke evacuation system and/or fire detection system as specified in Division 26 Sections.

D. Sealants: Comply with requirements specified in division 7 Section “Joint Sealants” to seal between the operator housing and the adjacent surfaces.

E. Signage: Apply signage on both sides of each door and sidelite as required by ANSI/BHMA A156.10 and manufacturers installation instructions.

F. Signage: Apply signage on both sides of each door and sidelite as required by ANSI/BHMA A156.19 and manufacturers installation instructions.

3.3 ADJUSTING

A. Adjust automatic door operators, controls and hardware for smooth and safe operation and for weather tight closure. Adjust doors in compliance with ANSI/BHMA standard.

3.4 FIELD QUALITY CONTROL

A. Before placing doors into operation, AAADM certified technician shall inspect and approve doors for compliance with ANSI/BHMA standard. Certified technician shall be approved by manufacturer.

3.5 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by automatic door operator installation.

B. Clean metal surfaces promptly after installation. Remove excess sealants, compounds, dirt and other substances. Repair damages and finish to match original finish.

3.6 DEMONSTRATION

A. Engage a factory-authorized representative to train Owner's maintenance personnel to adjust, operate, and maintain safe operation of the door.

END OF SECTION

SECTION 087150 - FIRE DEPARTMENT KEY BOXES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes key boxes and alert labels to be located at each building entrance as required by City of Compton.

1.03 SUBMITTALS

A. Product Data: Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Maintenance Data: For key box and alert label to include in maintenance manuals.

1.04 QUALITY ASSURANCE

A. Source Limitations: Obtain key boxes and alert labels from source acceptable to City of Compton.

B. Preinstallation Conference: Conduct conference at Project site with representative of City of Compton to confirm location of key boxes and alert labels.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Inventory key boxes and alert labels on receipt and provide secure lock-up for products delivered to Project site.

B. Tag each item or package separately with identification, and include basic installation instructions, templates, and necessary fasteners with each item or package.

PART 2 - PRODUCTS

2.01 KEY BOX COMPONENTS

A. Key Boxes: Order and obtain key boxes from source acceptable to City of Compton for installation at each exterior entrance door. City standard key box is manufactured by the Knox Company.

B. Alert Labels: Order and obtain alert labels from source acceptable to City of Compton for installation at each exterior entrance door.

C. Master Keys: Provide keys for exterior entrances, elevators, and fire phone and alarm reset keys in quantities as required by City of Compton. Assemble sets of keys on 3/4 inch round rings for placement in key boxes.

2.02 FINISHES

A. General: Provide key box manufacturer’s standard powder coat finish. Color: As selected by City of Compton from manufacturer’s full range.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine key box locations for compliance with requirements for installation tolerances, wall construction, and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General: Install key boxes at locations as directed by City of Compton. Install alert labels on upper corner of each exterior door. Installation of key boxes and alert labels shall be in accordance with requirements of City of Compton and as otherwise provided.

B. Mounting Heights: Mount key boxes at height of not less than 72 inches or greater than 144 inches above adjacent ground surface to comply with City of Compton requirements.

C. Install key boxes to comply with manufacturer's written instructions. Do not install surface-mounted items until finishes have been completed on substrates involved.

1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.

2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

D. Master Keys: Deliver master keys to City of Compton placement in key boxes.

3.03 ADJUSTING

A. Initial Adjustment: Adjust and check each key box to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended.

3.04 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by key box and alert label installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure that key boxes and alert labels are without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Glass for windows, doors, interior borrowed lites, storefront framing, and.
2. Glazing sealants and accessories.

1.3 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. IBC: International Building Code.

D. Interspace: Space between lites of an insulating-glass unit.

1.4 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.5 SUBMITTALS

A. Product Data: For each type of product.

B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.

1. Tinted glass.
2. Coated glass.
3. Laminated glass.
4. Insulating glass.

C. Glazing Accessory Samples: For sealants, in 12-inch lengths. Install sealant Samples between two strips of material representative in color of the adjoining framing system.

D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

E. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

F. Qualification Data: For manufacturers of insulating-glass units with sputter-coated, low-E coatings.

G. Product Certificates: For glass. Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.

H. Product Test Reports: For coated glass, insulating glass, and glazing sealants, for tests performed by a qualified testing agency. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.

I. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved by coated-glass manufacturer.

B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

E. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F.

1.9 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard. Warranty Period: Five years from date of Substantial Completion.

C. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Project: Subject to compliance with requirements, provide Vitro Glazing “Solarban 60 Clear” glass, or comparable product from one of the available manufacturers.

B. Available Manfacturers: Subject to compliance with requirements, provide products by one of the following:

1. AGC Glass Company North America, Inc.
2. Gardner Glass, Inc.
3. Guardian Glass; SunGuard.
4. Oldcastle BuildingEnvelope.
5. Pilkington North America.
6. Schott North America, Inc.
7. Or equal.

C. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type. Obtain reflective-coated glass from single source from single manufacturer.

D. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

2.2 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Design Criteria: : Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the 2016 CBC and ASTM E 1300.

1. Design Wind Pressures: As indicated on Structural Drawings.
2. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.
3. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

C. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

D. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites 6 mm thick.
2. For laminated-glass lites, properties are based on products of construction indicated.
3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.3 GLASS PRODUCTS, GENERAL

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."
2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.

1. Minimum Glass Thickness for Exterior Lites: 6 mm.
2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.

E. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 GLASS PRODUCTS

A. Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.

B. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

C. Heat-Strengthened Float Glass: ASTM C 1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

D. Reflective-Coated Vision Glass: ASTM C 1376.

E. Ceramic-Coated Vision Glass: ASTM C1048, Condition C, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3; and complying with Specification No. 95-1-31 in NGA's "Engineering Standards Manual."

2.5 LAMINATED GLASS

A. Laminated Glass: ASTM C 1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.

1. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written instructions.
2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
3. Interlayer Color: Clear unless otherwise indicated.

2.6 INSULATING GLASS

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.

1. Sealing System: Dual seal, with manufacturer's standard primary and secondary sealants.
2. Perimeter Spacer: Manufacturer's standard spacer material and construction Aluminum with black, color anodic finish.
3. Desiccant: Molecular sieve or silica gel, or a blend of both.

2.7 GLAZING SEALANTS

A. General:

1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Colors of Exposed Glazing Sealants: As selected by State’s Engineer from manufacturer's full range.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

2.8 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 804.3 tape, where indicated.
2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

2.9 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.10 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep systems.
3. Minimum required face and edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.

C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

F. Provide spacers for glass lites where length plus width is larger than 50 inches.

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until right before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant.

G. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 CLEANING AND PROTECTION

A. Immediately after installation remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.

C. Remove and replace glass that is damaged during construction period.

D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.8 MONOLITHIC GLASS SCHEDULE

A. Clear Glass Type: Annealed Heat-strengthened or Fully tempered float glass as required by application.

1. Minimum Thickness: 6 mm.
2. Safety glazing where required.

3.9 INSULATING GLASS SCHEDULE

A. Low-E-Coated, Clear Insulating Glass Type:

1. Basis-of-Design Product: Vitro Solarban 60.
2. Overall Unit Thickness: 1 inch.
3. Minimum Thickness of Each Glass Lite: 6 mm.
4. Outdoor Lite: Annealed, Heat-strengthened, or Fully tempered float glass as required by application.
5. Interspace Content: Air.
6. Indoor Lite: Annealed, Heat-strengthened, or Fully tempered float glass as required by application .
7. Low-E Coating: Sputtered on third surface.
8. Winter Nighttime U-Factor: 0.47 maximum.
9. Summer Daytime U-Factor: 0.50 maximum.
10. Visible Light Transmittance: 79 percent minimum.
11. SGHC: 0.70 maximum.
12. Safety glazing where required.

END OF SECTION

STUDENT HOUSING
INCREMENT 02
Compton College

SECTION 088810: FIRE RATED GLASS & FRAMING
PART 1 GENERAL
1.01 SUMMARY
A. Section Includes: Fire rated temperature rise door system,. 60-90 minute full vision temperature rise doors for interior and exterior applications. Applications of fire temperature rise door system includes Vision lites in full vision temperature rise doors.
1.02 REFERENCES
A. American Society for Testing and Materials (ASTM):
   1. ASTM E152: Methods of Fire Tests of Door Assemblies.
   2. ASTM E163: Methods for Fire Tests of Window Assemblies.
   3. ASTM E2074: Standard Test Method for Fire Tests of Door Assemblies, including Positive Pressure Testing of Side-hinged and Pivoted Swinging Door Assemblies.
   4. ASTM E2010-1: Standard Test for Positive Pressure of Fire Tests of Window Assemblies.
B. National Fire Protection Association (NFPA):
   1. NFPA 80: Fire Doors and Windows.
   2. NFPA 252: Fire Tests of Door Assemblies.
   3. NFPA 257: Fire Tests of Window Assemblies.
C. Underwriters Laboratories, Inc. (UL):
   1. UL 9: Standard for Safety of Fire Tests of Window Assemblies.
   2. UL 10 B: Standard for Safety of Fire Tests of Door Assemblies.
   3. UL 10 C: Standard for Safety of Positive Pressure Fire Tests of Door Assemblies.
D. Standard Council of Canada (ULC):
   1. ULC Standard CAN4-S104: Fire Tests of Door Assemblies.
   2. ULC Standard CAN4-S106: Fire Tests of Window Assemblies.
E. Consumer Product Safety Commission (CPSC):
   1. CPSC 16 CFR 1201: Safety Standard for Architectural Glazing Materials.
F. American National Standards Institute (ANSI):
   1. ANSI Z97.1: Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.
G. Glass Association of North America (GANA)
   1. GANA – Glazing Manual.
   2. FGMA – Sealant Manual.
H. American Recovery and Reinvestment Act
   1. Section 1605, Title XVI Buy American Provision]

1.03 SYSTEM DESCRIPTION

A. Performance Requirements:
   1. Fire Rating: must meet 60-90 minute temperature rise doors as specified. Must meet 250 degrees F/450 degrees F at 30 minutes.
   2. Door Certifications: Doors must be tested in accordance with ASTM E2074-00, NFPA 80, NFPA 252, UL 10B, UL 10C or CAN4-S104.
   3. Testing Laboratory: Fire test must be conducted by a nationally recognized independent testing laboratory.
   4. Glazing: Fire protective glazing must be limited to 100 sq. in. where temperature rise requirements apply. Fire resistive glazing tested to ASTM E-119/UL 263/ULC-S101 up to the max. size tested. All glazing used in doors must meet CPSC Cat. I or II impact safety.
   5. Max. Door Opening Sizes: must meet maximum sizes of 54 in. x 120 in. for single doors and 96 in. x 120 in. for pair doors. No intermediate rails required. For max. door sizes, continuous hinges may be required.

B. Listings and Labels:
   1. Fire rated temperature rise door system shall be under current follow-up service by a nationally recognized independent testing laboratory approved by OSHA and maintain a current listing or certification. Assemblies shall be labeled in accordance with limits of listings.

1.04 SUBMITTALS

A. Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedure Section.
   1. Shop Drawings: Submit shop drawings showing layout, profiles and product components.
   2. Samples: Submit samples for finishes, colors and textures.
   3. Technical Information: Submit latest edition of manufacturer's product data.

1.05 DELIVERY, STORAGE AND HANDLING

A. General: Comply with Division 1 Product Requirements Sections.
B. Ordering: Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.
C. Delivery: Deliver materials to specified destinations in manufacturer's or distributor's packaging undamaged, complete with installation instructions.
D. Storage and Protection: Store off ground, under cover, protected from weather and construction activities and at temperature conditions recommended by manufacturer.

1.06 FABRICATION DIMENSIONS

A. Field Measurements: Verify actual measurements for openings by field measurements before fabrication. Show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

1.07 WARRANTY

A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.
B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document. Manufacturer's warranty is not intended to limit other rights that the Owner may have under the Contract Documents.

PART 2 PRODUCTS

2.01 MANUFACTURERS – FIRE RATED TEMPERATURE RISE DOOR

A. Basis of Design Product, Door Assembly: Subject to compliance with requirements, provide Door System: GPX Builders Series Temperature Rise Framing as distributed by SAFTI *FIRST*™ Fire Rated Glazing Solutions, or equal.

B. Basis of Design Product, Glazing Assembly:: Subject to compliance with requirements, provide (SuperLite ™ II-XL) (SuperLite ™ II-XL IGU) as manufactured and distributed by SAFTI *FIRST* ™ Fire Rated Glazing Solutions, or equal.

C. Fire rated glass and framing must be provided by a single-source, US manufacturer. Distributors of fire rated glass and framing are not to be considered as manufacturers. Materials for the project should be shipped together in the same shipment on the same truck.

2.02 MATERIALS – DOOR

A. Temperature rise 60-90 minute doors.

B. Properties:

1. Constructed in accordance with the individual manufacturer's listings or in accordance with HMMA 861-06 and HMMA 850.
2. Meets 250 degrees F/450 degrees F at 30 minutes.
3. Maximum door opening sizes are 54 in. x 120 in. for single doors and 108 in. x 120 in. for pair doors. No intermediate rails required. For max. door sizes, continuous hinges may be required.
4. Standard door profile includes 6 in. rail and 2 in. frame. Narrow door profile includes 3-3/4 in. rail and 1-1/8 in frame.
5. 10 in. ADA compliant bottom rail (can be modified with AHJ approval).
6. 4 to 5 in. door depth

2.03 MATERIALS – GLASS

A. Assemblies shall be glazed with SuperLite™ glazing products.

B. Properties:

1. Fire protective glass will be limited to 100 sq. in. where temperature rise requirements apply. Fire resistive glass tested to ASTM E-119/UL 263 can be used up to the max. size tested.
2. Individual Lites shall be permanently identified with a listing mark.
3. Glazing material installed in "Hazardous Locations" (subject to human impact) shall be certified to meet the applicable requirements for fire rated assemblies referenced in ANSI Z97.1 Standard for Safety Glazing Materials Used In Buildings and/or CPSC 16 CFR 1201 Safety Standard for Architectural Glazing Materials.
4. Visible daylight transmission: Varies by glazing type. Must meet:

SuperLite II-XL 60	0.856
SuperLite II-XL 60 Starphire	0.898
SuperLite II-XL 90	0.853
SuperLite II-XL 90 Starphire	0.895

5. STC/OITC rating: Varies by glazing type. Must meet:

Product	STC	OITC
SuperLite II-XL 60	42	39
SuperLite II-XL 90	44	40

C. Logo: Each piece of fire rated glazing shall be labeled with a permanent logo.

2.03 FABRICATION

A. Assemblies shall be furnished assembled (should configurations and job site conditions allow)

B. Door assemblies shall be factory prepared for field mounting of hardware.
C. Fabrication Dimensions: Fabricate to approved dimensions. The general contractor shall guarantee dimensions within required tolerance. Obtain approved shop drawings prior to fabrication.

2.04 FINISHES

A. Available with high performance Coraflon fluoropolymer finishes by PPG or other custom finishes including stainless steel or aluminum clad.

2.05 DOOR HARDWARE FOR SINGLE AND PAIR DOORS

A. Hardware shall be supplied with the fire door. Hardware selection shall be from door manufacturer's standard recommended hardware groups as specified below.
B. Provide high traffic areas of areas requiring a door motion force of greater than 15 lbs. with power assisted hardware for use with manufacturer's frame system.

C. Standard operating hardware for standard profile single and pair doors. Please call manufacturer for narrow profile door hardware and custom hardware options (including but not limited to concealed rods, concealed closers, electric strike, etc.)

Quantity	Item	Description	Manufacturer	Finish
4	Hinges	Ball Bearing Heavy Duty Butt Hinges	PBB4B81	US26D
1	Panic Device	Heavy Duty Touch Bar Panic with Surface vertical Rods	Monarch F-25-V	US26D
1	Closing Device	Heavy-duty Surface Applied Closer	LCN 4040XP	Aluminum
1	Auto Door Bottoms	420APKL	Pemko	

PART 3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

A. Compliance: Comply with manufacturer's product data including product technical bulletins and installation instructions.

3.02 EXAMINATION

A. Site Verification of Conditions: Verify substrate conditions, have been previously installed under other sections, and are acceptable for product installation in accordance with manufacturer's instructions. Openings shall be plumb, square and within allowable tolerances. The Architect/Engineer shall be notified of any conditions that jeopardize the integrity of the proposed fire wall/door framing system. Do not proceed until such conditions are corrected.

3.03 INSTALLATION

A. Fire door/window installation shall be by a licensed contractor and in strict accordance with the approved shop drawings.

3.04 CLEANING AND PROTECTION

A. Protect glass from contact with contaminating substances resulting from construction operations. Remove such substances by method approved by manufacturer.

B. Wash glass on both faces not more than four days prior to date schedule for inspections intended to establish date of Substantial Completion. Wash glass by method recommended by glass manufacturer.

C. Remove temporary coverings and protection of adjacent work areas.

D. Remove construction debris from project site and legally dispose of debris.

END OF SECTION

SECTION 088813 - FIRE-RATED GLASS – FIRELITE®

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Fire-rated glazing materials installed as transoms, borrowed lites, and windows in fire-rated frames.

B. Related Sections include the following:

1. Section 081100 “Metal Doors and Frames” for vision panels in interior doors and interior vision panel (borrowed lites) frames.
2. Section 081416 “Flush Wood Doors” for vision panels in interior doors.
3. Section 081433 “Stile and Rail Wood Doors” for vision panels in interior doors.

1.2 References

A. American Society for Testing and Materials (ASTM): ASTM E2010-01: Standard Test Method for Positive Pressure Fire Tests of Window Assemblies.

B. Glass Association of North America (GANA):

1. GANA – Glazing Manual.
2. FGMA – Sealant Manual.

C. National Fire Protection Association (NFPA):

1. NFPA 80: Fire Doors and Windows.
2. NFPA 257 – Fire Tests of Window Assemblies.

D. Underwriters Laboratories, Inc. (UL): UL 9 – Fire Tests of Window Assemblies.

1.3 DEFINITIONS

A. Manufacturer: A firm that produces primary glass, fabricated glass or framing as defined in referenced glazing publications.

1.4 SUBMITTALS

A. Comply with requirements of Section 013300<**Insert Section** #>.

B. Product data: Submit manufacturer’s technical data for each glazing material required, including installation and maintenance instructions.

C. Certificates of compliance from glass and glazing materials manufacturers attesting that glass and glazing materials furnished for project comply with requirements. Separate certification will not be required for glazing materials bearing manufacturer's permanent label designating type and thickness of glass, provided labels represent a quality control program involving a recognized certification agency or independent testing laboratory acceptable to authority having jurisdiction.

D. Product Test Listings: From UL indicating fire-rated glass complies with requirements, based on comprehensive testing of current product.

E. Samples: Submit, for verification purposes, approx. 8-inch by 10-inch sample for each type of glass indicated.

1.5 QUALITY ASSURANCE

A. Glazing Standards: GAMA Glazing Manual and FGMA Sealant Manual.

B. Fire Protective Rated Glass: Each lite shall bear permanent, nonremovable label of UL certifying it for use in tested and rated fire protective assemblies.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to specified destination in manufacturer or distributor's packaging, undamaged, complete with installation instructions.

B. Store off ground, under cover, protected from weather and construction activities.

1.7 WARRANTY

A. Provide manufacturer's limited warranty under provision of Section 017400.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: FireLite® as manufactured by Nippon Electric Glass Company, Ltd., and distributed by Technical Glass Products, 8107 Bracken Place SE, Snoqualmie, WA 98065 phone (800.426.0279) fax (425.396.8300) e-mail sales@fireglass.com, web site http://www.fireglass.com

2.2 PERFORMANCE REQUIREMENTS

A. Fire-rated glass ceramic clear and wireless glazing material listed for use in non-impact safety-rated locations such as transoms and borrowed lites with fire rating requirements ranging from 20 to 90 minutes with required hose stream test.

B. Passes positive pressure test standards UL 10C.

2.3 MATERIALS-GLASS

A. Properties:

1. Thickness: 3/16 inch.
2. Weight: 2.56 lbs/ft2 or 12.5 kg/m2
3. Approximate Visible Transmission: 88 percent.
4. Approximate Visible Reflection: 9 percent.
5. Hardness (Vicker's Scale): 700.
6. Fire-rating: 20 minutes to 90 minutes.
7. Impact Safety Resistance: None.
8. Positive Pressure Test: UL 10C; passes.
9. Surface Finish:

    a. Standard Grade is polished for a surface quality that is comparable to alternative fire-rated ceramics marketed as having a premium finish.
    b. Premium Grade is finish ground and polished on both surfaces to provide superior surface quality, improving overall clarity and providing a surface that is unmatched by alternative products.
    c. Obscure-Patterned surface for privacy

10. Positive Pressure Test: UL 10C; passes.

B. Maximum sheet sizes based on surface finish:

1. Premium: 48 inches by 96 inches.
2. Standard: 48 inches by 96 inches.
3. Obscure: 36 inches by 96 inches.

C. Labeling: Permanently label each piece of FireLite® with the FireLite® logo, UL logo and fire rating in sizes up to 3,325 sq. in., and with the FireLite® label only for sizes that exceed the listing (as approved by the local authority having jurisdiction).

D. Fire Rating: Fire rating classified and labeled by UL for fire rating scheduled at opening locations on drawings, when tested in accordance with NFPA 257.

2.4 GLAZING COMPOUND FOR FIRE-RATED GLAZiNG MATERIALS

A. Glazing Tape: Closed cell polyvinyl chloride (PVC) foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume of 2 percent. Glass panels that exceed 1,393 sq. inches for 90-minute ratings must be glazed with fire-rated glazing tape supplied by manufacturer.

B. Glazing Compound: DAP 33 putty.

C. Silicone Sealant: One-part neutral curing silicone, medium modulus sealant, Type S; Grade NS; Class 25 with additional movement capability of 50 percent in both extension and compression (total 100 percent); Use (Exposure) NT; Uses (Substrates) G, A, and O as applicable. Available Products:

1. Dow Corning 795 - Dow Corning Corp.
2. Silglaze-II 2800 - General Electric Co.
3. Spectrem 2 - Tremco Inc.

D. Setting Blocks: Neoprene, EPDM, or silicone; tested for compatibility with glazing compound; of 70 to 90 Shore A hardness.

E. Cleaners, Primers, and Sealers: Type recommended by manufacturer of glass and gaskets.

2.5 FABRICATION

A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standard as required to comply with system performance requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine glass framing, with glazier present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, offsets at corners.
2. Minimum required face or edge clearances.
3. Observable edge damage or face imperfections.

B. Do not proceed with glazing until unsatisfactory conditions have been corrected.

C. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings that are not firmly bonded to substrates.

3.2 INSTALLATION (GLAZING)

A. Comply with referenced FGMA standards and instructions of manufacturers of glass, glazing sealants, and glazing compounds.

B. Protect glass from edge damage during handling and installation. Inspect glass during installation and discard pieces with edge damage that could affect glass performance.

C. Set units of glass in each series with uniformity of pattern, draw, bow, and similar characteristics.

D. Cut glazing tape to length and set against permanent stops, flush with sight lines to fit openings exactly, with stretch allowance during installation.

E. Place setting blocks located at quarter points of glass with edge block no more than 6 inches from corners.

F. Glaze vertically into labeled fire-rated metal frames or partition walls with same fire rating as glass and push against tape for full contact at perimeter of pane or unit.

G. Place glazing tape on free perimeter of glazing in same manner described above.

H. Install removable stop and secure without displacement of tape.

I. Use specified glazing compound, without adulteration; bed glazing material in glazing compound; entirely fill all recess and spaces. Provide visible glazing compound with smooth and straight edges.

J. Install so that appropriate FireLite® markings remain permanently visible.

3.3 PROTECTION AND CLEANING

A. Protect glass from contact with contaminating substances resulting from construction operations. Remove any such substances by method approved by glass manufacturer.

B. Wash glass on both faces not more than four days prior to date scheduled for inspections intended to establish date of substantial completion. Wash glass by method recommended by glass manufacturer.

3.4 GLAZING SCHEDULE

Rating	Assembly	Max. Exposed Area (Sq. In.)	Max. Width Of Exposed Glazing (In.)	**OR**	Max. Height Of Exposed Glazing (In.)	Stop Height
20 to 60 min.	Other than doors	3,325	95		95	5/8”
	HMS or wood*	3,325	95		95	3/4"
90 min.	Fireframes®	2,627	56 ½”		56 ½”	5/8”
	D.S.	2,627	56 ½”		56 ½”	3/4"
	Other than doors					
	HMS					
	Fireframes					
	D.S.					

A. HMS indicates hollow metal steel framing. Fireframes® D.S. indicates Designer Series narrow profile framing available from TGP. For wood frames, check with manufacturer for maximum tested glass sizes.

END OF SECTION

SECTION 089119 - FIXED LOUVERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fixed extruded-aluminum louvers.
2. Blank-off panels for louvers

B. Related Requirements:

1. Section 081113 "Hollow Metal Doors and Frames" for louvers in hollow-metal doors.
2. Section 081416 "Flush Wood Doors" for louvers in flush wood doors.

1.3 DEFINITIONS

A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.

B. Horizontal Louver: Louver with horizontal blades (i.e., the axis of the blades are horizontal).

C. Vertical Louver: Louver with vertical blades (i.e., the axis of the blades are vertical).

D. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.

E. Wind-Driven-Rain-Resistant Louver: Louver that provides specified wind-driven-rain performance, as determined by testing according to AMCA 500-L.

F. Windborne-Debris-Impact-Resistant Louver: Louver that provides specified windborne-debris-impact resistance, as determined by testing according to AMCA 540.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.

B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.

1. Show weep paths, gaskets, flashings, sealants, and other means of preventing water intrusion.
2. Show mullion profiles and locations.

C. Samples: Color samples for each type of metal finish required.

D. Delegated-Design Submittal: For louvers indicated to comply with structural and seismic performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.6 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 WARRANTY

A. Special Finish Warranty: Manufacturer agrees to repair or replace components on which finishes fail in materials or workmanship within specified warranty period.

1. Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain fixed louvers from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design louvers, including comprehensive engineering analysis by a qualified professional engineer, using structural and seismic performance requirements and design criteria indicated.

B. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver-blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.

1. Wind Loads: Determine loads based on pressures as indicated on Structural Drawings.

C. Seismic Performance: As indicated on Structural drawings.

D. Seismic Performance: Louvers, including attachments to other construction, shall withstand the effects of earthquake motions determined according to 2019 CBC.

E. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

G. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

2.3 FIXED EXTRUDED-ALUMINUM LOUVERS

A. Horizontal Nondrainable-Blade Louver:

1. Basis of Design Product: Subject to compliance with requirements, provide Pottorff EFD 435 louver assembly, or comparable product from one of the available manufacturers.

2. Available Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Air Balance; a division of MESTEK, Inc.

   b. Airolite Company, LLC (The).

   c. Carnes Company.

   d. Cesco Products; a division of MESTEK, Inc.

   e. Construction Specialties, Inc.

   f. Greenheck Fan Corporation.

   g. Or equal.

3. Louver Depth: 4 inches.
4. Blade Profile: Plain blade without center baffle.
5. Frame and Blade Nominal Thickness: Not less than 0.080 inch.
6. Mullion Type: Fully recessed.
7. Louver Performance Ratings:

   a. Free Area: Not less than 7.5 sq. ft. for 48-inch-wide by 48-inch-high louver.
   b. Point of Beginning Water Penetration: Not less than 700 fpm.

8. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.4 LOUVER SCREENS

A. General: Provide screen at each exterior louver.

   1. Screen Location for Fixed Louvers: Interior face.
   2. Screening Type: Bird screening.

B. Secure screen frames to louver frames with stainless-steel machine screws, spaced a maximum of 6 inches from each corner and at 12 inches o.c.

C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.

   1. Metal: Same type and form of metal as indicated for louver to which screens are attached. Reinforce extruded-aluminum screen frames at corners with clips.
   2. Finish: Same finish as louver frames to which louver screens are attached.
   3. Type: Rewirable frames with a driven spline or insert.

D. Louver Screening for Aluminum Louvers:

1. Bird Screening: Aluminum, 1/4-inch-square mesh, 0.063-inch wire.

2.5 MATERIALS

A. Aluminum Extrusions: ASTM B221, Alloy 6063-T5, T-52, or T6.

B. Aluminum Sheet: ASTM B209, Alloy 3003 or 5005, with temper as required for forming, or as otherwise recommended by metal producer for required finish.

C. Fasteners: Use types and sizes to suit unit installation conditions.

1. Use tamper-resistant screws for exposed fasteners unless otherwise indicated.
2. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.

D. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, fabricated from stainless-steel components, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing according to ASTM E488/E488M conducted by a qualified testing agency.

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

F. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

G. Recycled Content of Aluminum Components: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

2.6 FABRICATION

A. Factory assemble louvers to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Vertical Assemblies: Where height of louver units exceeds fabrication and handling limitations, fabricate units to permit field-bolted assembly with close-fitting joints in jambs and mullions, reinforced with splice plates.

1. Horizontal Mullions: Provide horizontal mullions at joints.

C. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.

D. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

1. Frame Type: Channel unless otherwise indicated.

E. Include supports, anchorages, and accessories required for complete assembly.

F. Provide vertical mullions of type and at spacings indicated, but not more than is recommended by manufacturer, or 72 inches o.c., whichever is less.

1. Fully Recessed Mullions: Where indicated, provide mullions fully recessed behind louver blades. Where length of louver exceeds fabrication and handling limitations, fabricate with close-fitting blade splices designed to permit expansion and contraction.
2. Semirecessed Mullions: Where indicated, provide mullions partly recessed behind louver blades, so louver blades appear continuous. Where length of louver exceeds fabrication and handling limitations, fabricate with interlocking split mullions and close-fitting blade splices designed to permit expansion and contraction.
3. Exposed Mullions: Where indicated, provide units with exposed mullions of same width and depth as louver frame. Where length of louver exceeds fabrication and handling limitations, provide interlocking split mullions designed to permit expansion and contraction.

G. Join frame members to each other and to fixed louver blades with fillet welds concealed from view unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.7 ALUMINUM FINISHES

A. Finish louvers after assembly.

B. High-Performance Organic Finish: Three-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color and Gloss: Match Architect's sample.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Protect unpainted galvanized- and nonferrous-metal surfaces that are in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.

F. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 079200 "Joint Sealants" for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

A. Clean exposed louver surfaces that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.

B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

C. Restore louvers damaged during installation and construction, so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION

SECTION 092116.23 - GYPSUM BOARD SHAFT WALL ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes gypsum board shaft wall assemblies.

1.3 ACTION SUBMITTALS

A. Product Data: For each component of gypsum board shaft wall assembly.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and support them on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Comply with gypsum-shaftliner-board manufacturer's written instructions.

B. Do not install finish panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, moisture damaged, or mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.

B. STC-Rated Assemblies: Provide materials and construction identical to those of assemblies tested according to ASTM E90 and classified according to ASTM E413 by a testing and inspecting agency.

2.2 GYPSUM BOARD SHAFT WALL ASSEMBLIES

A. Fire-Resistance Rating: As indicated.

B. STC Rating: As indicated.

C. Gypsum Shaftliner Board:

1. Type X: ASTM C1396/C1396M; manufacturer's proprietary fire-resistive liner panels with paper faces, 1 inch thick, with double beveled long edges.

    a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

        1) USG Corporation.

        2) CertainTeed Corporation.
        3) Georgia-Pacific Gypsum LLC.
        4) National Gypsum Company.
        5) PABCO Gypsum.
        6) Or equal.

2. Moisture- and Mold-Resistant Type X: ASTM C1396/C1396M; manufacturer's proprietary fire-resistive liner panels with ASTM D3273 mold-resistance score of 10 as rated according to ASTM D3274, 1 inch thick, and with double beveled long edges.

    a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

        1) USG Corporation.

2) CertainTeed Corporation.
3) CertainTeed Gypsum.
4) Georgia-Pacific Gypsum LLC.
5) National Gypsum Company.
6) PABCO Gypsum.
7) Or equal.

D. Non-Load-Bearing Steel Framing, General: Complying with ASTM C645 requirements for metal unless otherwise indicated and complying with requirements for fire-resistance-rated assembly indicated. Protective Coating: ASTM A653/A653M, G40, hot-dip galvanized unless otherwise indicated.

E. Studs: Manufacturer's standard profile for repetitive, corner, and end members as follows:

1. Depth: As indicated.
2. Minimum Base-Metal Thickness: 0.030 inch.

F. Runner Tracks: Manufacturer's standard J-profile track with manufacturer's standard long-leg length, but at least 2 inches long and matching studs in depth. Minimum Base-Metal Thickness: Matching steel studs.

G. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. CEMCO; California Expanded Metal Products Co.
b. ClarkDietrich.
c. Fire Trak Corp.
d. GCP Applied Technologies Inc.

H. Elevator-Hoistway-Entrance Struts: Manufacturer's standard J-profile jamb strut with long-leg length of 3 inches, matching studs in depth, and not less than 0.033 inch thick.

I. Finish Panels: Gypsum board as specified in Section 092900 "Gypsum Board.".

J. Sound Attenuation Blankets: As specified in Section 092900 "Gypsum Board."

2.3 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with shaft wall manufacturer's written instructions.

B. Trim Accessories: Cornerbead, edge trim, and control joints of material and shapes as specified in Section 092900 "Gypsum Board" that comply with gypsum board shaft wall assembly manufacturer's written instructions for application indicated.

C. Steel Drill Screws: ASTM C1002 unless otherwise indicated.

D. Track Fasteners: Power-driven fasteners of size and material required to withstand loading conditions imposed on shaft wall assemblies without exceeding allowable design stress of track, fasteners, or structural substrates in which anchors are embedded.

1. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E488/E488M conducted by a qualified testing agency.
2. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E1190 conducted by a qualified testing agency.

E. Reinforcing: Galvanized-steel reinforcing strips with 0.033-inch minimum thickness of base metal (uncoated).

F. Acoustical Sealant: Section 079219 "Acoustical Joint Sealants."

G. Gypsum Board Cants:

1. Gypsum Board Panels: As specified in Section 092900 "Gypsum Board," Type X, 1/2- or 5/8-inch panels.
2. Adhesive: Laminating adhesive as specified in Section 092900 "Gypsum Board."
3. Non-Load-Bearing Steel Framing: As specified in Section 092216 "Non-Structural Metal Framing."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install gypsum board shaft wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated and manufacturer's written installation instructions.

B. Do not bridge building expansion joints with shaft wall assemblies; frame both sides of expansion joints with furring and other support.

C. Install supplementary framing in gypsum board shaft wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, wall-mounted door stops, and similar items that cannot be supported directly by shaft wall assembly framing.

1. Elevator Hoistway: At elevator hoistway-entrance door frames, provide jamb struts on each side of door frame.
2. Reinforcing: Provide where items attach directly to shaft wall assembly as indicated on Drawings; accurately position and secure behind at least one layer of face panel.

D. Penetrations: At penetrations in shaft wall, maintain fire-resistance rating of shaft wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons and floor indicators, and similar items.

E. Isolate perimeter of gypsum panels from building structure to prevent cracking of panels while maintaining continuity of fire-rated construction.

F. Firestop Tracks: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

G. Control Joints: Install control joints according to ASTM C840 and in specific locations approved by Architect while maintaining fire-resistance rating of gypsum board shaft wall assemblies.

H. Sound-Rated Shaft Wall Assemblies: Seal gypsum board shaft walls with acoustical sealant at perimeter of each assembly where it abuts other work and at joints and penetrations within each assembly.

I. Gypsum Board Cants: At projections into shaft exceeding 4 inches and where indicated, install gypsum board cants covering tops of projections.

1. Slope cant panels at least 75 degrees from horizontal. Set base edge of panels in adhesive and secure top edges to shaft walls at 24 inches o.c. with screws fastened to shaft wall framing.
2. Where non-load-bearing steel framing is required to support gypsum board cants, install framing at 24 inches o.c. and extend studs from the projection to shaft wall framing.

J. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.3 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, or mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Non-load-bearing steel framing systems for interior partitions.
2. Suspension systems for interior ceilings and soffits.
3. Grid suspension systems for gypsum board ceilings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of code-compliance certification for studs and tracks.

B. Evaluation Reports: For firestop tracks, post-installed anchors, and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.5 QUALITY ASSURANCE

A. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud Association, the Steel Framing Industry Association, or the Steel Stud Manufacturers Association.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

C. Horizontal Deflection: For composite wall assemblies, limited to 1/360 of the wall height based on horizontal loading of 5 lbf/sq. ft..

2.2 FRAMING SYSTEMS

A. Framing Members, General: Comply with ASTM C754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C645 requirements for steel unless otherwise indicated.
2. Protective Coating: ASTM A653/A653M, G40, hot-dip galvanized unless otherwise indicated.

B. Studs and Tracks: ASTM C645.

1. Steel Studs and Tracks:

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1) CEMCO; California Expanded Metal Products Co.
2) ClarkDietrich.
3) MarinoWARE.
4) SCAFCO Steel Stud Company.
5) Or equal.

b. Minimum Base-Steel Thickness: 0.0329 inch.
c. Depth: As indicated on Drawings.

C. Slip-Type Head Joints: Where indicated, provide one of the following:

1. Clip System: Clips designed for use in head-of-wall deflection conditions that provide a positive attachment of studs to tracks while allowing 1-1/2-inch minimum vertical movement.

    a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

        1) CEMCO; California Expanded Metal Products Co.
        2) ClarkDietrich.
        3) MarinoWARE.
        4) SCAFCO Steel Stud Company.
        5) Or equal.

2. Single Long-Leg Track System: ASTM C645 top track with 2-inch-deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top track and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
3. Double-Track System: ASTM C645 top outer tracks, inside track with 2-inch-deep flanges in thickness not less than indicated for studs and fastened to studs, and outer track sized to friction-fit over inner track.
4. Deflection Track: Steel sheet top track manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

    a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

        1) CEMCO; California Expanded Metal Products Co.
        2) ClarkDietrich.
        3) MarinoWARE.
        4) SCAFCO Steel Stud Company.
        5) Or equal.

D. Firestop Tracks: Top track manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. CEMCO; California Expanded Metal Products Co.
    b. ClarkDietrich.
    c. Fire Trak Corp.
    d. MarinoWARE.

e. SCAFCO Steel Stud Company.
f. Or equal.

E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base-Steel Thickness: 0.0329 inch.

F. Cold-Rolled Channel Bridging: Steel, 0.0538-inch minimum base-steel thickness, with minimum 1/2-inch-wide flanges.

1. Depth: 1-1/2 inches.
2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch-thick, galvanized steel.

G. Hat-Shaped, Rigid Furring Channels: ASTM C645.

1. Minimum Base-Steel Thickness: 0.0179 inch.
2. Depth: .

H. Resilient Furring Channels: 1/2-inch-deep, steel sheet members designed to reduce sound transmission.

1. Configuration: Asymmetrical or hat shaped.

I. Cold-Rolled Furring Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges.

1. Depth: 3/4 inch.
2. Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum uncoated-steel thickness of 0.0329 inch.
3. Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch-diameter wire.

J. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum uncoated-steel thickness of 0.0179 inch, and depth required to fit insulation thickness indicated.

2.3 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch-diameter wire.

B. Wire Hangers: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.

C. Flat Hangers: Steel sheet, 1 by 3/16 inch by length indicated.

D. Carrying Channels (Main Runners): Cold-rolled, commercial-steel sheet with a base-steel thickness of 0.0538 inch and minimum 1/2-inch-wide flanges.

1. Depth: 1-1/2 inches.

E. Furring Channels (Furring Members):

1. Cold-Rolled Channels: 0.0538-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges, 3/4 inch deep.
2. Steel Studs and Tracks: ASTM C645.

a. Minimum Base-Steel Thickness: 0.0329 inch.
b. Depth: 1-5/8 inches.

3. Hat-Shaped, Rigid Furring Channels: ASTM C645, 7/8 inch deep.

a. Minimum Base-Steel Thickness: 0.0179 inch 0.0296 inch Insert thickness.

4. Resilient Furring Channels: 1/2-inch-deep members designed to reduce sound transmission.

a. Configuration: Asymmetrical or hat shaped.

F. Grid Suspension System for Gypsum Board Ceilings: ASTM C645, direct-hung system composed of main beams and cross-furring members that interlock.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Armstrong World Industries, Inc.
b. Rockfon (Rockwool International).
c. USG Corporation.
d. Or equal.

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

B. Isolation Strip at Exterior Walls: Provide one of the following:

1. Asphalt-Saturated Organic Felt: ASTM D226/D226M, Type I (No. 15 asphalt felt), nonperforated.
2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C754.

1. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C1063 that apply to framing installation.
2. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.

B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.

C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

D. Install bracing at terminations in assemblies.

E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Single-Layer Application: As required by horizontal deflection performance requirements but not more than 16 inches o.c. unless otherwise indicated.

2. Multilayer Application: As required by horizontal deflection performance requirements but not more than 16 inches o.c. unless otherwise indicated.
3. Tile Backing Panels: As required by horizontal deflection performance requirements 16 inches o.c. unless otherwise indicated.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.

    a. Install two studs at each jamb unless otherwise indicated.
    b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
    c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

    a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
6. Curved Partitions:

    a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
    b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of no fewer than two studs at ends of arcs, place studs 6 inches o.c.

E. Direct Furring:

1. Screw to wood framing.
2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

F. Z-Shaped Furring Members:

1. Erect insulation, specified in Section 072100 "Thermal Insulation," vertically and hold in place with Z-shaped furring members spaced 24 inches o.c.
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.5 INSTALLING CEILING SUSPENSION SYSTEMS

A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Hangers: 48 inches o.c.
2. Carrying Channels (Main Runners): 48 inches o.c.
3. Furring Channels (Furring Members): 16 inches o.c.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

    a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

    a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
5. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.

F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

G. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior gypsum board.

B. Related Requirements:

1. Section 061600 "Sheathing" for gypsum sheathing for exterior walls.
2. Section 079219 "Acoustical Joint Sealants" for acoustical joint sealants installed in gypsum board assemblies.
3. Section 092116.23 "Gypsum Board Shaft Wall Assemblies" for metal shaft-wall framing, gypsum shaft liners, and other components of shaft-wall assemblies.
4. Section 092216 "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Glass-mat interior gypsum board.
2. Interior trim.
3. Aluminum trim.
4. Joint treatment materials.
5. Laminating adhesive.
6. Sound-attenuation blankets.
7. Acoustical sealant.

B. Samples: For the following products:

1. Trim Accessories: Full-size Sample in 12-inch-long length for each trim accessory indicated.

1.4 QUALITY ASSURANCE

A. Mockups: Build mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Build mockups for the following:

a. Each level of gypsum board finish indicated for use in exposed locations.
b. Each texture finish indicated.

2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
3. Simulate finished lighting conditions for review of mockups.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

B. Core: 5/8 inch, Type X unless indicated otherwise.

2.3 SPECIALTY GYPSUM BOARD

A. Glass-Mat Interior Gypsum Board: ASTM C1658/C1658M. With fiberglass mat laminated to both sides. Specifically designed for interior use.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Georgia-Pacific Gypsum LLC. Fiberglass-Mat Faced Gypsum Board: DensArmor Plus Interior Panel (BOD).
    b. National Gypsum Company.
    c. USG Corporation.
    d. Or equal.

2. Core: 5/8 inch, Type X.
3. Long Edges: Tapered.
4. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

B. Impact-Resistant Gypsum Board: ASTM C1396/C1396M gypsum board, tested in accordance with ASTM C1629/C1629M.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. American Gypsum.
    b. CertainTeed; SAINT-GOBAIN.
    c. Georgia-Pacific Gypsum LLC.
    d. Gold Bond Building Products, LLC provided by National Gypsum Company.
    e. PABCO Gypsum.
    f. USG Corporation.

2. Core: 5/8 inch, Type X.

3. Surface Abrasion: ASTM C1629/C1629M, meets or exceeds Level 1 requirements.
4. Indentation: ASTM C1629/C1629M, meets or exceeds Level 1 requirements.
5. Hard-Body Impact: ASTM C1629/C1629M, meets or exceeds Level 1 requirements in accordance with test in Annex A1.
6. Long Edges: Tapered.
7. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.

2.4 TRIM ACCESSORIES

A. Interior Trim: ASTM C1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
2. Shapes:

a. Cornerbead.
b. Bullnose bead.
c. LC-Bead: J-shaped; exposed long flange receives joint compound.
d. L-Bead: L-shaped; exposed long flange receives joint compound.
e. Expansion (control) joint.
f. Curved-Edge Cornerbead: With notched or flexible flanges.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. ClarkDietrich.
b. Flannery, Inc.
c. Fry Reglet Corporation.
d. Gordon, Inc.
e. Pittcon Industries.
f. Tamlyn.
g. Or equal.

2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B221, Alloy 6063-T5.
3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

2.5 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C475/C475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.
2. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.

C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.

    a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use drying-type, all-purpose compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.

2.6 AUXILIARY MATERIALS

A. Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

C. Steel Drill Screws: ASTM C1002 unless otherwise indicated.

1. Use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inch thick.

D. Sound-Attenuation Blankets: ASTM C665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

E. Acoustical Sealant: As specified in Section 079219 "Acoustical Joint Sealants."

F. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION AND FINISHING OF PANELS, GENERAL

A. Comply with ASTM C840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch-wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch-wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 INSTALLATION OF INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Wallboard Type: As indicated on Drawings.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

    a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
    b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.

3. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing

member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.

2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. On Z-shaped furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written instructions and temporarily brace or fasten gypsum panels until fastening adhesive has set.

E. Curved Surfaces:

1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12-inch-long straight sections at ends of curves and tangent to them.
2. For double-layer construction, fasten base layer to studs with screws 16 inches o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches o.c.

3.4 INSTALLATION OF TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners unless otherwise indicated.
2. LC-Bead: Use at exposed panel edges.
3. L-Bead: Use where indicated.
4. U-Bead: Use where indicated.
5. Curved-Edge Cornerbead: Use at curved openings.

D. Aluminum Trim: Install in locations indicated on Drawings.

3.5 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Where indicated on Drawings.
3. Level 3: Where indicated on Drawings.
4. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.

    a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

E. Glass-Mat Gypsum Sheathing Board: Finish according to manufacturer's written instructions for use as exposed soffit board.

F. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.

3.6 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

SECTION 092910-ACOUSTIC ISOLATION PADS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes installation of acoustic isolation pads over penetrations and junction boxes within all partitions containing sound insulation, including but not limited to, demising partitions, corridor partitions, walls adjacent to stairwells, shafts, and similar conditions.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 QUALITY ASSURANCE

A. Mockups: Install five mockups to demonstrate and set quality standards for materials and execution.

PART 2 - PRODUCTS

2.1 PRODUCT

A. Basis of Design Product: Subject to compliance with requirements, provide Lowry & Associates “Lowry’s Electrical Box Pads,” or approved equal. Comply with the following

1. Material Composition

    a. Polybutene - butyl, inert fillers
    b. Shall not contain asbestos.

2. Shelf Life - 1 year
3. Service Temperature – 30 deg.· to 200 deg. F.
4. Adhesion - adheres readily to metal or plastic.
5. Minimum Thickness - 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates for compliance with requirements and other conditions affecting performance.

3.2 INSTALLATION

A. Install in accordance with manufacturer's written recommendations. Secure pads with positive attachment to prevent dislodgment.

B. Brush or wipe construction dust and dirt from box surface. If surface is contaminated with oil, etc., wipe with xylene or toluene to remove residue.

C. Center electrical box pad on the back of the junction box. Mold around conduit and cable entering the box. Mold cover around box sides covering all openings.

END OF SECTION

SECTION 093013 - CERAMIC TILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Porcelain tile.
2. Metal edge strips.

B. Related Requirements:

1. Section 079200 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
2. Section 092900 "Gypsum Board" for glass-mat, water-resistant backer board for ceramic tile installation.

1.3 DEFINITIONS

A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.

B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in its "Specifications for Installation of Ceramic Tile."

C. Face Size: Actual tile size, excluding spacer lugs.

D. Module Size: Actual tile size plus joint width indicated.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

C. Samples for Verification:

1. Full-size units of each type and composition of tile and for each color and finish required.
2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required. Make samples at least 36 inches square, but not fewer than four tiles. Use grout of type and in color or colors approved for completed Work.
3. Full-size units of each type of trim and accessory for each color and finish required.
4. Stone thresholds in 6-inch lengths.
5. Metal edge strips in 6-inch lengths.

1.6 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of product.

B. Product Test Reports: For tile-setting and -grouting products.

1.7 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup of each type of floor tile installation.
2. Build mockup of each type of wall tile installation.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

D. Store liquid materials in unopened containers and protected from freezing.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Tile: Obtain tile of each type and color or finish from single source or producer. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.

1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.
2. Obtain waterproof membrane, except for sheet products, from manufacturer of setting and grouting materials.

C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer:

1. Stone thresholds.
2. Waterproof membrane.
3. Cementitious backer units.
4. Metal edge strips.

2.2 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated. Revise subparagraph below if seconds (Second grade tile units) are acceptable. Second grade tile must comply with all requirements for Standard grade tile, except that examination for facial defects is done at a distance of 10 feet (3 m) instead of 3 feet (914 mm). Provide tile complying with Standard grade requirements unless otherwise indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated. Where tile is indicated for installation on exteriors or in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

E. Product Characteristics, Ceramic Tile Flooring: Ceramic Tile Flooring shall be stable, firm, and slip resistant, Comply with CBC Section 11B-302.1

2.3 TILE PRODUCTS

A. Basis of Design Products: Subject to compliance with requirements, provide tile products indicated in “Materials and Color Schedule” on Drawings.

2.4 THRESHOLDS

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch or less above adjacent floor surface.

2.5 TILE BACKING PANELS

A. General: Subject to compliance with requirements, refer to Section 062900 –Grysom Board for tile backing panels.

2.6 WATERPROOF MEMBRANE

A. General: Manufacturer's standard product, selected from the following, that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

B. Chlorinated Polyethylene Sheet: Nonplasticized, chlorinated polyethylene faced on both sides with nonwoven polyester fabric.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following: Noble Company (The).

2. Nominal Thickness: 0.040 inch.

C. PVC Sheet: PVC heat-fused on both sides to facings of nonwoven polyester.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Compotite Corporation.

b. Noble Company (The).

c. Or equal.

2. Nominal Thickness: 0.040 inch.

D. Fabric-Reinforced, Modified-Bituminous Sheet: Self-adhering, SBS-modified-bituminous sheet with fabric reinforcement facing; 0.040-inch nominal thickness.

E. Fabric-Reinforced, Fluid-Applied Membrane: System consisting of liquid-latex rubber or elastomeric polymer and continuous fabric reinforcement.

F. Waterproofing and Tile-Setting Adhesive: One-part, fluid-applied product intended for use as both waterproofing and tile-setting adhesive in a two-step process.

2.7 SETTING MATERIALS

A. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.02.

1. Cleavage Membrane: Asphalt felt, ASTM D226/D226M, Type I (No. 15); or polyethylene sheeting, ASTM D4397, 4.0 mils thick.
2. Reinforcing Wire Fabric: Galvanized, welded-wire fabric, 2 by 2 inches by 0.062-inch diameter; comply with ASTM A185/A185M and ASTM A82/A82M, except for minimum wire size.
3. Latex Additive: Manufacturer's standard acrylic resin or styrene-butadiene-rubber water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement and aggregate mortar bed.

B. Improved Modified Dry-Set Mortar (Thinset): ANSI A118.15.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. ARDEX Americas.

b. Bonsal American, an Oldcastle company.

c. C-Cure.

d. Custom Building Products.

e. H.B. Fuller Construction Products Inc. / TEC.

f. LATICRETE SUPERCAP, LLC.

g. MAPEI Corporation.

h. Merkrete; a Parex USA, Inc. brand.

i. Or equal.

2. Provide prepackaged, dry-mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid-latex additive at Project site.
3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.15.

2.8 GROUT MATERIALS

A. High-Performance Tile Grout: ANSI A118.7.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. ARDEX Americas.

b. Boiardi Products Corporation; a QEP company.

c. Bostik, Inc.

d. C-Cure.

e. Custom Building Products.

f. LATICRETE SUPERCAP, LLC.

g. MAPEI Corporation.

h. Summitville Tiles, Inc.

i. Or equal.

2. Polymer Type: Acrylic resin or styrene-butadiene rubber in liquid-latex form for addition to prepackaged dry-grout mix.

2.9 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Vapor-Retarder Membrane: Polyethylene sheeting, ASTM D4397, 4.0 mils thick.

C. Metal Edge Strips: Angle or L-shaped, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; stainless steel, ASTM A276/A276M or ASTM A666, 300 Series exposed-edge material.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Blanke Corporation.

b. Ceramic Tool Company, Inc.

c. Schluter Systems L.P.

d. Or equal.

D. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

E. Floor Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Bonsal American, an Oldcastle company.

b. Custom Building Products.

c. Summitville Tiles, Inc.

d. Or equal.

2.10 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
2. Verify that concrete substrates for tile floors installed with thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.

    a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
    b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.

3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Where indicated, prepare substrates to receive waterproof membrane by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.

C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 INSTALLATION OF CERAMIC TILE

A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:

    a. Exterior tile floors.
    b. Tile floors in wet areas.
    c. Tile floors consisting of tiles 8 by 8 inches or larger.
    d. Tile floors consisting of rib-backed tiles.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

E. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.

F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

1. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
2. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

G. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:

1. Porcelain Tile: 1/16 inch.

H. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

I. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.

J. Metal Edge Strips: Install at locations indicated, where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile and where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with or below top of tile and no threshold is indicated.

3.4 INSTALLATION OF TILE BACKING PANEL

A. Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated.

3.5 INSTALLATION OF WATERPROOF MEMBRANE

A. Install waterproof membrane to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.

B. Allow waterproof membrane to cure and verify by testing that it is watertight before installing tile or setting materials over it.

3.6 ADJUSTING AND CLEANING

A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.

B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3.7 PROTECTION

A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.8 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

A. Interior Floor Installations, Concrete:

1. Ceramic Tile Installation: TCNA F144; thinset mortar on waterproof membrane.

    a. Ceramic Tile Type: As indicated in Finish Schedule.
    b. Thinset Mortar: Improved modified dry-set mortar.
    c. Grout: High-performance unsanded grout.

B. Interior Wall Installations, Metal Studs and Backing Panels:

1. Ceramic Tile Installation: TCNA W244C or TCNA W244F; thinset mortar on cementitious backer units or fiber-cement backer board over vapor-retarder membrane.

    a. Ceramic Tile Type: As indicated in Finish Schedule.
    b. Thinset Mortar: Improved modified dry-set mortar.
    c. Grout: High-performance unsanded grout.

END OF SECTION

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes acoustical panels and exposed suspension systems for interior ceilings.

1.3 SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified, 6 inches in size.

C. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Ceiling suspension-system members.
2. Structural members to which suspension systems will be attached.
3. Method of attaching hangers to building structure.
4. Carrying channels or other supplemental support for hanger-wire attachment where conditions do not permit installation of hanger wires at required spacing.
5. Size and location of initial access modules for acoustical panels.
6. Items penetrating finished ceiling and ceiling-mounted items including the following:

    a. Lighting fixtures.
    b. Diffusers.
    c. Grilles.
    d. Speakers.
    e. Sprinklers.
    f. Access panels.
    g. Perimeter moldings.

7. Show operation of hinged and sliding components covered by or adjacent to acoustical panels.

8. Minimum Drawing Scale: 1/4 inch = 1 foot.

D. Qualification Data: For testing agency.

E. Product Test Reports: For each acoustical panel ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency or a qualified testing agency.

F. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.

G. Field quality-control reports.

H. Maintenance Data: For finishes to include in maintenance manuals.

I. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Units: Full-size panels equal to 2 percent of quantity installed.
2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.
3. Hold-Down Clips: Equal to 2 percent of quantity installed.

1.4 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Build mockup of typical ceiling area as shown on Drawings.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain each type of acoustical ceiling panel and its supporting suspension system from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Suspended ceilings shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 and 2019 CBC.

B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Class A according to ASTM E 1264.
2. Smoke-Developed Index: 50 or less.

C. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency. Indicate design designations from UL or from the listings of another qualified testing agency.

2.3 ACOUSTICAL PANELS

A. Acoustical Panel Standard: Provide manufacturer's standard panels according to ASTM E 1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.

B. Basis of Design Product: Subject to compliance with requirements, provide ceiling panel products as indicated in the “Materials and Colors Schedule” on Drawings, or comparable products from one of the available manufacturers.

C. Available Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Gypsum.
2. CertainTeed Corporation.

3. USG Corporation.
4. Or equal.

D. Antimicrobial Treatment: Manufacturer's standard broad spectrum, antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273, ASTM D 3274, or ASTM G 21 and evaluated according to ASTM D 3274 or ASTM G 21.

2.4 METAL SUSPENSION SYSTEM

A. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C 635/C 635M and designated by type, structural classification, and finish indicated. Comply with ASTM C635-07 and Section 5.1 of ASTM E580-10A.

B. Basis of Design Product: Subject to compliance with requirements, provide Armstrong “Prelude” suspension system, or equal. Comply with the following.

1. Product Evaluation Report Type And Number: EST 1308.
2. Manufacturer’s Model Number, Main Runner: 7300 Series.
3. Manufacturer’s Catalog Number: 7300 Series.

C. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized, G30 coating designation; with prefinished 15/16-inch-wide metal caps on flanges.

1. Structural Classification: Heavy-duty system as defined by ASTM C635-08.
2. End Condition of Cross Runners: Override (stepped) or butt-edge type.
3. Face Design: Flat, flush.
4. Cap Material: Cold-rolled steel.
5. Cap Finish: Painted white.

2.5 ACCESSORIES

A. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

B. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.

C. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.

D. Seismic Hold-Down Clips: Armstrong BERC-2 (ESR 1308).

E. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.

F. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

2.6 METAL EDGE MOLDINGS AND TRIM

A. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners. Edge moldings shall fit acoustical panel edge details and suspension systems indicated and match width and configuration of exposed runners unless otherwise indicated.

2.7 ACOUSTICAL SEALANT

A. Acoustical Sealant: As specified in Section 07921 "Acoustical Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders unless otherwise indicated, and comply with layout shown on reflected ceiling plans.

B. Layout openings for penetrations centered on the penetrating items.

3.3 INSTALLATION

A. Install acoustical panel ceilings according to ASTM C 636/C 636M, seismic design requirements, and manufacturer's written instructions. Fire-Rated Assembly: Install fire-rated ceiling systems according to tested fire-rated design.

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
6. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
7. Do not attach hangers to steel deck tabs.
8. Attach hangers to structural members.
9. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
10. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends. Miter corners accurately and connect securely.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.

1. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
2. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
3. Install hold-down clips in areas indicated; space according to panel manufacturer's written instructions unless otherwise indicated. Hold-Down Clips: Space 24 inches o.c. on all cross runners.
4. Protect lighting fixtures and air ducts according to requirements indicated for fire-resistance-rated assembly.

3.4 ERECTION TOLERANCES

A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet, non-cumulative.

B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet, non-cumulative.

3.5 FIELD QUALITY CONTROL

A. Special Inspections: Engage a qualified special inspector to perform the following special inspections: Periodic inspection during the installation of suspended ceiling grids according to ASCE/SEI 7 and 2019 CBC.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

C. Perform the following tests and inspections of completed installations of acoustical panel ceiling hangers and anchors and fasteners in successive stages and when installation of ceiling suspension systems on each floor has reached 20 percent completion, but no panels have been installed. Do not proceed with installations of acoustical panel ceiling hangers for the next area until test results for previously completed installations of acoustical panel ceiling hangers show compliance with requirements.

1. Within each test area, testing agency select one of every 10 power-actuated fasteners and postinstalled anchors used to attach hangers to concrete and test them for 200 lbf of tension; it also select one of every two postinstalled anchors used to attach bracing wires to concrete and test them for 440 lbf of tension.

2. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.

D. Acoustical panel ceiling hangers, anchors, and fasteners will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.6 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.

B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 095436 - SUSPENDED DECORATIVE GRIDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Suspended decorative steel grid units with baffles.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Suspended decorative steel grid units.

2. Baffles.

B. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of sizes indicated below:

1. Cell Grids: Set of full-size module Samples of each type, finish, and color.

2. Beam Grids: Set of 12-inch-long Samples of each type, finish, and color; a 12-inch-long spliced section; and a 6-inch-long per leg corner section.

C. Delegated Design Submittals: For design of seismic restraints and attachment devices.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Lighting fixtures.

2. Air outlets and inlets.

3. Speakers.

4. Sprinklers.

B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Build mockup of typical ceiling area as shown on Drawings.

2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver suspended decorative grid components to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they are protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Handle suspended decorative grids and accessories to avoid damaging units and finishes.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design seismic restraints and attachment devices.

B. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.

2. Smoke-Developed Index: 450 or less.

2.2 PRODUCTS, GENERAL

A. Sheet Metal: Selected for surface flatness, smoothness, and freedom from surface blemishes where exposed to view in finished unit. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, variations in flatness exceeding those permitted by referenced standards for stretcher-leveled metal sheet, stains, discolorations, or other imperfections.

B. Grid Fabrication: Components are formed from metal indicated. Manufacturer's standard units of size, shape, and profile indicated; finished to comply with requirements indicated.

C. Cover Profiles and Trim: Provide manufacturer's standard cover profiles and trim for exposed members, and as indicated or required, for edges of grids, at changes in ceiling height, and for other conditions, of same metal and finish as suspended decorative grids.

D. Metal Suspension-System Standard: Provide ceiling manufacturer's standard metal suspension systems of types and finishes indicated that comply with applicable ASTM C635/C635M requirements. Provide systems complete with runners or beams, splice sections, connector clips, alignment clips, leveling clips, hangers, molding, trim, web covers, load-resisting struts, fixture filler pans, clips and adapters, and other suspension components required to support ceiling units and other ceiling-supported construction.

E. Attachment Devices: Size for 5 times the design load indicated in ASTM C635/C635M, Table 1, Direct Hung, unless otherwise indicated.

1. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated in accordance with ICC-ES AC193 and ACI 318, greater than or equal to the design load, as determined by testing in accordance with ASTM E488/E488M conducted by a qualified testing agency.

2. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated in accordance with ICC-ES AC70, greater than or equal to the design load, as determined by testing in accordance with ASTM E1190 conducted by a qualified testing agency.

F. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated, Carbon-Steel Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper.

2. Size: Select wire diameter so its stress at 3 times hanger design load indicated in ASTM C635/C635M, Table 1, Direct Hung, is less than yield stress of wire, but provide not less than 0.135-inch- diameter wire.

G. Rods and Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.

H. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch-thick, galvanized-steel sheet complying with ASTM A653/A653M, G90 coating designation; with bolted connections and 5/16-inch-diameter bolts.

I. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

J. Exposed Metal Edge Moldings, Covers, Trim, and Fixture Filler Panels: Provide exposed members as indicated or required to conceal edges of and penetrations through ceiling, to conceal edges of beams, to cover runner webs, for fixture trim and adapters, for fasciae at changes in ceiling height, and for other conditions; of metal and finish matching suspended decorative grids unless otherwise indicated. For Circular Penetrations of Ceiling: Fabricate edge moldings to diameter required to fit penetration exactly.

2.3 SUSPENDED DECORATIVE STEEL GRID UNITS

A. Basis of Design Product: Design is based on Armstrong World Industries, Inc “SoundScape” ceiling baffle system. Provide indicated system or comparable system from one of the available manufacturers

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Hunter Douglas Architectural Products, Inc.

2. Rockfon; ROCKWOOL International.

3. USG Corporation.

C. Steel Sheet: Commercial-quality, cold-rolled, carbon-steel sheet; stretcher leveled; with protective coating complying with ASTM C635/C635M.

1. Painted Finishes: Electrolytic zinc-coated steel complying with ASTM A879/A879M, 04Z coating, surface treatment as recommended by finish manufacturer for type of use and finish indicated.

2. Sheet Metal Thickness: Not less than 0.020 inch.

D. Beam Grid Module: As indicated on Drawings.

E. Beam Width by Height: As indicated on Drawings.

F. Finish: Painted to match Architect's sample.

2.4 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each installation area and establish layout of suspended decorative grids to balance border widths at opposite edges of each space. Comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION OF SUSPENDED DECORATIVE GRIDS

A. Install suspended decorative grids to comply with ASTM C636/C636M and seismic design requirements indicated, in accordance with manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within plenum that are not part of supporting structure or of grid suspension system.

2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

3. Where width of ducts and other construction within plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.

4. Secure hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for structure to which hangers are attached and for hanger type involved.

5. Do not support grids directly from permanent metal forms or floor deck. Fasten hangers to expansion anchors or power-actuated anchors that extend through forms into concrete.

6. Do not attach hangers to steel deck tabs.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with expansion anchors.

D. Install edge moldings and trim of type indicated at perimeter of each suspended decorative grid and where necessary to conceal edges of grids.

1. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, level with ceiling system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.

2. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspended decorative grids in coordination with suspension system and exposed moldings and trim. Comply with installation tolerances in accordance with CISCA's "Metal Ceilings Technical Guidelines."

1. Align joints in adjacent courses to form uniform, straight joints parallel to room axis in both directions unless otherwise indicated.

2. Fit adjoining units to form flush, tight joints.

3. Where grid edges are visible, install cover profiles unless other trim is indicated.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. Seismic design compliance.

2. <Insert special inspections>.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

C. Perform the following tests and inspections on each floor when installation of the suspended decorative grid on each floor is 20 percent complete. Do not proceed with installing the remainder of the grid on each floor until results in the test area for the floor show compliance with requirements.

1. Hanger-Wire Attachment: Within each test area, testing agency selects one of every 10 power-actuated anchors and expansion anchors used to attach hangers to concrete and tests them for 200 lbf of tension.

2. Bracing-Wire Attachment: Within each test area, testing agency selects one of every two expansion anchors used to attach bracing wires to concrete and tests them for 440 lbf of tension.

3. When tested anchors do not comply with requirements, testing agency tests those anchors not previously tested until 20 pass consecutively and then resumes initial testing frequency.

D. Suspended decorative grid anchors will be considered defective if they do not pass tests and inspections.

E. Prepare tests and inspection reports.

3.5 CLEANING

A. Clean exposed surfaces of suspended decorative grids, including trim and edge moldings, after removing strippable, temporary protective covering if any. Comply with manufacturer's written instructions for stripping of temporary protective covering, cleaning, and touchup of minor finish damage. Remove and replace grid components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage, including dented and deformed grids.

END OF SECTION 095436

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Thermoplastic-rubber base.
2. Rubber molding accessories.
3. Stair-tread nosing.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified, not less than 12 inches long.

C. Product Schedule: For resilient base and accessory products. Use same designations indicated on Drawings.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.5 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 THERMOPLASTIC-RUBBER BASE

A. Basis of Design Product: Subject to compliance with requirements, provide. products indicated in the “Materials and Colors Schedule” on Drawings, or comparable products from one of the available manufacturers.

B. Available Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Armstrong World Industries, Inc.
2. Burke Mercer Flooring Products; a division of Burke Industries Inc.
3. Johnsonite; a Tarkett company.
4. Roppe Corporation, USA.
5. Or equal.

C. Product Standard: ASTM F1861, Type TP (rubber, thermoplastic).

1. Group: I (solid, homogeneous).
2. Style and Location:

a. Style A, Straight: Provide in areas with carpet.
b. Style B, Cove: Provide in areas with resilient floor coverings.

D. Thickness: 1/8-inch.

E. Height: 4-1/2 inches.

F. Lengths: Coils in manufacturer's standard length.

G. Outside Corners: Job formed.

H. Inside Corners: Job formed.

I. Colors: As indicated by manufacturer's designations.

2.3 RUBBER MOLDING ACCESSORY

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Roppe Corporation, USA.
2. VPI Corporation.
3. Or equal.

B. Profile and Dimensions: As indicated.

C. Locations: Provide rubber molding accessories in areas indicated.

D. Colors and Patterns: As indicated by manufacturer's designations.

2.4 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

1. Adhesives shall have a VOC content of 50 g/L or less.

C. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient stair-tread manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

C. Do not install resilient products until materials are the same temperature as space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length. Form without producing discoloration (whitening) at bends.
2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length. Cope corners to minimize open joints.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

B. Perform the following operations immediately after completing resilient-product installation:

1. Remove adhesive and other blemishes from surfaces.
2. Sweep and vacuum horizontal surfaces thoroughly.
3. Damp-mop horizontal surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION

SECTION 096519 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Luxury vinyl floor tile.
2. Solid Vinyl Floor Tile.

B. Related Requirements: Comply with “CALGreen VERIFICATION GUIDELINES MANDATORY CHECKLIST” requirements as indicated in Drawing Sheet G1.21.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating VOC content.
2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
3. Laboratory Test Reports: For flooring products, indicating compliance with requirements for low-emitting materials.
4. Environmental Product Declaration: For each product.
5. Health Product Declaration: For each product.
6. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.

C. Shop Drawings: For each type of resilient floor tile.

1. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
2. Show details of special patterns.

D. Samples: Full-size units of each color, texture, and pattern of floor tile required.

E. Product Schedule: For floor tile. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.

1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Coordinate mockups in this Section with mockups specified in other Sections.

a. Size: Minimum 100 sq. ft. for each type, color, and pattern in locations directed by Architect.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

1.9 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Close spaces to traffic during floor tile installation.

D. Close spaces to traffic for 48 hours after floor tile installation.

E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For resilient floor tile, as determined by testing identical products according to ASTM E648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

B. Verify flooring products comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 SOLID VINYL FLOOR TILE

A. Basis of Design Products: Subject to compliance with requirements, provide products as indicated in “Materials and Color Schedule” in Drawings” or comparable products from one of the following manufacturers.

1. Armstrong Flooring, Inc.
2. Congoleum Corporation.
3. Mannington Mills, Inc.
4. VPI Corporation.
5. Or equal.

B. Tile Standard: ASTM F1700.

1. Class: . Class III printed film vinyl plank.
2. Type: B, Embossed Surface.

C. Thickness: As indicated in “Materials and Color Schedule” in Drawings.

D. Size: As indicated in “Materials and Color Schedule” in Drawings.

E. Colors and Patterns: As indicated in “Materials and Color Schedule” in Drawings.

2.3 VINYL COMPOSITION FLOOR TILE

A. Basis of Design Products: Subject to compliance with requirements, provide products as indicated in “Materials and Color Schedule” in Drawings” or comparable products from one of the following manufacturers.

1. American Biltrite.
2. Armstrong World Industries, Inc.
3. Congoleum Corporation.
4. Johnsonite; a Tarkett company.
5. Or equal.

B. Tile Standard: ASTM F1066, Class 2, through pattern.

C. Wearing Surface: Smooth.

D. Thickness: 0.125 inch.

E. Size: 12 by 12 inches.

F. Colors and Patterns: As indicated by manufacturer's designations.

2.4 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

1. Verify adhesives have a VOC content of 50 g/L or less.
2. Verify adhesive complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Floor Polish: Provide protective, liquid floor-polish products recommended by floor tile manufacturer.

D. Sealers and Finish Coats for Resilient Terrazzo Floor Tile: Products recommended by floor tile manufacturer for resilient terrazzo floor tile.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 7 or more than 10 pH.
4. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
b. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install floor tiles until materials are the same temperature as space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles in pattern indicated.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.

G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

H. Adhere floor tiles to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.

B. Perform the following operations immediately after completing floor tile installation:

1. Remove adhesive and other blemishes from surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish: Remove soil, adhesive, and blemishes from floor tile surfaces before applying liquid floor polish.

1. Apply one coat(s).

E. Joint Sealant: Apply sealant to resilient terrazzo floor tile perimeter and around columns, at door frames, and at other joints and penetrations.

F. Sealers and Finish Coats: Remove soil, visible adhesive, and surface blemishes from resilient terrazzo floor tile surfaces before applying liquid cleaners, sealers, and finish products.

1. Sealer: Apply two base coats of liquid sealer.
2. Finish: Apply two coats of liquid floor finish.

G. Cover floor tile until Substantial Completion.

END OF SECTION

SECTION 096520 - LUXURY VINYL FLOOR TILE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes: Luxury vinyl floor tile.

B. Related Requirements: Comply with “CALGreen Residential Measures” requirements as indicated on Drawing Sheet GRN.1..

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating VOC content.
2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
3. Laboratory Test Reports: For flooring products, indicating compliance with requirements for low-emitting materials.
4. Environmental Product Declaration: For each product.
5. Health Product Declaration: For each product.
6. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.

C. Shop Drawings: For each type of resilient floor tile.

1. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
2. Show details of special patterns.

D. Samples: Full-size units of each color, texture, and pattern of floor tile required.

E. Product Schedule: For floor tile. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Coordinate mockups in this Section with mockups specified in other Sections. Size: Minimum 100 sq. ft. for each type, color, and pattern in locations directed by Architect.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

1.9 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following periods:

1. 48 hours before installation.
2. During installation.

3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Close spaces to traffic during floor tile installation.

D. Close spaces to traffic for 48 hours after floor tile installation.

E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For resilient floor tile, as determined by testing identical products according to ASTM E648 or NFPA 253 by a qualified testing agency. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

B. Verify flooring products comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 SOLID VINYL FLOOR TILE

A. Basis of Design Product: Subject to compliance with requirements, provide products indicated in “Interior Finish Schedule” in Drawings.

B. Tile Standard: ASTM F1700.

1. Class: . Class III printed film vinyl plank.
2. Type: B, Embossed Surface.

C. Thickness: As indicated in “Interior Finish Schedule” in Drawings.

D. Size: As indicated in “Interior Finish Schedule” in Drawings.

E. Colors and Patterns: As indicated in “Interior Finish Schedule” in Drawings.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

1. Verify adhesives have a VOC content of 50 g/L or less.
2. Verify adhesive complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Floor Polish: Provide protective, liquid floor-polish products recommended by floor tile manufacturer.

D. Sealers and Finish Coats for Floor Tile: Products recommended by floor tile manufacturer for resilient terrazzo floor tile.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 7 or more than 10 pH.

4. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

    a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
    b. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install floor tiles until materials are the same temperature as space where they are to be installed. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter. Lay tiles in pattern indicated.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.

G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

H. Adhere floor tiles to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.

B. Perform the following operations immediately after completing floor tile installation:

1. Remove adhesive and other blemishes from surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish: Remove soil, adhesive, and blemishes from floor tile surfaces before applying liquid floor polish.

1. Apply one coat(s).

E. Joint Sealant: Apply sealant to floor tile perimeter and around columns, at door frames, and at other joints and penetrations.

F. Cover floor tile until Substantial Completion.

END OF SECTION

SECTION 099113 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes surface preparation and the application of paint systems on exterior substrates.

B. Related Requirements:

1. Section 051200 "Structural Steel Framing" for shop priming of metal substrates with primers specified in this Section.
2. Section 099123 "Interior Painting" for surface preparation and the application of paint systems on interior substrates.
3. Comply with “CALGreen VERIFICATION GUIDELINES MANDATORY CHECKLIST” requirements as indicated in Drawing Sheet G1.21.

1.2 DEFINITIONS

A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

D. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

E. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

F. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

B. Samples for Initial Selection: For each type of topcoat product.

C. Samples for Verification: For each type of paint system and each color and gloss of topcoat.

1. Submit Samples on rigid backing, 8 inches square.

2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

D. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
3. VOC content.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.5 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.

a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft..
b. Other Items: Architect will designate items or areas required.

2. Final approval of color selections will be based on mockups.

a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Benjamin Moore & Co.
2. Dunn-Edwards Corporation.
3. Sherwin-Williams Company (The) Basis of Design manufacturer.
4. Vista Paint.

B. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to products listed in other Part 2 articles for the paint category indicated.

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. VOC Content: Provide materials that comply with VOC limits of authorities having jurisdiction.

C. Colors: As indicated in a color schedule.

2.3 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:

1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Masonry (Clay and CMU): 12 percent.
3. Wood: 15 percent.
4. Portland Cement Plaster: 12 percent.
5. Gypsum Board: 12 percent.

C. Portland Cement Plaster Substrates: Verify that plaster is fully cured.

D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

E. Proceed with coating application only after unsatisfactory conditions have been corrected. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.

F. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer.

G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

I. Aluminum Substrates: Remove loose surface oxidation.

J. Wood Substrates:

1. Scrape and clean knots. Before applying primer, apply coat of knot sealer recommended in writing by topcoat manufacturer for exterior use in paint system indicated.
2. Sand surfaces that will be exposed to view, and dust off.
3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

K. Plastic Trim Fabrication Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
4. Paint entire exposed surface of window frames and sashes.
5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed to view:

a. Equipment, including panelboards and switch gear.
b. Uninsulated metal piping.
c. Uninsulated plastic piping.
d. Pipe hangers and supports.
e. Metal conduit.
f. Plastic conduit.
g. Tanks that do not have factory-applied final finishes.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

A. Concrete and Portland Cement Plaster Substrates, Non-traffic Surfaces: 100% Acrylic Flat.

1. Prime Coat:

a. Benjamin Moore & Co: 023 Fresh Start Primer
b. Dunn Edwards: UGPR00 Utra-Grip Premium
c. Sherwin-Williams Company (The): A24W300 Loxon Primer (BOD)
d. Vista Paint: 4600 Uniprime II

2. Intermediate Coat:

a. Benjamin Moore & Co: W105 Regal Select 100% Acrylic Flat
b. Dunn Edwards: EVSH10 Evershield Flat Exterior
c. Sherwin-Williams Company (The): K33 Duration Flat (BOD)
d. Vista Paint: 2000 Duratone 100% Acrylic Flat

3. Finish Coat:

    a. Benjamin Moore & Co: W105 Regal Select 100% Acrylic Flat
    b. Dunn Edwards: EVSH10 Evershield Flat Exterior
    c. Sherwin-Williams Company (The): K33 Duration Flat (BOD)
    d. Vista Paint: 2000 Duratone 100% Acrylic Flat

B. Concrete and Portland Cement Plaster Substrates, Non-traffic Surfaces: 100% Acrylic Low Sheen.

1. Prime Coat:

    a. Benjamin Moore & Co: 023 Fresh Start Primer
    b. Dunn Edwards: UGPR00 Utra-Grip Premium
    c. Sherwin-Williams Company (The): A24W300 Loxon Primer (BOD)
    d. Vista Paint: 4600 Uniprime II

2. Intermediate Coat:

    a. Benjamin Moore & Co: W103 Regal Select 100% Acrylic Low Sheen
    b. Dunn Edwards: EVSH20 Evershield Low Sheen Exterior
    c. Sherwin-Williams Company (The): A89 Super Paint Satin (BOD)
    d. Vista Paint: 8200 Carefree 100% Acrylic Velva Sheen

3. Finish Coat:

    a. Benjamin Moore & Co: W103 Regal Select 100% Acrylic Low Sheen
    b. Dunn Edwards: EVSH20 Evershield Low Sheen Exterior
    c. Sherwin-Williams Company (The): A89 Super Paint Satin (BOD)
    d. Vista Paint: 8200 Carefree 100% Acrylic Velva Sheen

C. Concrete and Portland Cement Plaster Substrates, Non-traffic Surfaces: 100% Acrylic Eggshell.

1. Prime Coat:

    a. Benjamin Moore & Co: 023 Fresh Start Primer
    b. Dunn Edwards: UGPR00 Utra-Grip Premium
    c. Sherwin-Williams Company (The): A24W300 Loxon Primer (BOD)
    d. Vista Paint: 4600 Uniprime II

2. Intermediate Coat:

    a. Benjamin Moore & Co: 631 Aura Satin Exterior
    b. Dunn Edwards: EVSH30 Evershield Eggshell Exterior
    c. Sherwin-Williams Company (The): K33 Duration Satin (BOD)
    d. Vista Paint: 8300 Carefree Eggshell 100% Acrylic

3. Finish Coat:

    a. Benjamin Moore & Co: 631 Aura Satin Exterior
    b. Dunn Edwards: EVSH30 Evershield Eggshell Exterior
    c. Sherwin-Williams Company (The): K33 Duration Satin (BOD)
    d. Vista Paint: 8300 Carefree Eggshell 100% Acrylic

D. Concrete and Portland Cement Plaster Substrates, Non-traffic Surfaces: 100% Acrylic Semi Gloss.

1. Prime Coat:

    a. Benjamin Moore & Co: 023 Fresh Start Primer
    b. Dunn Edwards: UGPR00 Utra-Grip Premium
    c. Sherwin-Williams Company (The): A24W300 Loxon Primer (BOD)
    d. Vista Paint: 4600 Uniprime II

2. Intermediate Coat:

    a. Benjamin Moore & Co: W096 Regal Select 100% Acrylic Semi Gloss
    b. Dunn Edwards: EVSH40 Evershield Semi Gloss Exterior
    c. Sherwin-Williams Company (The): K34 Duration Gloss (BOD)
    d. Vista Paint: 8400 Carefree Semi Gloss 100% Acrylic

3. Finish Coat:

    a. Benjamin Moore & Co: W096 Regal Select 100% Acrylic Semi Gloss
    b. Dunn Edwards: EVSH40 Evershield Semi Gloss Exterior
    c. Sherwin-Williams Company (The): K34 Duration Gloss (BOD)
    d. Vista Paint: 8400 Carefree Semi Gloss 100% Acrylic

E. Concrete and Portland Cement Plaster Substrates, Non-traffic Surfaces: 100% Acrylic Gloss.

1. Prime Coat:

    a. Benjamin Moore & Co: 023 Fresh Start Primer
    b. Dunn Edwards: UGPR00 Utra-Grip Premium
    c. Sherwin-Williams Company (The): A24W300 Loxon Primer (BOD)
    d. Vista Paint: 4600 Uniprime II

2. Intermediate Coat:

    a. Benjamin Moore & Co: 543 Ben Gloss Exterior
    b. Dunn Edwards: EVSH50 Evershield Gloss Exterior
    c. Sherwin-Williams Company (The): A85 Super Paint Gloss (BOD)
    d. Vista Paint: 8500 Carefree Gloss 100% Acrylic

3. Finish Coat:

    a. Benjamin Moore & Co: 543 Ben Gloss Exterior
    b. Dunn Edwards: EVSH50 Evershield Gloss Exterior
    c. Sherwin-Williams Company (The): A85 Super Paint Gloss (BOD)
    d. Vista Paint: 8500 Carefree Gloss 100% Acrylic

F. Ferrous Metal Substrates: 100% Acrylic Low Sheen.

1. Prime Coat:

    a. Benjamin Moore & Co: M04 Acrylic Prime
    b. Dunn Edwards: UGPR00 Utra-Grip Premium
    c. Sherwin-Williams Company (The): B66W1 DTM Acrylic Primer (BOD)
    d. Vista Paint: 9600 Protec Primer

2. Intermediate Coat:

    a. Benjamin Moore & Co: W103 Regal Select 100% Acrylic Low Sheen
    b. Dunn Edwards: EVSH20 Evershield Low Sheen Exterior
    c. Sherwin-Williams Company (The): A89 Super Paint Satin (BOD)
    d. Vista Paint: 8200 Carefree 100% Acrylic Velva Sheen

3. Finish Coat:

    a. Benjamin Moore & Co: W103 Regal Select 100% Acrylic Low Sheen
    b. Dunn Edwards: EVSH20 Evershield Low Sheen Exterior
    c. Sherwin-Williams Company (The): A89 Super Paint Satin (BOD)
    d. Vista Paint: 8200 Carefree 100% Acrylic Velva Sheen

G. Ferrous Metal Substrates: 100% Acrylic Eggshell.

1. Prime Coat:

    a. Benjamin Moore & Co: M04 Acrylic Prime
    b. Dunn Edwards: UGPR00 Utra-Grip Premium
    c. Sherwin-Williams Company (The): B66W1 DTM Acrylic Primer (BOD)
    d. Vista Paint: 9600 Protec Primer

2. Intermediate Coat:

    a. Benjamin Moore & Co: 631 Aura Satin Exterior
    b. Dunn Edwards: EVSH30 Evershield Eggshell Exterior
    c. Sherwin-Williams Company (The): K33 Duration Satin (BOD)
    d. Vista Paint: 8300 Carefree Eggshell 100% Acrylic

3. Finish Coat:

    a. Benjamin Moore & Co: 631 Aura Satin Exterior
    b. Dunn Edwards: EVSH30 Evershield Eggshell Exterior
    c. Sherwin-Williams Company (The): K33 Duration Satin (BOD)
    d. Vista Paint: 8300 Carefree Eggshell 100% Acrylic

H. Ferrous Metal Substrate: 100% Acrylic Semi Gloss.

1. Prime Coat:

    a. Benjamin Moore & Co: M04 Acrylic Prime
    b. Dunn Edwards: UGPR00 Utra-Grip Premium
    c. Sherwin-Williams Company (The): B66W1 DTM Acrylic Primer (BOD)
    d. Vista Paint: 9600 Protec Primer

2. Intermediate Coat:

    a. Benjamin Moore & Co: W096 Regal Select 100% Acrylic Semi Gloss
    b. Dunn Edwards: EVSH40 Evershield Semi Gloss Exterior
    c. Sherwin-Williams Company (The): K34 Duration Gloss (BOD)
    d. Vista Paint: 8400 Carefree Semi Gloss 100% Acrylic

3. Finish Coat:

    a. Benjamin Moore & Co: W096 Regal Select 100% Acrylic Semi Gloss
    b. Dunn Edwards: EVSH40 Evershield Semi Gloss Exterior
    c. Sherwin-Williams Company (The): K34 Duration Gloss (BOD)
    d. Vista Paint: 8400 Carefree Semi Gloss 100% Acrylic

I. Galvanized and Aluminum Metal Substrates: 100% Acrylic Low Sheen.

1. Prime Coat:

    a. Benjamin Moore & Co: M04 Acrylic Prime
    b. Dunn Edwards: GAPR00 Galv-Alum Premium
    c. Sherwin-Williams Company (The): B66A50 DTM Bonding Primer (BOD)
    d. Vista Paint: 4800 Metal Pro Primer

2. Intermediate Coat:

    a. Benjamin Moore & Co: W103 Regal Select 100% Acrylic Low Sheen
    b. Dunn Edwards: EVSH20 Evershield Low Sheen Exterior
    c. Sherwin-Williams Company (The): A89 Super Paint Satin (BOD)
    d. Vista Paint: 8200 Carefree 100% Acrylic Velva Sheen

3. Finish Coat:

    a. Benjamin Moore & Co: W103 Regal Select 100% Acrylic Low Sheen
    b. Dunn Edwards: EVSH20 Evershield Low Sheen Exterior
    c. Sherwin-Williams Company (The): A89 Super Paint Satin (BOD)
    d. Vista Paint: 8200 Carefree 100% Acrylic Velva Sheen

J. Galvanized and Aluminum Metal Substrates: 100% Acrylic Eggshell.

1. Prime Coat:

    a. Benjamin Moore & Co: M04 Acrylic Prime
    b. Dunn Edwards: GAPR00 Galv-Alum Premium
    c. Sherwin-Williams Company (The): B66A50 DTM Bonding Primer (BOD)
    d. Vista Paint: 4800 Metal Pro Primer

2. Intermediate Coat:

    a. Benjamin Moore & Co: 631 Aura Satin Exterior
    b. Dunn Edwards: EVSH30 Evershield Eggshell Exterior
    c. Sherwin-Williams Company (The): K33 Duration Satin (BOD)
    d. Vista Paint: 8300 Carefree Eggshell 100% Acrylic

3. Finish Coat:

    a. Benjamin Moore & Co: 631 Aura Satin Exterior
    b. Dunn Edwards: EVSH30 Evershield Eggshell Exterior
    c. Sherwin-Williams Company (The): K33 Duration Satin (BOD)
    d. Vista Paint: 8300 Carefree Eggshell 100% Acrylic

K. Galvanized and Aluminum Metal Substrates: 100% Acrylic Semi Gloss.

1. Prime Coat:

    a. Benjamin Moore & Co: M04 Acrylic Prime
    b. Dunn Edwards: GAPR00 Galv-Alum Premium
    c. Sherwin-Williams Company (The): B66A50 DTM Bonding Primer (BOD)
    d. Vista Paint: 4800 Metal Pro Primer

2. Intermediate Coat:

    a. Benjamin Moore & Co: W096 Regal Select 100% Acrylic Semi Gloss
    b. Dunn Edwards: EVSH40 Evershield Semi Gloss Exterior
    c. Sherwin-Williams Company (The): K34 Duration Gloss (BOD)
    d. Vista Paint: 8400 Carefree Semi Gloss 100% Acrylic

3. Finish Coat:

    a. Benjamin Moore & Co: W096 Regal Select 100% Acrylic Semi Gloss
    b. Dunn Edwards: EVSH40 Evershield Semi Gloss Exterior
    c. Sherwin-Williams Company (The): K34 Duration Gloss (BOD)
    d. Vista Paint: 8400 Carefree Semi Gloss 100% Acrylic

L. Wood Substrates: 100% Acrylic Flat.

1. Prime Coat:

    a. Benjamin Moore & Co: 023 Fresh Start Primer
    b. Dunn Edwards: EZPR00 E-Z Prime Premium
    c. Sherwin-Williams Company (The): B51W20 PrepRite Pro Block (BOD)
    d. Vista Paint: 4200 Terminator II

2. Intermediate Coat:

    a. Benjamin Moore & Co: W105 Regal Select 100% Acrylic Flat
    b. Dunn Edwards: EVSH10 Evershield Ext Flat
    c. Sherwin-Williams Company (The): K32 Duration Flat (BOD)
    d. Vista Paint: 2000 Duratone 100% Acrylic Flat

3. Finish Coat:

    a. Benjamin Moore & Co: W105 Regal Select 100% Acrylic Flat
    b. Dunn Edwards: EVSH10 Evershield Ext Flat
    c. Sherwin-Williams Company (The): K32 Duration Flat (BOD)
    d. Vista Paint: 2000 Duratone 100% Acrylic Flat

M. Wood Substrates: 100% Acrylic Low Sheen.

1. Prime Coat:

    a. Benjamin Moore & Co: 023 Fresh Start Primer
    b. Dunn Edwards: EZPR00 E-Z Prime Premium
    c. Sherwin-Williams Company (The): B51W20 PrepRite Pro Block (BOD)
    d. Vista Paint: 4200 Terminator II

2. Intermediate Coat:

    a. Benjamin Moore & Co: W103 Regal Select 100% Acrylic Low Sheen
    b. Dunn Edwards: EVSH20 Evershield Low Sheen Exterior
    c. Sherwin-Williams Company (The): A89 Super Paint Satin (BOD)
    d. Vista Paint: 8200 Carefree 100% Acrylic Velva Sheen

3. Finish Coat:

    a. Benjamin Moore & Co: W103 Regal Select 100% Acrylic Low Sheen
    b. Dunn Edwards: EVSH20 Evershield Low Sheen Exterior
    c. Sherwin-Williams Company (The): A89 Super Paint Satin (BOD)
    d. Vista Paint: 8200 Carefree 100% Acrylic Velva Sheen

N. Wood Substrates: 100% Acrylic Eggshell.

1. Prime Coat:

    a. Benjamin Moore & Co: 023 Fresh Start Primer
    b. Dunn Edwards: EZPR00 E-Z Prime Premium
    c. Sherwin-Williams Company (The): B51W20 PrepRite Pro Block (BOD)
    d. Vista Paint: 4200 Terminator II

2. Intermediate Coat:

    a. Benjamin Moore & Co: 631 Aura Satin Exterior
    b. Dunn Edwards: EVSH30 Evershield Eggshell Exterior
    c. Sherwin-Williams Company (The): K33 Duration Satin (BOD)
    d. Vista Paint: 8300 Carefree Eggshell 100% Acrylic

3. Finish Coat:

    a. Benjamin Moore & Co: 631 Aura Satin Exterior
    b. Dunn Edwards: EVSH30 Evershield Eggshell Exterior
    c. Sherwin-Williams Company (The): K33 Duration Satin (BOD)
    d. Vista Paint: 8300 Carefree Eggshell 100% Acrylic

O. Wood Substrates: 100% Acrylic Semi Gloss.

1. Prime Coat:

    a. Benjamin Moore & Co: 023 Fresh Start Primer

    b. Dunn Edwards: EZPR00 E-Z Prime Premium

    c. Sherwin-Williams Company (The): B51W20 PrepRite Pro Block (BOD)

    d. Vista Paint: 4200 Terminator II

2. Intermediate Coat:

    a. Benjamin Moore & Co: W096 Regal Select 100% Acrylic Semi Gloss
    b. Dunn Edwards: EVSH40 Evershield Semi Gloss Exterior

    c. Sherwin-Williams Company (The): K34 Duration Gloss (BOD)

    d. Vista Paint: 8400 Carefree Semi Gloss 100% Acrylic

3. Finish Coat:

    a. Benjamin Moore & Co: W096 Regal Select 100% Acrylic Semi Gloss
    b. Dunn Edwards: EVSH40 Evershield Semi Gloss Exterior

    c. Sherwin-Williams Company (The): K34 Duration Gloss (BOD)

    d. Vista Paint: 8400 Carefree Semi Gloss 100% Acrylic

P. Wood Substrates: 100% Acrylic Gloss.

1. Prime Coat:

    a. Benjamin Moore & Co: 023 Fresh Start Primer

    b. Dunn Edwards: EZPR00 E-Z Prime Premium

    c. Sherwin-Williams Company (The): B51W20 PrepRite Pro Block (BOD)

    d. Vista Paint: 4200 Terminator II

2. Intermediate Coat:

a. Benjamin Moore & Co: 543 Ben Gloss Exterior

b. Dunn Edwards: EVSH50 Evershield Gloss Exterior

c. Sherwin-Williams Company (The): A85 Super Paint Gloss (BOD)

d. Vista Paint: 8500 Carefree Gloss 100% Acrylic

3. Finish Coat:

a. Benjamin Moore & Co: 543 Ben Gloss Exterior

b. Dunn Edwards: EVSH50 Evershield Gloss Exterior

c. Sherwin-Williams Company (The): A85 Super Paint Gloss (BOD)

d. Vista Paint: 8500 Carefree Gloss 100% Acrylic

Q. Wood Substrates: Semi -Transparent 100% Acrylic Stain.

1. First Coat:

a. Benjamin Moore & Co: 098 MooreWood Acrylic Stain

b. Dunn Edwards: WPT-3 WeatherPro Stain

c. Sherwin-Williams Company (The): A15T5 Woodscapes (BOD)

d. Vista Paint: Olympic MAXIMUM ST Acrylic Stain

2. Second Coat:

a. Benjamin Moore & Co: 098 MooreWood Acrylic Stain

b. Dunn Edwards: WPT-3 WeatherPro Stain

c. Sherwin-Williams Company (The): A15T5 Woodscapes (BOD)

d. Vista Paint: Olympic Premium Acrylic Stain

END OF SECTION

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes surface preparation and the application of paint systems on interior substrates.

B. Related Requirements:

1. Section 051200 "Structural Steel Framing" for shop priming of metal substrates with primers specified in this Section.
2. Section 099113 "Exterior Painting" for surface preparation and the application of paint systems on exterior substrates.
3. Comply with “CALGreen VERIFICATION GUIDELINES MANDATORY CHECKLIST” requirements as indicated in Drawing Sheet G1.21.

1.3 DEFINITIONS

A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

D. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

E. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

F. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

G. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.

1. Submit Samples on rigid backing, 8 inches square.
2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

C. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.
3. VOC content.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.6 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.

a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft..
b. Other Items: Architect will designate items or areas required.

2. Final approval of color selections will be based on mockups. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to University.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Benjamin Moore & Co. Montvale, New Jersey 07653; www.benjaminmoore.com.
2. Dunn-Edwards Paint Co. (The), Los Angeles, California 90058; www.dunnedwards.com.
3. Sherwin-Williams Company (The), Cleveland, Ohio 44115; www.sherwin-williams.com.
4. Vista Paint Corporation (The), Fullerton, California 92831; www.vistapaint.com.

B. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to products listed in other Part 2 articles for the paint category indicated.

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 50 g/L.
3. Dry-Fog Coatings: 50 g/L.
4. Primers, Sealers, and Undercoaters: 100 g/L.
5. Rust Preventative Coatings: 100 g/L.
6. Zinc-Rich Industrial Maintenance Primers: 100 g/L.
7. Pretreatment Wash Primers: 420 g/L.
8. Floor Coatings: 50 g/L.
9. Shellacs, Clear: 730 g/L.
10. Shellacs, Pigmented: 550 g/L.

C. Low-Emitting Materials: Interior paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: University reserves the right to invoke the following procedure:

1. University will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.
3. College District may direct Contractor to stop applying coatings if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Masonry (Clay and CMU): 12 percent.
3. Wood: 15 percent.
4. Gypsum Board: 12 percent.
5. Plaster: 12 percent.

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Plaster Substrates: Verify that plaster is fully cured.

E. Spray-Textured Ceiling Substrates: Verify that surfaces are dry.

F. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

G. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceed that permitted in manufacturer's written instructions.

F. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer.

G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

I. Aluminum Substrates: Remove loose surface oxidation.

J. Wood Substrates:

1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
2. Sand surfaces that will be exposed to view, and dust off.
3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

K. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed in equipment rooms:

a. Equipment, including panelboards and switch gear.
b. Uninsulated metal piping.
c. Uninsulated plastic piping.
d. Pipe hangers and supports.
e. Metal conduit.
f. Plastic conduit.
g. Tanks that do not have factory-applied final finishes.
h. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.

2. Paint the following work where exposed in occupied spaces:

a. Equipment, including panelboards.
b. Uninsulated metal piping.
c. Uninsulated plastic piping.
d. Pipe hangers and supports.
e. Metal conduit.
f. Plastic conduit.
g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
h. Other items as directed by Architect.

3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: College District may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

A. Concrete and Portland Cement Plaster Substrates, Non-traffic Surfaces: 100% Acrylic Flat

1. Prime Coat:

    a. Benjamin Moore & Co: 023 Fresh Start Primer
    b. Dunn Edwards: ESPR00 Eff-Stop Premium
    c. Sherwin-Williams Company (The): A24W8300 Loxon Primer (BOD)
    d. Vista Paint: 4600 Uniprime II

2. Intermediate Coat:

    a. Benjamin Moore & Co: 547 Regal Select 100% Acrylic Flat
    b. Dunn Edwards: SPMA10 Suprema Int Flat
    c. Sherwin-Williams Company (The): A96 Duration Flat (BOD)
    d. Vista Paint: 8100Carefree Acrylic Flat

3. Finish Coat:

    a. Benjamin Moore & Co: 547 Regal Select 100% Acrylic Flat
    b. Dunn Edwards: SPMA10 Suprema Int Flat
    c. Sherwin-Williams Company (The): A96 Duration Flat (BOD)
    d. Vista Paint: 8100Carefree Acrylic Flat

B. Concrete and Portland Cement Plaster Substrates, Non-traffic Surfaces: 100% Acrylic Low Sheen

1. Prime Coat:

a. Benjamin Moore & Co: 023 Fresh Start Primer
b. Dunn Edwards: UGPR00 Utra-Grip Premium
c. Sherwin-Williams Company (The): A24W300 Loxon Primer (BOD)
d. Vista Paint: 4600 Uniprime II

2. Intermediate Coat:

a. Benjamin Moore & Co: NA
b. Dunn Edwards: SPMA20 Suprema Velvet
c. Sherwin-Williams Company (The): NA (BOD)
d. Vista Paint: 8200 Carefree 100% Acrylic Velva Sheen

3. Finish Coat:

a. Benjamin Moore & Co: NA
b. Dunn Edwards: SPMA20 Suprema Velvet
c. Sherwin-Williams Company (The): NA (BOD)
d. Vista Paint: 8200 Carefree 100% Acrylic Velva Sheen

C. Concrete and Portland Cement Plaster Substrates, Non-traffic Surfaces: 100% Acrylic Eggshell

1. Prime Coat:

a. Benjamin Moore & Co: 023 Fresh Start Primer
b. Dunn Edwards: UGPR00 Ultra-Grip Premium
c. Sherwin-Williams Company (The): A24W300 Loxon Primer (BOD)
d. Vista Paint: 4600 Uniprime II

2. Intermediate Coat:

a. Benjamin Moore & Co: 549 Regal Select 100% Acrylic Eggshell
b. Dunn Edwards: SPMA30 Suprema Eggshell Interior
c. Sherwin-Williams Company (The): A97 Duration Satin (BOD)
d. Vista Paint: 8300 Carefree Eggshell 100% Acrylic

3. Finish Coat:

a. Benjamin Moore & Co: 549 Regal Select 100% Acrylic Eggshell
b. Dunn Edwards: SPMA30 Suprema Eggshell Interior
c. Sherwin-Williams Company (The): A97 Duration Satin
d. Vista Paint: 8300 Carefree Eggshell 100% Acrylic

D. Concrete and Portland Cement Plaster Substrates, Non-traffic Surfaces: 100% Acrylic Semi Gloss

1. Prime Coat:

a. Benjamin Moore & Co: 023 Fresh Start Primer
b. Dunn Edwards: UGPR00 Utra-Grip Premium
c. Sherwin-Williams Company (The): A24W300 Loxon Primer (BOD)
d. Vista Paint: 4600 Uniprime II

2. Intermediate Coat:

a. Benjamin Moore & Co: 551 Regal Select 100% Acrylic Semi Gloss
b. Dunn Edwards: SPMA40 Suprema Semi Gloss Interior
c. Sherwin-Williams Company (The): A98 Duration Semi Gloss (BOD)
d. Vista Paint: 8400 Carefree Semi Gloss 100% Acrylic

3. Finish Coat:

a. Benjamin Moore & Co: 551 Regal Select 100% Acrylic Semi Gloss
b. Dunn Edwards: SPMA40 Suprema Semi Gloss Interior
c. Sherwin-Williams Company (The): A98 Duration Semi Gloss (BOD)
d. Vista Paint: 8400 Carefree Semi Gloss 100% Acrylic

E. Concrete and Portland Cement Plaster Substrates, Non-traffic Surfaces: 100% Acrylic Gloss

1. Prime Coat:

a. Benjamin Moore & Co: 023 Fresh Start Primer
b. Dunn Edwards: UGPR00 Utra-Grip Premium
c. Sherwin-Williams Company (The): A24W300 Loxon Primer (BOD)
d. Vista Paint: 4600 Uniprime II

2. Intermediate Coat:

a. Benjamin Moore & Co: NA
b. Dunn Edwards: SPMA50 Suprema Gloss Interior
c. Sherwin-Williams Company (The): A85 Super Paint Gloss (BOD)
d. Vista Paint: 8500 Carefree Gloss 100% Acrylic

3. Finish Coat:

a. Benjamin Moore & Co: NA
b. Dunn Edwards: SPMA50 Suprema Gloss Interior
c. Sherwin-Williams Company (The): A85 Super Paint Gloss (BOD)
d. Vista Paint: 8500 Carefree Gloss 100% Acrylic

F. CMU Substrates: 100% Acrylic Flat

1. Prime Coat:

    a. Benjamin Moore & Co: 285 Block Filler
    b. Dunn Edwards: SBPR00 Block Filler
    c. Sherwin-Williams Company (The): B25W25 Block Filler (BOD)
    d. Vista Paint: 040 Block Filler

2. Intermediate Coat:

    a. Benjamin Moore & Co: 547 Regal Select 100% Acrylic Flat
    b. Dunn Edwards: SPMA10 Suprema Int Flat
    c. Sherwin-Williams Company (The): A96 Duration Flat (BOD)
    d. Vista Paint: 8100Carefree Acrylic Flat

3. Finish Coat:

    a. Benjamin Moore & Co: 547 Regal Select 100% Acrylic Flat
    b. Dunn Edwards: SPMA10 Suprema Int Flat
    c. Sherwin-Williams Company (The): A96 Duration Flat (BOD)
    d. Vista Paint: 8100Carefree Acrylic Flat

G. CMU Substrates: 100% Acrylic Low Sheen

1. Prime Coat:

    a. Benjamin Moore & Co: 285 Block Filler
    b. Dunn Edwards: SBPR00 Block Filler
    c. Sherwin-Williams Company (The): B25W25 Block Filler (BOD)
    d. Vista Paint: 040 Block Filler

2. Intermediate Coat:

    a. Benjamin Moore & Co: NA
    b. Dunn Edwards: SPMA20 Suprema Velvet
    c. Sherwin-Williams Company (The): NA
    d. Vista Paint: 8200 Carefree 100% Acrylic Velva Sheen

3. Finish Coat:

    a. Benjamin Moore & Co: NA
    b. Dunn Edwards: SPMA20 Suprema Velvet
    c. Sherwin-Williams Company (The): NA
    d. Vista Paint: 8200 Carefree 100% Acrylic Velva Sheen

H. CMU Substrates: 100% Acrylic Eggshell

1. Prime Coat:

    a. Benjamin Moore & Co: 285 Block Filler

b. Dunn Edwards: SBPR00 Block Filler
c. Sherwin-Williams Company (The): B25W25 Block Filler (BOD)
d. Vista Paint: 040 Block Filler

2. Intermediate Coat:

a. Benjamin Moore & Co: 549 Regal Select 100% Acrylic Eggshell
b. Dunn Edwards: SPMA30 Suprema Eggshell Interior
c. Sherwin-Williams Company (The): A97 Duration Satin (BOD)
d. Vista Paint: 8300 Carefree Eggshell 100% Acrylic

3. Finish Coat:

a. Benjamin Moore & Co: 549 Regal Select 100% Acrylic Eggshell
b. Dunn Edwards: SPMA30 Suprema Eggshell Interior
c. Sherwin-Williams Company (The): A97 Duration Satin (BOD)
d. Vista Paint: 8300 Carefree Eggshell 100% Acrylic

I. CMU Substrates: 100% Acrylic Semi Gloss

1. Prime Coat:

a. Benjamin Moore & Co: 285 Block Filler
b. Dunn Edwards: SBPR00 Block Filler
c. Sherwin-Williams Company (The): B25W25 Block Filler (BOD)
d. Vista Paint: 040 Block Filler

2. Intermediate Coat:

a. Benjamin Moore & Co: 551 Regal Select 100% Acrylic Semi Gloss
b. Dunn Edwards: SPMA40 Suprema Semi Gloss Interior
c. Sherwin-Williams Company (The): A98 Duration Semi Gloss (BOD)
d. Vista Paint: 8400 Carefree Semi Gloss 100% Acrylic

3. Finish Coat:

a. Benjamin Moore & Co: 551 Regal Select 100% Acrylic Semi Gloss
b. Dunn Edwards: SPMA40 Suprema Semi Gloss Interior
c. Sherwin-Williams Company (The): A98 Duration Semi Gloss (BOD)
d. Vista Paint: 8400 Carefree Semi Gloss 100% Acrylic

J. CMU Substrates: 100% Acrylic Gloss

1. Prime Coat:

a. Benjamin Moore & Co: 285 Block Filler
b. Dunn Edwards: SBPR00 Block Filler
c. Sherwin-Williams Company (The): B25W25 Block Filler (BOD)
d. Vista Paint: 040 Block Filler

2. Intermediate Coat:

    a. Benjamin Moore & Co: NA
    b. Dunn Edwards: SPMA50 Suprema Gloss Interior
    c. Sherwin-Williams Company (The): A85 Super Paint Gloss (BOD)
    d. Vista Paint: 8500 Carefree Gloss 100% Acrylic

3. Finish Coat:

    a. Benjamin Moore & Co: NA
    b. Dunn Edwards: SPMA50 Suprema Gloss Interior
    c. Sherwin-Williams Company (The): A85 Super Paint Gloss (BOD)
    d. Vista Paint: 8500 Carefree Gloss 100% Acrylic

K. Ferrous Metal Substrates: 100% Acrylic Low Sheen

1. Prime Coat:

    a. Benjamin Moore & Co: M04 Acrylic Prime
    b. Dunn Edwards: UGPR00 Utra-Grip Premium
    c. Sherwin-Williams Company (The): B66W1 DTM Acrylic Primer (BOD)
    d. Vista Paint: 9600 Protec Primer

2. Intermediate Coat:

    a. Benjamin Moore & Co: NA
    b. Dunn Edwards: SPMA20 Suprema Velvet
    c. Sherwin-Williams Company (The): NA
    d. Vista Paint: 8200 Carefree 100% Acrylic Velva Sheen

3. Finish Coat:

    a. Benjamin Moore & Co: NA
    b. Dunn Edwards: SPMA20 Suprema Velvet
    c. Sherwin-Williams Company (The): NA
    d. Vista Paint: 8200 Carefree 100% Acrylic Velva Sheen

L. Ferrous Metal Substrates: 100% Acrylic Eggshell

1. Prime Coat:

    a. Benjamin Moore & Co: M04 Acrylic Prime
    b. Dunn Edwards: UGPR00 Utra-Grip Premium
    c. Sherwin-Williams Company (The): B66W1 DTM Acrylic Primer (BOD)
    d. Vista Paint: 9600 Protec Primer

2. Intermediate Coat:

    a. Benjamin Moore & Co: 549 Regal Select 100% Acrylic Eggshell

b. Dunn Edwards: SPMA30 Suprema Eggshell Interior
c. Sherwin-Williams Company (The): A97 Duration Satin (BOD)
d. Vista Paint: 8300 Carefree Eggshell 100% Acrylic

3. Finish Coat:

a. Benjamin Moore & Co: 549 Regal Select 100% Acrylic Eggshell
b. Dunn Edwards: SPMA30 Suprema Eggshell Interior
c. Sherwin-Williams Company (The): A97 Duration Satin (BOD)
d. Vista Paint: 8300 Carefree Eggshell 100% Acrylic

M. Ferrous Metal Substrate: 100% Acrylic Semi Gloss

1. Prime Coat:

a. Benjamin Moore & Co: M04 Acrylic Prime
b. Dunn Edwards: UGPR00 Utra-Grip Premium
c. Sherwin-Williams Company (The): B66W1 DTM Acrylic Primer (BOD)
d. Vista Paint: 9600 Protec Primer

2. Intermediate Coat:

a. Benjamin Moore & Co: 551 Regal Select 100% Acrylic Semi Gloss
b. Dunn Edwards: SPMA40 Suprema Semi Gloss Interior
c. Sherwin-Williams Company (The): A98 Duration Semi Gloss (BOD)
d. Vista Paint: 8400 Carefree Semi Gloss 100% Acrylic

3. Finish Coat:

a. Benjamin Moore & Co: 551 Regal Select 100% Acrylic Semi Gloss
b. Dunn Edwards: SPMA40 Suprema Semi Gloss Interior
c. Sherwin-Williams Company (The): A98 Duration Semi Gloss (BOD)
d. Vista Paint: 8400 Carefree Semi Gloss 100% Acrylic

N. Galvanized and Aluminum Metal Substrates: 100% Acrylic Low Sheen

1. Prime Coat:

a. Benjamin Moore & Co: M04 Acrylic Prime
b. Dunn Edwards: GAPR00 Galv-Alum Premium
c. Sherwin-Williams Company (The): B66A50 DTM Bonding Primer (BOD)
d. Vista Paint: 4800 Metal Pro Primer

2. Intermediate Coat:

a. Benjamin Moore & Co: NA
b. Dunn Edwards: SPMA20 Suprema Velvet
c. Sherwin-Williams Company (The): NA
d. Vista Paint: 8200 Carefree 100% Acrylic Velva Sheen

3. Finish Coat:

    a. Benjamin Moore & Co: NA
    b. Dunn Edwards: SPMA20 Suprema Velvet
    c. Sherwin-Williams Company (The): NA
    d. Vista Paint: 8200 Carefree 100% Acrylic Velva Sheen

O. Galvanized and Aluminum Metal Substrates: 100% Acrylic Eggshell

1. Prime Coat:

    a. Benjamin Moore & Co: M04 Acrylic Prime
    b. Dunn Edwards: GAPR00 Galv-Alum Premium
    c. Sherwin-Williams Company (The): B66A50 DTM Bonding Primer (BOD)
    d. Vista Paint: 4800 Metal Pro Primer

2. Intermediate Coat:

    a. Benjamin Moore & Co: 549 Regal Select 100% Acrylic Eggshell
    b. Dunn Edwards: SPMA30 Suprema Eggshell Interior
    c. Sherwin-Williams Company (The): A97 Duration Satin (BOD)
    d. Vista Paint: 8300 Carefree Eggshell 100% Acrylic

3. Finish Coat:

    a. Benjamin Moore & Co: 549 Regal Select 100% Acrylic Eggshell
    b. Dunn Edwards: SPMA30 Suprema Eggshell Interior
    c. Sherwin-Williams Company (The): A97 Duration Satin (BOD)
    d. Vista Paint: 8300 Carefree Eggshell 100% Acrylic

P. Galvanized and Aluminum Metal Substrates: 100% Acrylic Semi Gloss

1. Prime Coat:

    a. Benjamin Moore & Co: M04 Acrylic Prime
    b. Dunn Edwards: GAPR00 Galv-Alum Premium
    c. Sherwin-Williams Company (The): B66A50 DTM Bonding Primer (BOD)
    d. Vista Paint: 4800 Metal Pro Primer

2. Intermediate Coat:

    a. Benjamin Moore & Co: 551 Regal Select 100% Acrylic Semi Gloss
    b. Dunn Edwards: SPMA40 Suprema Semi Gloss Interior
    c. Sherwin-Williams Company (The): A98 Duration Semi Gloss (BOD)
    d. Vista Paint: 8400 Carefree Semi Gloss 100% Acrylic

3. Finish Coat:

    a. Benjamin Moore & Co: 551 Regal Select 100% Acrylic Semi Gloss

b. Dunn Edwards: SPMA40 Suprema Semi Gloss Interior
c. Sherwin-Williams Company (The): A98 Duration Semi Gloss (BOD)
d. Vista Paint: 8400 Carefree Semi Gloss 100% Acrylic

Q. Wood Substrates: 100% Acrylic Flat

1. Prime Coat: 1

a. Benjamin Moore & Co: 023 Fresh Start Primer
b. Dunn Edwards: EZPR00 E-Z Prime Premium
c. Sherwin-Williams Company (The): B51W20 PrepRite Pro Block (BOD)
d. Vista Paint: 4200 Terminator II

2. Intermediate Coat:

a. Benjamin Moore & Co: 547 Regal Select 100% Acrylic Flat
b. Dunn Edwards: SPMA10 Suprema Int Flat
c. Sherwin-Williams Company (The): A96 Duration Flat (BOD)
d. Vista Paint: 8100Carefree Acrylic Flat

3. Finish Coat:

a. Benjamin Moore & Co: 547 Regal Select 100% Acrylic Flat
b. Dunn Edwards: SPMA10 Suprema Int Flat
c. Sherwin-Williams Company (The): A96 Duration Flat (BOD)
d. Vista Paint: 8100Carefree Acrylic Flat

R. Wood Substrates: 100% Acrylic Low Sheen

1. Prime Coat:

a. Benjamin Moore & Co: 023 Fresh Start Primer
b. Dunn Edwards: EZPR00 E-Z Prime Premium
c. Sherwin-Williams Company (The): B51W20 PrepRite Pro Block (BOD)
d. Vista Paint: 4200 Terminator II

2. Intermediate Coat:

a. Benjamin Moore & Co: NA
b. Dunn Edwards: SPMA20 Suprema Velvet
c. Sherwin-Williams Company (The): NA
d. Vista Paint: 8200 Carefree 100% Acrylic Velva Sheen

3. Finish Coat:

a. Benjamin Moore & Co: NA
b. Dunn Edwards: SPMA20 Suprema Velvet
c. Sherwin-Williams Company (The): NA
d. Vista Paint: 8200 Carefree 100% Acrylic Velva Sheen

S. Wood Substrates: 100% Acrylic Eggshell

1. Prime Coat:

a. Benjamin Moore & Co: 023 Fresh Start Primer
b. Dunn Edwards: EZPR00 E-Z Prime Premium
c. Sherwin-Williams Company (The): B51W20 PrepRite Pro Block (BOD)
d. Vista Paint: 4200 Terminator II

2. Intermediate Coat:

a. Benjamin Moore & Co: 549 Regal Select 100% Acrylic Eggshell
b. Dunn Edwards: SPMA30 Suprema Eggshell Interior
c. Sherwin-Williams Company (The): A97 Duration Satin (BOD)
d. Vista Paint: 8300 Carefree Eggshell 100% Acrylic

3. Finish Coat:

a. Benjamin Moore & Co: 549 Regal Select 100% Acrylic Eggshell
b. Dunn Edwards: SPMA30 Suprema Eggshell Interior
c. Sherwin-Williams Company (The): A97 Duration Satin (BOD)
d. Vista Paint: 8300 Carefree Eggshell 100% Acrylic

T. Wood Substrates: 100% Acrylic Semi Gloss

1. Prime Coat:

a. Benjamin Moore & Co: 023 Fresh Start Primer
b. Dunn Edwards: EZPR00 E-Z Prime Premium
c. Sherwin-Williams Company (The): B51W20 PrepRite Pro Block (BOD)
d. Vista Paint: 4200 Terminator II

2. Intermediate Coat:

a. Benjamin Moore & Co: 551 Regal Select 100% Acrylic Semi Gloss
b. Dunn Edwards: SPMA40 Suprema Semi Gloss Interior
c. Sherwin-Williams Company (The): A98 Duration Semi Gloss (BOD)
d. Vista Paint: 8400 Carefree Semi Gloss 100% Acrylic

3. Finish Coat:

a. Benjamin Moore & Co: 551 Regal Select 100% Acrylic Semi Gloss
b. Dunn Edwards: SPMA40 Suprema Semi Gloss Interior
c. Sherwin-Williams Company (The): A98 Duration Semi Gloss (BOD)
d. Vista Paint: 8400 Carefree Semi Gloss 100% Acrylic

U. Wood Substrates: 100% Acrylic Gloss

1. Prime Coat:

a. Benjamin Moore & Co: 023 Fresh Start Primer
b. Dunn Edwards: EZPR00 E-Z Prime Premium
c. Sherwin-Williams Company (The): B51W20 PrepRite Pro Block (BOD)
d. Vista Paint: 4200 Terminator II

2. Intermediate Coat:

a. Benjamin Moore & Co: NA
b. Dunn Edwards: SPMA50 Suprema Gloss Interior
c. Sherwin-Williams Company (The): A85 Super Paint Gloss (BOD)
d. Vista Paint: 8500 Carefree Gloss 100% Acrylic

3. Finish Coat:

a. Benjamin Moore & Co: NA
b. Dunn Edwards: SPMA50 Suprema Gloss Interior
c. Sherwin-Williams Company (The): A85 Super Paint Gloss (BOD)
d. Vista Paint: 8500 Carefree Gloss 100% Acrylic

V. Wood Substrates: Stain and Clear Polyurethane Varnish Finish

1. SG Stain:

a. Benjamin Moore & Co: Benwood Low VOC Acrylic S/T Stain
b. Dunn Edwards: V109 Stain Seal
c. Sherwin-Williams Company (The): Wood Classics S/T Acrylic Stain (BOD)
d. Vista Paint: Deft WB S/T Stain

2. Intermediate Coat:

a. Benjamin Moore & Co: 423 Benwood Low Lustre Or 422 Benwood Gloss
b. Dunn Edwards: MC80-6841 Satin or MC80-6842 SG or MC80-6843 Gloss
c. Sherwin-Williams Company (The): A68 Wood Classics Satin /SG/ Gloss (BOD)
d. Vista Paint: MC80-6841 Satin or MC80-6842 SG or MC80-6843 Gloss

3. Finish Coat:

a. Benjamin Moore & Co: 423 Benwood Low Lustre Or 422 Benwood Gloss
b. Dunn Edwards: MC80-6841 Satin or MC80-6842 SG or MC80-6843 Gloss
c. Sherwin-Williams Company (The): A68 Wood Classics Satin /SG/ Gloss (BOD)
d. Vista Paint: MC80-6841 Satin or MC80-6842 SG or MC80-6843 Gloss

W. Gypsum Wallboard Substrates: 100% Acrylic Flat

1. Prime Coat:

a. Benjamin Moore & Co: 023 Fresh Start Primer

b. Dunn Edwards: VNPR00 PVA Sealer
c. Sherwin-Williams Company (The): B28W08111 Premium Wall & Wood Primer (BOD)
d. Vista Paint: 1100 Hi Build PVA Sealer

2. Intermediate Coat:

a. Benjamin Moore & Co: 547 Regal Select 100%. Acrylic Flat
b. Dunn Edwards: SPMA10 Suprema Int Flat
c. Sherwin-Williams Company (The): A96 Duration Flat (BOD)
d. Vista Paint: 8100Carefree Acrylic Flat

3. Finish Coat:

a. Benjamin Moore & Co: 547 Regal Select 100% Acrylic Flat
b. Dunn Edwards: SPMA10 Suprema Int Flat
c. Sherwin-Williams Company (The): A96 Duration Flat (BOD)
d. Vista Paint: 8100Carefree Acrylic Flat

X. Gypsum Wallboard Substrates: 100% Acrylic Low Sheen

1. Prime Coat:

a. Benjamin Moore & Co: 023 Fresh Start Primer
b. Dunn Edwards: VNPR00 PVA Sealer
c. Sherwin-Williams Company (The): B28W08111 Premium Wall & Wood Primer (BOD)
d. Vista Paint: 1100 Hi Build PVA Sealer

2. Intermediate Coat:

a. Benjamin Moore & Co: NA
b. Dunn Edwards: SPMA20 Suprema Velvet
c. Sherwin-Williams Company (The): NA
d. Vista Paint: 8200 Carefree 100% Acrylic Velva Sheen

3. Finish Coat:

a. Benjamin Moore & Co: NA
b. Dunn Edwards: SPMA20 Suprema Velvet
c. Sherwin-Williams Company (The): NA
d. Vista Paint: 8200 Carefree 100% Acrylic Velva Sheen

Y. Gypsum Wallboard Substrates: 100% Acrylic Eggshell

1. Prime Coat:

a. Benjamin Moore & Co: 023 Fresh Start Primer
b. Dunn Edwards: VNPR00 PVA Sealer

c. Sherwin-Williams Company (The): B28W08111 Premium Wall & Wood Primer (BOD)
d. Vista Paint: 1100 Hi Build PVA Sealer

2. Intermediate Coat:

a. Benjamin Moore & Co: 549 Regal Select 100% Acrylic Eggshell
b. Dunn Edwards: SPMA30 Suprema Eggshell Interior
c. Sherwin-Williams Company (The): A97 Duration Satin (BOD)
d. Vista Paint: 8300 Carefree Eggshell 100% Acrylic

3. Finish Coat:

a. Benjamin Moore & Co: 549 Regal Select 100% Acrylic Eggshell
b. Dunn Edwards: SPMA30 Suprema Eggshell Interior
c. Sherwin-Williams Company (The): A97 Duration Satin (BOD)
d. Vista Paint: 8300 Carefree Eggshell 100% Acrylic

Z. Gypsum Wallboard Substrates: 100% Acrylic Semi Gloss

1. Prime Coat:

a. Benjamin Moore & Co: 023 Fresh Start Primer
b. Dunn Edwards: VNPR00 PVA Sealer
c. Sherwin-Williams Company (The): B28W08111 Premium Wall & Wood Primer (BOD)
d. Vista Paint: 1100 Hi Build PVA Sealer

2. Intermediate Coat:

a. Benjamin Moore & Co: 551 Regal Select 100% Acrylic Semi Gloss
b. Dunn Edwards: SPMA40 Suprema Semi Gloss Interior
c. Sherwin-Williams Company (The): A98 Duration Semi Gloss (BOD)
d. Vista Paint: 8400 Carefree Semi Gloss 100% Acrylic

3. Finish Coat:

a. Benjamin Moore & Co: 551 Regal Select 100% Acrylic Semi Gloss
b. Dunn Edwards: SPMA40 Suprema Semi Gloss Interior
c. Sherwin-Williams Company (The): A98 Duration Semi Gloss (BOD)
d. Vista Paint: 8400 Carefree Semi Gloss 100% Acrylic

AA. Gypsum Wallboard Substrates: 100% Acrylic Gloss

1. Prime Coat:

a. Benjamin Moore & Co: 023 Fresh Start Primer
b. Dunn Edwards: VNPR00 PVA Sealer
c. Sherwin-Williams Company (The): B28W08111 Premium Wall & Wood Primer (BOD)

d. Vista Paint: 1100 Hi Build PVA Sealer

2. Intermediate Coat:

a. Benjamin Moore & Co: NA
b. Dunn Edwards: SPMA50 Suprema Gloss Interior
c. Sherwin-Williams Company (The): A85 Super Paint Gloss (BOD)
d. Vista Paint: 8500 Carefree Gloss 100% Acrylic

3. Finish Coat:

a. Benjamin Moore & Co: NA
b. Dunn Edwards: SPMA50 Suprema Gloss Interior
c. Sherwin-Williams Company (The): A85 Super Paint Gloss (BOD)
d. Vista Paint: 8500 Carefree Gloss 100% Acrylic

END OF SECTION

SECTION 099600 - HIGH-PERFORMANCE COATINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes surface preparation and application of high-performance coating systems on the following substrates:

1. Exterior and interior steel handrails.

B. Related Sections include the following:

1. Division 05 Sections for shop priming of metal substrates with primers specified in this Section.
2. Division 09 painting Sections for general field painting.
3. Comply with “CALGreen VERIFICATION GUIDELINES MANDATORY CHECKLIST” requirements as indicated in Drawing Sheet G1.21.

1.03 DEFINITIONS

A. Gloss ranges used in this Section include the following:

1. Semigloss refers to medium-sheen finish with a gloss range between 30 and 65 when measured at a 60-degree meter.
2. High gloss refers to high-sheen finish with a gloss range more than 65 when measured at a 60-degree meter.

1.04 ACTION SUBMITTALS

A. Samples for Verification: For each type of coating system and in each color and gloss of finish coat indicated.

1. Submit Samples on rigid backing, 8 inches square.
2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

1.05 QUALITY ASSURANCE

A. Master Painters Institute (MPI) Standards, Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for preparation and application requirements as supplemental to coating systems manufacturer's written instructions and recommendations.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.07 PROJECT CONDITIONS

A. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 50 and 95 deg F.

B. Do not apply coatings in rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.01 HIGH-PERFORMANCE COATINGS, GENERAL

A. Material Compatibility:

1. Provide materials for use within each coating system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. Provide products of same manufacturer for each coat in a coating system.

B. VOC Content of Field-Applied Interior Paints and Coatings: Provide products that comply with limits for VOC content not exceeding maximum permitted by authorities having jurisdiction.

C. Basis of Design Products: Coating systems indicated are products manufactured by Tnemec Company, Inc. Subject to compliance with requirements, provide coating products indicated or comparable products by one of the following:

1. PPG Amercoat; Pittsburgh, PA. 15272; www.ppgpmc.com
2. Carboline Protective Coatings; St. Louis, MO. 63144; www.carboline.com. (distributed by Vista Paint Co.)
3. Or equal.

D. Colors: Match Architect's samples.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for conditions affecting performance of work.

1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
2. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
3. Coating application indicates acceptance of surfaces and conditions.

3.02 PREPARATION

A. Comply with manufacturer's written instructions and recommendations applicable to substrates indicated.

B. Remove plates, machined surfaces, and similar items already in place that are not to be coated. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and coating. After completing coating operations, reinstall items that were removed; use workers skilled in the trades involved.

C. Clean substrates of substances that could impair bond of coatings, including dirt, oil, grease, and incompatible paints and encapsulants. Remove incompatible primers and reprime substrate with compatible primers as required to produce coating systems indicated. Clean all welds and damaged organic urethane zinc shop primer.

D. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by coating manufacturer and according to SSPC-SP 11, "Power Tool Clean to Bare Metal."

E. Galvanized-Metal Substrates: SSPC-SP1 Solvent Clean to Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, mechanically etch surfaces to provide a uniform anchor profile that promote adhesion of subsequently applied coatings.

3.03 APPLICATION

A. Apply high-performance coatings according to manufacturer's written instructions.

1. Use applicators and techniques suited for coating and substrate indicated.
2. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Coat back sides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.

D. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.04 FIELD QUALITY CONTROL

A. Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when coatings are being applied:

1. Owner may engage the services of a qualified testing agency to sample coating material being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Sub-contractor.
2. Testing agency will perform tests for compliance with specified requirements.
3. Owner may direct Sub-contractor to stop applying coatings if test results show materials being used do not comply with specified requirements. Sub-contractor shall remove noncomplying coating materials from Project site, pay for testing, and recoat surfaces coated with rejected materials. Sub-contractor will be required to remove rejected materials from previously coated surfaces if, on recoating with complying materials, the two coatings are incompatible.

3.05 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.06 HIGH-PERFORMANCE COATING SCHEDULE

A. Steel Substrates: Zinc/Epoxy/Urethane Coating System: Semi-Gloss Acrylic Polyurethane Finish

1. Prime (Spot) Coat: Tnemec 94-H20 Hydro-Zinc @ 2.5-3.5 mils DFT.
2. Intermediate Coat: Tnemec L69 Epoxoline @ 2.0-4.0 mils DFT.
3. Topcoat: Tnemec 1095 Endura-Shield @ 2.0-4.0 mils DFT.

B. Galvanized-Metal Substrates: Epoxy/Urethane Coating System: Semi-Gloss Acrylic Polyurethane Finish

1. Prime Coat: Tnemec L69 Epoxoline @ 2.0-4.0 mils DFT.
2. Intermediate Coat: Not required
3. Topcoat: Tnemec 1095 Endura-Shield @ 2.0-4.0 mils DFT.

END OF SECTION

SECTION 101100 - VISUAL DISPLAY UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes: Visual display board assemblies.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, and accessories for visual display units.
2. Include electrical characteristics for motorized units.

B. Shop Drawings: For visual display units.

1. Include plans, elevations, sections, details, and attachment to other work.
2. Show locations of panel joints. Show locations of field-assembled joints for factory-fabricated units too large to ship in one piece.
3. Show locations and layout of special-purpose graphics.
4. Include sections of typical trim members.

C. Product Schedule: For visual display units. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each visual display unit, for tests performed by [manufacturer and witnessed by a qualified testing agency] [a qualified testing agency].

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For visual display units to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Build mockup of typical visual display unit as shown on Drawings. Include accessories.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver factory-fabricated visual display units completely assembled in one piece. If dimensions exceed maximum manufactured unit size, or if unit size is impracticable to ship in one piece, provide two or more pieces with joints in locations indicated on approved Shop Drawings.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install visual display units until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.

2. Smoke-Developed Index: 450 or less.

2.2 GLASS MARKERBOARDS

A. Basis of Design Product: Subject to compliance with requirements, provide Claridge Products and Equipment, Inc., Dry-Erase Whiteboard MCM-46-TG with through glass stand-off mounts.

B. Glass Markerboards: Fabricated of 6-mm low iron tempered glass with steel backing for use with magnets.

1. Edge Treatment: Smooth polished edge with rounded corners.
2. Surface: Glossy.
3. Color: White.

C. Mounting: Round, stainless steel standoffs, holding glass approximately 1 inch (25 mm) from wall surface; mounted through holes in markerboard.

D. Graphics: Provide screen-printed graphics where indicated.

E. Marker Tray: Aluminum, attached with stainless steel clips.

F. Size: 48 by 72 inches.

G. Display Rail: Manufacturer's standard, extruded-aluminum display rail with plastic-impregnated-cork insert, end stops, and continuous paper holder, designed to hold accessories.

1. Size: 1 inch high by full length of visual display unit.
2. Map Hooks: Two map hooks for every 48 inches of display rail or fraction thereof.
3. Aluminum Color: Match finish of visual display assembly trim.

2.3 TACKBOARD PANELS

A. Tackboard Panels:

1. Facing: 1/8-inch-thick, plastic-impregnated cork.
2. Core: Manufacturer's standard.

2.4 MATERIALS

A. Plastic-Impregnated-Cork Sheet: Seamless, homogeneous, self-sealing sheet consisting of granulated cork, linseed oil, resin binders, and dry pigments that are mixed and calendared onto fabric backing; with washable vinyl finish and integral color throughout; with surface-burning characteristics indicated.

B. Hardboard: ANSI A135.4, tempered.

C. Particleboard: ANSI A208.1, Grade M-1.

D. MDF: ANSI A208.2, Grade 130.

E. Fiberboard: ASTM C208 cellulosic fiber insulating board.

F. Extruded Aluminum: ASTM B221, Alloy 6063.

G. Adhesives for Field Application: Mildew-resistant, nonstaining adhesive for use with specific type of panels, sheets, or assemblies; and for substrate application; as recommended in writing by visual display unit manufacturer.

2.5 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.

B. Examine walls and partitions for proper preparation and backing for visual display units.

C. Examine walls and partitions for suitable framing depth where sliding visual display units will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Comply with manufacturer's written instructions for surface preparation.

B. Clean substrates of substances, such as dirt, mold, and mildew, that could impair the performance of and affect the smooth, finished surfaces of visual display boards.

C. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, projections, depressions, and substances that will impair bond between visual display units and wall surfaces.

D. Prepare recesses for sliding visual display units as required by type and size of unit.

3.3 INSTALLATION

A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

B. Factory-Fabricated Visual Display Board Assemblies: Attach concealed clips, hangers, and grounds to wall surfaces and to visual display board assemblies with fasteners at not more than 16 inches o.c. Secure tops and bottoms of boards to walls.

3.4 CLEANING AND PROTECTION

A. Clean visual display units in accordance with manufacturer's written instructions. Attach one removable cleaning instructions label to visual display unit in each room.

B. Touch up factory-applied finishes to restore damaged or soiled areas.

C. Cover and protect visual display units after installation and cleaning.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain motorized, sliding visual display units.

END OF SECTION 101100

SECTION 101146 - VISUAL DISPLAY FABRICS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Related Requirements: Comply with “CALGreen VERIFICATION GUIDELINES MANDATORY CHECKLIST” requirements as indicated in Drawing Sheet G1.21.

1.2 SUMMARY

A. Section includes dry-erase wall coverings.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of dry-erase wall covering. Include data on physical characteristics, durability, and flame-resistance characteristics.

B. Shop Drawings: Show location and extent. Indicate seams and termination points.

C. Samples for Verification: Full width by 36-inch-long section of dry-erase wall covering.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For surface-burning characteristics of each type of dry-erase wall covering, for tests performed by manufacturer and witnessed by a qualified testing agency.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For dry-erase wall coverings to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for installation.

1. Build mockup of typical dry-erase wall covering as directed by Architect.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install dry-erase wall coverings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

2.2 DRY-ERASE WALL COVERINGS

A. Dry-Erase Wall Covering: Intended for use with dry-erase markers and as a projection surface and consisting of low-gloss plastic film bonded to fabric backing.

1. Basis of Design Product: Design is based on product manufactured by Koroseal Interior Products. Subject to compliance with requirements, provide products as indicated in “Materials and Color Schedule” in Drawings” or equal:

2. Color: As indicated by manufacturer's designations.

B. Adhesives for Field Application: Strippable, mildew-resistant, nonstaining adhesive for use with dry-erase wall coverings; and for substrate application; as recommended in writing by dry-erase wall covering manufacturer.

C. Primer/Sealer: Mildew-resistant primer/sealer complying with requirements in Section 099123 "Interior Painting" and recommended in writing by dry-erase wall covering manufacturer for intended substrate.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, moisture content, and other conditions affecting performance of the Work.

B. Examine walls and partitions for proper preparation for dry-erase wall covering.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Comply with manufacturer's written instructions for surface preparation.

B. Clean substrates of substances, including dirt, mold, and mildew, that could impair the bond of dry-erase wall coverings or affect the smooth, finished surfaces of dry-erase wall coverings.

C. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, projections, and depressions.

D. Prepare substrates indicated to receive dry-erase wall covering as required by manufacturer's written instructions to achieve a smooth, dry, clean, structurally sound surface that is uniform in color.

1. Moisture Content: Maximum of 4 percent when tested with an electronic moisture meter.
2. Metals: If not factory primed, clean and apply metal as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
3. Plaster: Allow new plaster to cure. Neutralize areas of high alkalinity. Prime with primer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
4. Gypsum Board: Prime with primer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
5. Painted Surfaces: Treat areas susceptible to pigment bleeding.

3.3 INSTALLATION

A. Dry-Erase Wall Covering: Comply with dry-erase wall-covering manufacturers' written installation instructions.

1. Install seams horizontal and level, with lowest seam 24 inches above finished floor. Railroad fabric (reverse roll direction) to ensure color matching.
2. Double cut seams, with no gaps or overlaps. Remove air bubbles, wrinkles, blisters, and other defects.
3. After installation, clean dry-erase wall covering in accordance with manufacturer's written instructions. Remove excess adhesive at finished seams, perimeter edges, and adjacent surfaces.

3.4 CLEANING AND PROTECTION

A. Remove excess adhesive at finished seams, perimeter edges, and adjacent surfaces.

B. Clean dry-erase wall covering in accordance with manufacturer's written instructions. Attach one removable cleaning instructions label to dry-erase wall covering in each room.

C. Reinstall hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

END OF SECTION

SECTION 101419 - DIMENSIONAL LETTER SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes: Cast dimensional characters and College Logo.

1.3 COORDINATION

A. Furnish templates for placement of electrical service embedded in permanent construction by other installers.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For signs.

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
3. Show message list, typestyles, graphic elements, and layout for each sign at least half size.

C. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:

1. Dimensional Characters: Full-size Sample of each type of dimensional character.
2. Exposed Accessories: Full-size Sample of each accessory type.
3. Full-size Samples, if approved, will be returned to Contractor for use in the Project.

D. Product Schedule: For dimensional letter signs. Use same designations indicated on Drawings or specified.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify locations of electrical service embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Deterioration of finishes beyond normal weathering.
b. Separation or delamination of sheet materials and components.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Signage and Graphics: Raised characters shall comply with CBC 11B-703.2 and as follows:

1. Depth: It shall be 1/32 inch ((0.8 mm) minimum above their background and shall be sans serif uppercase and be duplicated I Braille.

2. Height: It shall be 5/8 inch (15.9 mm) minimum and 2 inches (51 mm)maximum based on the height of the uppercase letter :I". CBC Section 11B-703.2.5.
3. Finish and Contract: Characters and their background shall have a non-glare finish. Character shall contrast with their background with either light characters on a dark background or dork characters on a light background. CBC Section 11B-703.5.1.
4. Proportions: It shall be selected from fonts where the width of the uppercase letter "O" is 60% minimum and 110% maximum of the height of the uppercase letter "I". Stroke thickness of the uppercase letter "I" shall be 15% maximum of the height of the character. CBC Sections 11B-703.2.4 and 11B-703.2.6.
5. Character Spacing: Spacing between individual raised characters shall comply with CBC Section 11B-703.2.7 and 11B-703.2.8.
6. Format: Text shall be in a horizontal format. CBC Section 11B-703.2.9.
7. Braille: It shall be contracted (Grade 2) and shall comply with CBC Section 11B-703.3 and 11B-703.4. Braille dots shall have a domed or rounded shape and shall comply with CBC Table and Figure 11B-703.3.1.
8. Mounting Height: Tactile characters on signs shall be located 48 inches minimum to the baseline of the lowest Braille cells and 60 inches maximum to the baseline of the highest line of raised characters above the finish floor or ground surface. CBC Section and Figure 11B-703.4.1.
9. Mounting Location: A tactile sign shall be located per CBC Section and Figure 11B-703.4.2, as follows:

    a. Alongside a single door at the latch side.
    b. On the inactive leaf at double doors with one active leaf.
    c. To the right of the right hand door at double doors with two active leafs.
    d. On the nearest adjacent wall where there is not wall space at the latch side of a single door or at the right side of double doors with two active leafs.
    e. So that a clear floor space of 18 inches by 18 inches minimum, centered on the tactile characters, is provided beyond the arch of any door swing between the closed position and 45 degree open position.

10. Visual characters shall comply with CBC Section 11B-703.5 and shall be 40 inches minimum above finish floor or ground.
11. Pictograms shall comply with CBC Section 11B-703.6.
12. Symbols of accessibility shall comply with CBC Section 11B-703.7.
13. Variable message signs shall comply with CBC Section 11B-703.8.

2.2 DIMENSIONAL CHARACTERS

A. Cast Characters: Characters with uniform faces, sharp corners, and precisely formed lines and profiles, and as follows:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. ASI Sign Systems, Inc.
    b. Matthews International Corporation; Bronze Division.

c. Metal Arts.
d. Metallic Arts.
e. Southwell Company (The).
f. Or equal

2. Character Material: Cast aluminum.
3. Character Height: As indicated on Drawings.
4. Thickness: As indicated on Drawings.
5. Finishes: Integral Aluminum Finish: Clear anodized.
6. Mounting: Concealed studs.
7. Typeface: As indicated on Drawings.
8. College Logo: Owner will provide logo graphic for use in creating logo signage.

2.3 DIMENSIONAL CHARACTER MATERIALS

A. Aluminum Castings: ASTM B26/B26M, alloy and temper recommended by sign manufacturer for casting process used and for type of use and finish indicated.

2.4 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following:

1. Use concealed fasteners and anchors unless indicated to be exposed.
2. For exterior exposure, furnish stainless-steel devices unless otherwise indicated.
3. Sign Mounting Fasteners:

a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.
b. Projecting Studs: Threaded studs with sleeve spacer, welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.

B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

2.5 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling

limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.

2. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
3. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
4. Castings: Fabricate castings free of warp, cracks, blowholes, pits, scale, sand holes, and other defects that impair appearance or strength. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks before finishing.

2.6 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

2.7 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
3. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

B. Mounting Methods:

1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.

a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.

3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed characters and signs that do not comply with specified requirements. Replace characters with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION

SECTION 101423 - PANEL SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Panel signs.
2. Field-applied, vinyl-character signs.

1.3 DEFINITIONS

A. Accessible: In accordance with the accessibility standard.

1.4 COORDINATION

A. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.

B. Furnish templates for placement of electrical service embedded in permanent construction by other installers.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For panel signs.

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least half size.

C. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:

1. Panel Signs: Full-size Sample.
2. Field-Applied, Vinyl-Character Signs: Full-size Sample of characters on glass.
3. Variable Component Materials: Full-size Sample of each base material, character (letter, number, and graphic element) in each exposed color and finish not included in Samples above.
4. Exposed Accessories: Full-size Sample of each accessory type.
5. Full-size Samples, if approved, will be returned to Contractor for use in Project.

D. Product Schedule: For panel signs. Use same designations indicated on Drawings or specified.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.9 FIELD CONDITIONS

A. Field Measurements: Verify locations of anchorage devices embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

    a. Deterioration of finishes beyond normal weathering.
    b. Deterioration of embedded graphic image.
    c. Separation or delamination of sheet materials and components.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and 2019 CBC.

B. Signage and Graphics: Raised characters shall comply with CBC 11B-703.2 and as follows:

1. Depth: It shall be 1/32 inch ((0.8 mm) minimum above their background and shall be sans serif uppercase and be duplicated I Braille.
2. Height: It shall be 5/8 inch (15.9 mm) minimum and 2 inches (51 mm)maximum based on the height of the uppercase letter :I". CBC Section 11B-703.2.5.
3. Finish and Contract: Characters and their background shall have a non-glare finish. Character shall contrast with their background with either light characters on a dark background or dork characters on a light background. CBC Section 11B-703.5.1.
4. Proportions: It shall be selected from fonts where the width of the uppercase letter "O" is 60% minimum and 110% maximum of the height of the uppercase letter "I". Stroke thickness of the uppercase letter "I" shall be 15% maximum of the height of the character. CBC Sections 11B-703.2.4 and 11B-703.2.6.
5. Character Spacing: Spacing between individual raised characters shall comply with CBC Section 11B-703.2.7 and 11B-703.2.8.
6. Format: Text shall be in a horizontal format. CBC Section 11B-703.2.9.
7. Braille: It shall be contracted (Grade 2) and shall comply with CBC Section 11B-703.3 and 11B-703.4. Braille dots shall have a domed or rounded shape and shall comply with CBC Table and Figure 11B-703.3.1.
8. Mounting Height: Tactile characters on signs shall be located 48 inches minimum to the baseline of the lowest Braille cells and 60 inches maximum to the baseline of the highest line of raised characters above the finish floor or ground surface. CBC Section and Figure 11B-703.4.1.
9. Mounting Location: A tactile sign shall be located per CBC Section and Figure 11B-703.4.2, as follows:

    a. Alongside a single door at the latch side.
    b. On the inactive leaf at double doors with one active leaf.
    c. To the right of the right hand door at double doors with two active leafs.
    d. On the nearest adjacent wall where there is not wall space at the latch side of a single door or at the right side of double doors with two active leafs.
    e. So that a clear floor space of 18 inches by 18 inches minimum, centered on the tactile characters, is provided beyond the arch of any door swing between the closed position and 45 degree open position.

10. Visual characters shall comply with CBC Section 11B-703.5 and shall be 40 inches minimum above finish floor or ground.
11. Pictograms shall comply with CBC Section 11B-703.6.

12. Symbols of accessibility shall comply with CBC Section 11B-703.7.
13. Variable message signs shall comply with CBC Section 11B-703.8.

2.2 PANEL SIGNS

A. Panel Sign: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. ASI Sign Systems, Inc.
    b. Best Sign Systems, Inc.
    c. Vomar Products, Inc.
    d. Or equal.

2. Solid-Sheet Sign: Acrylic sheet with finish specified in "Surface Finish and Applied Graphics" Subparagraph and as follows:

    a. Thickness: As indicated on Drawings.
    b. Surface-Applied, Flat Graphics: Applied photo image.
    c. Surface-Applied, Raised Graphics: Applied polymer characters and Braille.
    d. Etched and Filled Graphics: Sign face etched or routed to receive enamel-paint infill.

3. Sign-Panel Perimeter: Finish edges smooth.

    a. Edge Condition: As indicated on Drawings.
    b. Corner Condition in Elevation: As indicated on Drawings.

4. Mounting: As indicated on Drawings with.
5. Surface Finish and Applied Graphics:

    a. Integral Acrylic Sheet Color: Match Architect's sample.
    b. Photo-Image Graphics: Manufacturer's standard multicolor, 600-dpi halftone or dot-screen image.

6. Text and Typeface: Accessible raised characters and Braille. Finish raised characters to contrast with background color, and finish Braille to match background color.
7. Flatness Tolerance: Sign shall remain flat or uniformly curved under installed conditions as indicated on Drawings and within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner.

2.3 FIELD-APPLIED, VINYL-CHARACTER SIGNS

A. Field-Applied, Vinyl-Character Sign: Prespaced characters die cut from 3- to 3.5-mil thick, weather-resistant vinyl film with release liner on the back and carrier film on the front for on-site alignment and application.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Allen Markings.
    b. APCO Graphics, Inc.
    c. Inpro Corporation.
    d. Mohawk Sign Systems.
    e. Seton Identification Products; a Brady Corporation company.
    f. Or equal.

2. Size: As indicated on Drawings.
3. Substrate: As indicated on Drawings.
4. Text and Font: As indicated on Drawings.

2.4 PANEL-SIGN MATERIALS

A. Aluminum Sheet and Plate: ASTM B209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

B. Aluminum Extrusions: ASTM B221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

C. Acrylic Sheet: ASTM D4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).

D. Vinyl Film: UV-resistant vinyl film of nominal thickness indicated, with pressure-sensitive, permanent adhesive on back; die cut to form characters or images as indicated on Drawings and suitable for exterior applications.

E. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.5 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following unless otherwise indicated:

1. Use concealed fasteners and anchors unless indicated to be exposed.
2. Inserts: Furnish inserts to be set by other installers into concrete or masonry work.

B. Adhesive: As recommended by sign manufacturer.

1. Verify adhesives have a VOC content of 70 g/L or less.
2. Verify adhesive complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch thick, with adhesive on both sides.

D. Hook-and-Loop Tape: Manufacturer's standard two-part tape consisting of hooked part on sign back and looped side on mounting surface.

E. Magnetic Tape: Manufacturer's standard magnetic tape with adhesive on one side.

F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

2.6 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

1. Preassemble signs in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
5. Internally brace signs for stability, to meet structural performance loading without oil-canning or other surface deformation, and for securing fasteners.
6. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.

B. Subsurface-Applied Graphics: Apply graphics to back face of clear face-sheet material to produce precisely formed image. Image shall be free of rough edges.

2.7 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.

C. Verify that anchorage devices embedded in permanent construction are correctly sized and located to accommodate signs.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Install signs so they do not protrude or obstruct according to the accessibility standard.
3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.

B. Accessible Signage: Install in locations on walls as indicated on Drawings and according to the accessibility standard.

C. Mounting Methods:

1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.

    a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
    b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.

2. Projecting Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.

    a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place spacers on studs, place sign in position, and push until spacers are pinched between sign and substrate, embedding the stud ends in holes. Temporarily support sign in position until adhesive fully sets.
    b. Thin or Hollow Surfaces: Place spacers on studs, place sign in position with spacers pinched between sign and substrate, and install washers and nuts on stud ends projecting through opposite side of surface, and tighten.

3. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.
4. Brackets: Remove loose debris from substrate surface and install backbar or bracket supports in position so that signage is correctly located and aligned.
5. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.
6. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.

D. Field-Applied, Vinyl-Character Signs: Clean and dry substrate. Align sign characters in final position before removing release liner. Remove release liner in stages, and apply and firmly press characters into final position. Press from the middle outward to obtain good bond without blisters or fishmouths. Remove carrier film without disturbing applied vinyl film.

E. Signs Mounted on Glass: Provide opaque sheet matching sign material and finish onto opposite side of glass to conceal back of sign.

3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION

SECTION 102113.17 - PHENOLIC-CORE TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Phenolic-core toilet compartments configured as toilet enclosures and urinal screens.

B. Related Requirements:

1. Section 061053 "Miscellaneous Rough Carpentry" for blocking.

2. Section 102800 "Toilet, Bath, and Laundry Accessories" for toilet tissue dispensers, grab bars, purse shelves, and similar accessories mounted on toilet compartments.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.

B. Shop Drawings: For toilet compartments.

1. Include plans, elevations, sections, details, and attachment details.

2. Show locations of cutouts for compartment-mounted toilet accessories.

3. Show locations of centerlines of toilet fixtures.

4. Show locations of floor drains.

5. Show ceiling grid, ceiling-mounted items, and overhead support or bracing locations.

C. Samples for Initial Selection: For each type of toilet compartment material indicated.

1. Include Samples of hardware and accessories involving material and color selection.

D. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:

1. Each type of material, color, and finish required for toilet compartments, prepared on 6-inch-square Samples of same thickness and material indicated for Work.

2. Each type of hardware and accessory.

E. Product Schedule: For toilet compartments, prepared by or under the supervision of supplier, detailing location and selected colors for toilet compartment material.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of toilet compartment.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet compartments to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Door Hinges: One hinge(s) with associated fasteners.

2. Latch and Keeper: One latch(es) and keeper(s) with associated fasteners.

3. Door Bumper: One door bumper(s) with associated fasteners.

4. Door Pull: One door pull(s) with associated fasteners.

5. Fasteners: Ten fasteners of each size and type.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Sanitary Facility Elements: Comply with the following:

1. Elements of Sanitary facilities shall be mounted at locations in compliance with CBC Sections 11B-602 through 11B-612.

2. Grab bars in toilet facilities and bathing facilities shall comply with CBC Section 11B-609. Grab bars and any will or other surfaces adjacent to grab bars shall be free of sharp or abrasive elements and shall have rounded edges. The space around the grab bars shall be as follows:

   a. 1-1/2 inch between the grab bar and the wall.
   b. 1-1/2 inch between the grab bar and projecting objects below and at the ends.
   c. 12 inch minimum between the grab bar and projecting objects above.

B. Accessible Toilet Compartments: Comply with the following:

1. Wheelchair accessible compartment shall comply with CBC Section 11B-604.8.1.

2. Toe clearance for at least one side partition of a wheelchair accessible compartment shall comply with CBC Section and figure 11B-604.8.1.4. It shall be 9 inches high minimum above the finish floor and 6 inches deep minimum beyond the compartment side face of the partition, exclusive of partition support members. It shall be 12 inches high minimum above the finish floor for children's use. Partition components at toe clearances shall be smooth without sharp edges or abrasive surfaces. Toe clearance at the side partition is not required in a compartment greater than 66 inches wide.

3. Ambulatory accessible compartments shall be provided where there are six or more toilet compartments ,or where the combination of urinals and water closets totals six or more fixtures. Such compartments shall be provided in the same quantity as wheelchair access compartments per CBC Section 11B-213.3.1 and shall comply with CBC 11B-604.8.2.

4. Door and door hardware for accessible compartments shall be self-closing and shall comply with CBC Section 11B-404 except that if the approach is to the latch side of an ambulatory compartment door, clearance between the door side of the compartment and any obstruction shall be 44 inches minimum. CBC Figure 11B-604.8.2.

5. A door pull complying with CBC Section 11B-404.2.7 shall be placed on both sides of the accessible compartment door near the latch.

6. Ambulatory accessible toile compartment door shall not swing into the clear floor space or clearance required for any fixture or into the minimum required compartment area. CBC Section 11B-604.8.2.2.

C. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 75 or less.

2. Smoke-Developed Index: 450 or less.

D. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and 2019 CBC for toilet compartments designated as accessible.

2.2 PHENOLIC-CORE TOILET COMPARMENTS

A. Product: Subject to compliance with requirements, provide product indicated in “Materials and Colors Schedule” on Drawings, or comparable product from one of the available manufacturers.

B. Available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Bobrick Washroom Equipment, Inc., Sierra Series 1090 (Basis of Design).

2. American Sanitary Partition Corporation.

3. Bradley Corporation.

4. General Partitions Mfg. Corp.

5. Global Partitions Corp., an ASI Group Company.

6. Weis-Robart Partitions, Inc.

7. Or equal.

C. Toilet-Enclosure Style: Ovehead braced.

D. Urinal-Screen Style: Wall hung.

E. Door, Panel, Screen, and Pilaster Construction: Solid phenolic-core panel material with melamine facing on both sides fused to substrate during panel manufacture (not separately laminated), and with eased and polished edges and no-sightline system. Provide minimum 3/4-inch-thick doors and pilasters and minimum 1/2-inch-thick panels.

F. Pilaster Shoes and Sleeves (Caps): Formed from stainless steel sheet, not less than 0.031-inch nominal thickness and 3 inches high, finished to match hardware.

G. Brackets (Fittings): Full-Height (Continuous) Type: Manufacturer's standard design; stainless steel.

H. Phenolic-Panel Finish:

1. Color and Pattern: As selected by Architect from manufacturer's full range, with manufacturer's standard through-color core matching face sheet.

2. Edge Color: Manufacturer's standard.

2.3 HARDWARE AND ACCESSORIES

A. Hardware and Accessories: Manufacturer's heavy-duty operating hardware and accessories.

1. Hinges: Manufacturer's minimum 0.062-inch-thick stainless steel continuous, cam type that swings to a closed or partially open position or continuous, spring-loaded type, allowing emergency access by lifting door. Mount with through-bolts.

2. Latch and Keeper: Manufacturer's heavy-duty surface-mounted cast-stainless steel latch unit designed to resist damage due to slamming, with combination rubber-faced door strike and keeper, and with provision for emergency access. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible. Mount with through-bolts.

3. Coat Hook: Manufacturer's heavy-duty combination cast-stainless steel hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories. Mount with through-bolts.

4. Door Bumper: Manufacturer's heavy-duty rubber-tipped cast-stainless steel bumper at out-swinging doors. Mount with through-bolts.

5. Door Pull: Manufacturer's heavy-duty cast-stainless steel pull at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible. Mount with through-bolts.

B. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized-steel, or other rust-resistant, protective-coated steel compatible with related materials.

2.4 MATERIALS

A. Aluminum Castings: ASTM B26/B26M.

B. Aluminum Extrusions: ASTM B221.

C. Brass Castings: ASTM B584.

D. Brass Extrusions: ASTM B455.

E. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304, stretcher-leveled standard of flatness.

F. Stainless Steel Castings: ASTM A743/A743M.

G. Zamac: ASTM B86, commercial zinc-alloy die castings.

2.5 FABRICATION

A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.

B. Floor-and-Ceiling-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at tops and bottoms of pilasters. Provide shoes and sleeves (caps) at pilasters to conceal anchorage.

C. Door Size and Swings: Unless otherwise indicated, provide 24-inch-wide in-swinging doors for standard toilet compartments and 36-inch-wide out-swinging doors with a minimum 32-inch-wide clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work. Confirm location and adequacy of blocking and supports required for installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.

1. Maximum Clearances:

    a. Pilasters and Panels: 1/2 inch.
    b. Panels and Walls: 1 inch.

2. Full-Height (Continuous) Brackets: Secure panels to walls and to pilasters with full-height brackets.

    a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
    b. Align brackets at pilasters with brackets at walls.

B. Floor-and-Ceiling-Anchored Units: Secure pilasters to supporting construction and level, plumb, and tighten. Hang doors and adjust so doors are level and aligned with panels when doors are in closed position.

C. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.3 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION

.SECTION 102600 - WALL AND DOOR PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Wall guards.
2. Corner guards.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, impact strength, dimensions of individual components and profiles, and finishes.
2. Include fire ratings of units recessed in fire-rated walls and listings for door-protection items attached to fire-rated doors.

B. Shop Drawings: For each type of wall and door protection showing locations and extent.

1. Include plans, elevations, sections, and attachment details.

C. Samples for Verification: For each type of exposed finish on the following products, prepared on Samples of size indicated below:

1. Wall Guards: 12 inches long. Include examples of joinery, corners, end caps, and field splices.
2. Corner and End-Wall Guards: 12 inches long. Include example top caps.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of handrail.

B. Material Certificates: For each type of exposed plastic material.

C. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of wall and door protection product to include in maintenance manuals.

1. Include recommended methods and frequency of maintenance for maintaining best condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to finishes and performance.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store wall and door protection in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1. Maintain room temperature within storage area at not less than 70 deg F during the period plastic materials are stored.
2. Keep plastic materials out of direct sunlight.
3. Store plastic wall- and door-protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F.

a. Store corner-guard covers in a vertical position.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of wall- and door-protection units that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including detachment of components from each other or from the substrates, delamination, and permanent deformation beyond normal use.
b. Deterioration of metals, metal finishes, plastics, and other materials beyond normal use.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain wall- and door-protection products of each type from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Surface Burning Characteristics: Comply with ASTM E84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and2019 CBC.

2.3 WALL GUARDS

A. Crash Rail: Heavy-duty assembly consisting of continuous snap-on plastic cover installed over concealed retainer; designed to withstand impacts.

B. Product: Subject to compliance with requirements, provide product indicated in “Materials and Colors Schedule” on Drawings, or comparable product from one of the available manufacturers.

C. Available Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Babcock-Davis.
2. Construction Specialties, Inc.
3. Korogard Wall Protection Systems; a division of RJF International Corporation.
4. Nystrom.
5. Pawling Corporation.
6. Or equal.

2.4 CORNER GUARDS

A. Surface-Mounted, Metal Corner Guards: Fabricated as one piece from formed or extruded metal with formed edges; with 90- or 135-degree turn to match wall condition.

B. Product: Subject to compliance with requirements, provide product indicated in "Materials and Colors Schedule" on Drawings, or comparable product from one of the available manufacturers.

C. Available Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Babcock-Davis.
2. Balco; a CSW Industrials Company.
3. Construction Specialties, Inc.
4. Korogard Wall Protection Systems; a division of RJF International Corporation.
5. Nystrom.
6. Pawling Corporation.
7. Or equal.
8. Material: Stainless-steel sheet, Type 304.

    a. Thickness: Minimum 0.0500 inch.
    b. Finish: Directional satin, No. 4.

9. Wing Size: Nominal 1-1/2 by 1-1/2 inches.
10. Corner Radius: 1/8 inch.
11. Mounting: Adhesive.

2.5 MATERIALS

A. Plastic Materials: Chemical- and stain-resistant, high-impact-resistant plastic with integral color throughout; extruded and sheet material as required, thickness as indicated.

B. Polycarbonate Plastic Sheet: ASTM D6098, S-PC01, Class 1 or Class 2, abrasion resistant; with a minimum impact-resistance rating of 15 ft.-lbf/in. of notch when tested according to ASTM D256, Test Method A.

C. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.

D. Adhesive: As recommended by protection product manufacturer.

2.6 FABRICATION

A. Fabricate wall and door protection according to requirements indicated for design, performance, dimensions, and member sizes, including thicknesses of components.

B. Factory Assembly: Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.

C. Quality: Fabricate components with uniformly tight seams and joints and with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

2.7 FINISHES

A. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine walls to which wall protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.

1. For wall and door protection attached with adhesive, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Complete finishing operations, including painting, before installing wall and door protection.

B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

A. Installation Quality: Install wall and door protection according to manufacturer's written instructions, level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.

B. Mounting Heights: Install wall and door protection in locations and at mounting heights indicated on Drawings.

C. Accessories: Provide splices, mounting hardware, anchors, trim, joint moldings, and other accessories required for a complete installation.

1. Provide anchoring devices and suitable locations to withstand imposed loads.
2. Where splices occur in horizontal runs of more than 20 feet, splice aluminum retainers and plastic covers at different locations along the run, but no closer than 12 inches apart.

3.4 CLEANING

A. Immediately after completion of installation, clean plastic covers and accessories using a standard ammonia-based household cleaning agent.

B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION

SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Public-use washroom accessories.
2. Childcare accessories.
3. Custodial accessories.

1.3 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Include electrical characteristics.

B. Samples: For each exposed product and for each finish specified, full size. Approved full-size Samples will be returned and may be used in the Work.

C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated.
2. Identify accessories using designations indicated.

1.5 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For manufacturer's special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For accessories to include in maintenance manuals.

1.7 WARRANTY

A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, visible silver spoilage defects.
2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Structural Performance: Design accessories and fasteners to comply with the following requirements: Grab Bars: Installed units are able to resist 250 lbf concentrated load applied in any direction and at any point.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

A. Sanitary Facility Elements: Comply with the following:

1. Elements of Sanitary facilities shall be mounted at locations in compliance with CBC Sections 11B-602 through 11B-612.
2. Grab bars in toilet facilities and bathing facilities shall comply with CBC Section 11B-609. Grab bars and any wall or other surfaces adjacent to grab bars shall be free of sharp or abrasive elements and shall have rounded edges. The space around the grab bars shall be as follows:

a. 1-1/2 inch between the grab bar and the wall.
b. 1-1/2 inch between the grab bar and projecting objects below and at the ends.
c. 12 inch minimum between the grab bar and projecting objects above.

B. Source Limitations: Obtain public-use washroom accessories from single source from single manufacturer.

C. Basis of Design Products: Subject to compliance with requirements, provide products indicated in “Washroom Accessories Legend” on Drawings or comparable products manufactured by one of the available manufacturers.

D. Available Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AJW Architectural Products.
2. American Specialties, Inc.
3. Bradley Corporation.
4. Tubular Specialties Manufacturing, Inc.
5. Or equal.

2.3 CHILDCARE ACCESSORIES

A. Source Limitations: Obtain childcare accessories from single source from single manufacturer.

B. Diaper-Changing Station:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. American Specialties, Inc.

b. Bradley Corporation.

c. GAMCO Specialty Accessories; a division of Bobrick.

d. Koala Kare Products; a Division of Bobrick.

e. Tubular Specialties Manufacturing, Inc.

f. Or equal.

2. Description: Horizontal unit that opens by folding down from stored position and with child-protection strap. Engineered to support minimum of 250-lb static load when opened.
3. Mounting: Semirecessed, with unit projecting not more than 1 inch from wall when closed.
4. Operation: By pneumatic shock-absorbing mechanism.

5. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin), exterior shell with rounded plastic corners; HDPE interior in manufacturer's standard color.
6. Liner Dispenser: Provide built-in dispenser for disposable sanitary liners.

2.4 MATERIALS

A. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304, 0.031-inch-minimum nominal thickness unless otherwise indicated.

B. Brass: ASTM B19, flat products; ASTM B16/B16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B30, castings.

C. Steel Sheet: ASTM A1008/A1008M, Designation CS (cold rolled, commercial steel), 0.036-inch-minimum nominal thickness.

D. Galvanized-Steel Sheet: ASTM A653/A653M, with G60 hot-dip zinc coating.

E. Galvanized-Steel Mounting Devices: ASTM A153/A153M, hot-dip galvanized after fabrication.

F. Fasteners: Screws, bolts, and other devices of same material as accessory unit, unless otherwise recommended by manufacturer or specified in this Section, and tamper and theft resistant where exposed, and of stainless or galvanized steel where concealed.

G. Chrome Plating: ASTM B456, Service Condition Number SC 2 (moderate service).

H. Mirrors: ASTM C1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.5 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated. Remove temporary labels and protective coatings.

B. Grab Bars: Install to comply with specified structural-performance requirements.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Clean and polish exposed surfaces according to manufacturer's written instructions.

END OF SECTION

SECTION 104413 - FIRE PROTECTION CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes: Fire-protection cabinets for portable fire extinguisher.

B. Related Requirements: Section 104416 "Fire Extinguishers" for portable, hand-carried fire extinguishers accommodated by fire-protection cabinets.

1.3 PREINSTALLATION CONFERENCE

A. Preinstallation Conference: Conduct conference at Project site. Review methods and procedures related to fire-protection cabinets, including, but not limited to, the following: Schedules and coordination requirements.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed-, semirecessed-, or surface-mounting method and relationships of box and trim to surrounding construction.
2. Show location of knockouts for hose valves.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

1.6 COORDINATION

A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain fire-protection cabinets, accessories, and fire extinguishers from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E814 for fire-resistance rating of walls where they are installed.

2.3 FIRE-PROTECTION CABINET

A. Fire Extinguisher Cabinets: Must comply with CBC Sections 11B-307, 11B-308, 11B-309, and 11B-403.

B. Cabinet Type: Suitable for fire extinguisher.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Babcock-Davis.

    b. Guardian Fire Equipment, Inc.

    c. Larsens Manufacturing Company.

    d. Nystrom.

    e. Potter Roemer LLC.

    f. Or equal.

C. Cabinet Construction: Rated and Nonrated.

D. Cabinet Material: Cold-rolled steel sheet.

E. Recessed Cabinet: Trimless with Concealed Flange: Surface of surrounding wall finishes flush with exterior finished surface of cabinet frame and door, without overlapping trim attached to cabinet. Provide recessed flange, of same material as box, attached to box, to act as drywall bead.

F. Semirecessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface, with exposed trim face and wall return at outer edge (backbend). Square-Edge Trim: 1-1/4- to 1-1/2-inch backbend depth.

G. Surface-Mounted Cabinet: Cabinet box fully exposed and mounted directly on wall with no trim.

H. Cabinet Trim Material: Steel sheet.

I. Door Material: Steel sheet.

J. Door Style: Vertical duo panel with frame.

K. Door Glazing: Tempered float glass (clear).

L. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

1. Provide manufacturer's standard.
2. Provide continuous hinge, of same material and finish as trim,, permitting door to open 180 degrees.

M. Accessories:

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
2. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.
3. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as directed by Architect. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."

    a. Location: Applied to cabinet door.
    b. Application Process: Decals or Pressure-sensitive vinyl letters.
    c. Lettering Color: Red.
    d. Orientation: Vertical.

N. Materials:

1. Cold-Rolled Steel: ASTM A1008/A1008M, Commercial Steel (CS), Type B.

    a. Finish: Baked enamel, TGIC polyester powder coat, HAA polyester powder coat, epoxy powder coat, or polyester/epoxy hybrid powder coat, complying with AAMA 2603.
    b. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
    c. Color: Match Architect's sample.

2. Tempered Float Glass: ASTM C1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

2.4 FABRICATION

A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

1. Weld joints and grind smooth.
2. Miter corners and grind smooth.
3. Provide factory-drilled mounting holes.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.

1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
2. Miter and weld perimeter door frames and grind smooth.

C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.5 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.

C. Finish fire-protection cabinets after assembly.

D. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where recessed and semirecessed cabinets will be installed.

B. Examine and coordinate with other subcontractors to confirm rough-in locations, rough-in dimensions, and potential conflicts requiring resolution before installation of cabinets.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare recesses for recessed and semirecessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

A. General: Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.

B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.

1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is inadequate for recessed cabinets, provide semirecessed fire-protection cabinets.
2. Provide inside latch and lock for break-glass panels.
3. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.

C. Identification: Apply decals or vinyl lettering at locations indicated.

3.4 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet and mounting bracket manufacturers.

E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 104416 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

B. Related Requirements: Section 104413 "Fire Protection Cabinets."

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.

B. Product Schedule: For fire extinguishers. Coordinate final fire-extinguisher schedule with fire-protection cabinet schedule to ensure proper fit and function. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.6 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure of hydrostatic test according to NFPA 10 when testing interval required by NFPA 10 is within the warranty period.
b. Faulty operation of valves or release levers.

2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction. Provide fire extinguishers approved, listed, and labeled by FM Global.

C. Comply with requirements of Title 19 C.C.R.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Amerex Corporation.

b. Babcock-Davis.

c. Guardian Fire Equipment, Inc.

d. JL Industries, Inc.; a division of the Activar Construction Products Group.

e. Kidde Residential and Commercial Division.

f. Larsens Manufacturing Company.

g. Nystrom.

h. Potter Roemer LLC.

i. Or equal.

2. Source Limitations: Obtain fire extinguishers, fire-protection cabinets, and accessories, from single source from single manufacturer.
3. Valves: Manufacturer's standard.
4. Handles and Levers: Manufacturer's standard.
5. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B, and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging.

B. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 4-A:80-B:C, 10-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

2.3 MOUNTING BRACKETS

A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Ansul by Johnson Controls Company.

b. Babcock-Davis.

c. Buckeye Fire Equipment Company.

d. Guardian Fire Equipment, Inc.

e. JL Industries, Inc.; a division of the Activar Construction Products Group.

f. Kidde Residential and Commercial Division.

g. Larsens Manufacturing Company.

h. Nystrom.

i. Potter Roemer LLC.

j. Or equal.

2. Source Limitations: Obtain mounting brackets and fire extinguishers from single source from single manufacturer.

B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface. Orientation: Vertical.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.

B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated. Coordinate installation of supporting backing.

END OF SECTION

SECTION 105000 - PACKAGE CONCIERGE® ELEMENT SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Package Concierge® Element System consisting of electronic lockers and PACKAGE CONCIERGE® locker control software. Designed to interface with Package Concierge® proprietary web-based operating system.

1.2 REFERENCES

A. ASTM A653 CS Type B – Galvannealed Steel.

B. ASTM B209 - Specification Aluminum and Aluminum Alloy Sheet and Plate.

C. ASTM B221 - Specification Aluminum and Aluminum Alloy Extruded Bar, Rods, Wire, Shapes, and Tubes.

1.3 SUBMITTALS

A. Submit under provisions of Section 013000.

B. Provide manufacturer's standard catalog data for specified products. Product Data is available at http://www.packageconcierge.com/architects-designers.

C. Shop Drawings: Prepared specifically for this project; show dimensions of locker system, locker compartments, wall cuts, and interface with other products.

D. Closeout Submittals: (1) Manufacturer’s Cleaning & Maintenance Instructions (Include methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance), and (2) Manufacturer's warranty to repair or replace components that fail in materials or workmanship within one year from date of purchase.

1.4 SEQUENCING/SCHEDULING

A. Ordering: Comply with Manufacturer’s ordering instructions and lead-time requirements to avoid delays.

B. Delivery: Deliver materials in Manufacturer’s original, unopened, undamaged packaging.

C. Storage: Store materials at temperature and in humidity conditions recommended by manufacturer and protect from exposure to harmful weather conditions.

D. Handling: Handle materials to prevent damage or marring of finish.

E. Installation: Except as otherwise indicated herein, sequencing or scheduling for performance of work of this section in relation with other work is Contractor's option.

1.5 REGULATORY REQUIREMENTS

A. Comply with Accessibility Guidelines of the Fair Housing Act (www.fairhousingfirst.gov).
B. Complies with the Standards and requirements of Custom-Built Kiosks (UL-Subject-2361) and is identified with the ETL Listed Mark.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer shall have a Quality System in place and be able to substantiate that manufactured units conform to requirements and match the approved design. Manufacturer must be ISO 9001:2008 certified.

B. Installer Qualifications: Installer should be highly experienced in performing work of this section, having been previously certified by Manufacturer and having done work similar to that required for this project. Installation is to be completed by Package Concierge® authorized installer only.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer:
Sales Office: Package Concierge, Inc. 5935 Corporate Drive, Manhattan, Kansas, 66503.
Manufacturing Operations: Florence Corporation, 5935 Corporate Drive Manhattan, Kansas, 66503.
Phone: 888-356-4968.
Email: info@packageconcierge.com.
Web: www.packageconcierge.com.

2.2 ELECTRONIC LOCKER SYSTEM

A. Package Concierge® Element Series Locker System: Consisting of a kiosk control module and one or more locker “modules.” Each module consists of a two (2) locker columns and is sometimes referred to as a double-column locker module. Each module consists of multiple individual lockers controlled by an electronic locking system engaged or released by the kiosk control module. The kiosk control module also includes usable lockers and can used as a standalone system. The Package Concierge® Element System is designed by combining desired number of locker modules in conjunction with a single kiosk control module. The system is configurable and scalable to meet the needs of the desired application. The system requires electrical and Ethernet connection (CAT 5e compatible) to use Package Concierge® proprietary software that operates the locker system. Depending on the size of the specified system, additional electrical connections may be required. Consult with Package Concierge® to determine the appropriately sized solution for your project application.

1. Preconfigured Outdoor Element System: ELEMENT24 (system includes kiosk control module and 24 usable locker compartments).
2. Preconfigured Outdoor Element System: ELEMENT34 (system includes kiosk control module and 34 usable locker compartments).

3. Preconfigured Outdoor Element System: ELEMENT44 (system includes kiosk control module and 44 usable locker compartments).
4. Preconfigured Outdoor Element System: ELEMENT60 (system includes kiosk control module and 60 usable locker compartments).
5. Preconfigured Outdoor Element System: ELEMENT72 (system includes kiosk control module and 72 usable locker compartments).
6. Custom Configured Element System: (Choose from individual locker modules to customize a system that includes at least one kiosk control module and desired number of usable package locker and/or dry cleaning locker compartments). Design your own system at: https://www.packageconcierge.com/resources/configurator/.
7. Compartments: As indicated on Drawings.
8. Compartment Identification: None - user compartment identification and use managed via software interface.
9. Compartment Door Locks: Each compartment door equipped with electronic lock managed by kiosk control module.
10. Optional Installation Accessories for Package Concierge® Element System
    a. Connector Kit: Required for any distributed (split) systems and for linear, U or L shaped contiguous systems larger than five (5) double column modules. (NOTE: L & U shape systems not available when lighted awnings are needed.)

11. Locker Module Materials:
    a. Compartment Doors: Galvannealed Steel (ASTM A653 CS Type B)
    b. Frames: Galvannealed Steel (ASTM A653 CS Type B) & 6063-T6 Aluminum (ASTM B221)
    c. Interior Shelves: 5052-H32 Aluminum (ASTM B209)
    d. Cabinet: Galvannealed Steel (ASTM A653 CS Type B)

12. Kiosk Module includes the following electronic components:
    a. Computer (computer/touch screen combination)
    b. Touch Screen (10 x 8 inch)
    c. Barcode Scanner (1D & 2D image capture)
    d. Camera (digital still image capture)

13. Finishes:
    a. Element System Lockers Exterior Finish:
        i. Sandstone
        ii. Dark Bronze
        iii. Postal Grey
        iv. Antique Bronze
        v. White
        vi. Silver Speck
        vii. Gold Speck
        viii. Black

    a. Element Kiosk Module Decals
        i. Package Concierge® Brand & Customer Help Information - Black Vinyl
        ii. Outdoor, Unprotected Installation Location
        iii. Outdoor, Protected Installation Location
        iv. Indoor Installation

14. Mounting:
    a. Floor Mount: Modules included in an Element system are physically connected

to each other at the time of installation. Each module is anchored to the foundation or floor suitable for mounting as outlined in the manufacturer's site preparation and installation guides.

b. Wall Mount: An alternative method of anchoring a system is to wall mount using methods outlined in manufacturer's installation instructions. (Note: Outdoor systems must be floor/foundation mounted.)

i. With Light Awning (Note: Awning required outside in unprotected area)
ii. No Awning – flat top only

15. Locker Control Software: Package Concierge® Element system control software installed on kiosk control module.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that foundation/floor is adequate for weight of system and for safe, accessible user access.
B. Verify that openings in wall are correctly located, aligned and sized if locker system is to be fully or semi-recessed (set back) in wall.
C. Verify that Power and Ethernet are installed and enabled: See manufacturer drawings and site preparation guide for recommended outlet or junction box placement.

D. Installer's Examination:
1. Examine conditions under which construction activities of this section are to be performed; submit written notification if such conditions are unacceptable.
2. Ensure that electrical and Ethernet connection are installed and enabled before beginning installation.
3. Beginning installation indicates acceptance of conditions.

3.2 INSTALLATION

A. Install Package Concierge® Element System in accordance with shop drawings and manufacturer's installation instructions.

B. Align, plumb, level and anchor in accordance with manufacturer's requirements.

C. For recessed applications allow wall clearance on the left and right sides of the system in accordance with manufacturer drawings.

D. The Element system may be installed indoors or outdoors. The location specified for the system will determine product components appropriate for the environment. Indoor Element systems should be protected from weather and located in an area with ambient temperature between 32°F - 95°F for optimal system operation. Element systems designed for outdoor use may be located in protected or unprotected outdoor areas with ambient temperature between -10°F to 100°F for optimal system operation.

E. Outdoor systems must be hard wired with electrical disconnect and installed according to National Electric Code (NEC) standards and manufacturer site preparation and installation instructions.

3.3 COMMISSIONING

A. Locker control system to be commissioned and tested with operating system software only by an authorized Package Concierge® installer.

3.4 CLEANING

A. See Package Concierge® System Cleaning & Maintenance Instructions.
B. Generally, clean surfaces with mild dish detergent. Do not use harsh abrasive cleaners. In event of graffiti, commercially available “KrudKutter™” solution may be used.

3.5 PROTECTION OF INSTALLED PRODUCTS

A. Protect finishes from damage by construction activities. [System should only be installed after construction is completed, including all flooring and painting.]

END OF SECTION

SECTION 105500.13 - USPS-DELIVERY POSTAL SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Mail receptacles.
2. Collection boxes.
3. Accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of postal specialty.

B. Shop Drawings: For postal specialties.

1. Include plans, elevations, sections, and attachment details.
2. Include identification sequence for compartments.
3. Include layout of identification text.
4. Include setting drawings, templates, and installation instructions for anchor bolts and other anchorages installed as part of the Work of other Sections.

C. Samples for Verification: For each type of exposed finish, prepared on 6-by-6-inch square Samples.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of postal specialty required to comply with USPS regulations, signed by product manufacturer. Include written approval by Postmaster General.

B. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For postal specialties and finishes to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Key Blanks: 10 for each type of compartment-door lock installed.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Furnish lock keys according to USPS requirements; with temporary identification for their respective locks, bagged, and securely taped inside the collection compartment for shipping.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of postal specialties that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

    a. Structural failures.
    b. Faulty operation of hardware.
    c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MAIL RECEPTACLES

A. Front-Loading Mail Receptacles Consisting of multiple compartments with fixed, solid compartment backs, enclosed within a recessed wall box. Provide access to compartments for distributing incoming mail from front of unit by unlocking master lock and swinging side-hinged master door to provide accessibility to entire group of compartments. Provide access to each compartment for removing mail by swinging compartment door. Comply with USPS-STD-4C.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. American Eagle Mailboxes.
    b. Bommer Industries, Inc.
    c. National Mailboxes; NMHP, Inc.
    d. Postal Products Unlimited, Inc.
    e. Salsbury Industries.
    f. Or equal.

2. Front-Loading Master Door: Fabricated from extruded aluminum and braced and framed to hold compartment doors; prepared to receive master-door lock. Master-Door Lock: Door prepared to receive lock provided by local postmaster.
3. Compartments: As indicated on Drawings.
4. Compartment Doors: Fabricated from extruded aluminum. Equip each with lock and tenant identification as required by USPS-STD-4C. Provide mail slot in the compartment with master-door lock.

    a. Compartment-Door Locks: Comply with USPS-L-1172C for locks and keys, or equivalent as approved by the USPS; with three keys for each compartment door. Key each compartment differently.

5. Frames: Fabricated from extruded aluminum or aluminum sheet; ganged and nested units, with cardholder and blank cards for tenant's identification within each compartment.
6. Concealed Components and Mounting Frames: Aluminum or steel sheet with manufacturer's standard finish.
7. Exposed Aluminum Finish: Finish surfaces exposed to view as follows: Baked-Enamel or Powder-Coated Finish: Color as selected by Architect from manufacturer's full range.

2.2 COLLECTION BOXES

A. Front-Loading Collection Boxes: Consisting of single compartment with fire-resistant cushion bottom, enclosed within wall box, with mail slot to receive mail. Provide door for collecting mail from front of unit.

1. Height: As indicated on Drawings.
2. Compartment Doors and Frames: Fabricated from 1/4-inch-thick aluminum, with opening not less than 12 by 20 inches and not more than 18 by 30 inches. Equip door with lock and concealed, full-length, flush hinge on one side.

    a. Door Lock: Door prepared to receive lock provided by local postmaster.
    b. Identification: Engrave face of compartment door with 1-inch-high letters as follows: "U.S. MAIL LETTER BOX" on two lines at top or bottom of unit.
    c. Door Style: Extend door full width and height of unit, with no exposed frame.

3. Mail Slot: Fabricated from 1/4-inch-thick aluminum, with 11-inch-wide by 1-1/4-inch-high opening, protected by inside hood and hinge flap, and with inside baffle to prevent removal of mail from box.
4. Exposed Materials: Fabricated from extruded or sheet aluminum. Baked-Enamel or Powder-Coated Finish: Color as selected by Architect from manufacturer's full range.
5. Concealed Components and Mounting Frames: Aluminum or steel sheet with manufacturer's standard finish.
6. Schedule-Card Holder: Recessed or surface-mounted holder for pickup schedule card in center of bottom front portion of unit. Fabricate of same material and finish as front of unit.
7. Mailbag Hooks: Two aluminum or stainless-steel hooks at exterior front edge of bottom of surface-mounted units, spaced 15 to 17-1/2 inches apart, for supporting mailbags.
8. Mailbag Rack: Internal rack system for supporting mailbags within unit.

2.3 ACCESSORIES

A. Directory for Mail Receptacles: Surface-mounted, front-opening unit, with clear glass or plastic window.

1. Framed, Top-Mount Unit for Mail Receptacles: Fabricate directory as framed, horizontal unit with modular sections having a 40-name capacity (5 modules); of same material and finish as adjacent mail receptacles; mounted above mail receptacles.
2. Name Strips: 1/4-inch-high label tape.

2.4 FABRICATION

A. Form postal specialties to required shapes and sizes, with true lines and angles, square, rigid, and without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges and corners free of sharp edges and burrs and safe to touch. Fabricate doors of postal specialties to preclude binding, warping, or misalignment.

B. Preassemble postal specialties in shop to greatest extent possible to minimize field assembly.

C. Mill joints to a tight, hairline fit. Cope or miter corner joints. Form joints exposed to weather to exclude water penetration.

D. Drill or punch holes required for fasteners and remove burrs. Use security fasteners where fasteners are exposed. If used, seal external rivets before finishing.

E. Weld in concealed locations to greatest extent possible without distorting or discoloring exposed surfaces. Remove weld spatter and welding oxides from exposed surfaces.

F. Fabricate tubular and channel frame assemblies with manufacturer's standard welded or mechanical joints. Provide subframes and reinforcement as required for a complete system to support loads.

G. Where dissimilar metals contact each other, protect against galvanic action by painting contact surfaces with bituminous coating or by applying other permanent separation as recommended by manufacturers of dissimilar metals.

2.5 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA's "Metal Finishes Manual for Architectural and Metal Products (AMP 500-06)" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for roughing-in openings, clearances, and other conditions affecting performance of the Work.

B. Examine walls and other adjacent construction for suitable conditions before installation.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install postal specialties level and plumb, according to manufacturer's written instructions.

1. Where dissimilar metals contact each other, protect against galvanic action by painting contact surfaces with bituminous coating or by applying other permanent separation as recommended by manufacturer.
2. Where aluminum contacts grout, concrete, masonry, or wood, protect against corrosion by painting contact surfaces with bituminous coating.

3. Final acceptance of postal specialties served by the USPS depends on compliance with USPS requirements.

B. Mail Receptacles: Install mail receptacles with center of tenant-door lock cylinders and bottom of compartments at the maximum and minimum heights above finished floor established by the USPS and manufacturer's written instructions. Install removable-core and keyed-in door lock cylinders as required for each type of cylinder lock.

C. Collection Boxes: Install collection boxes with centerline of mail slots not more than 48 inches above finished floor.

3.3 FIELD QUALITY CONTROL

A. Arrange for USPS personnel to examine and test postal specialties served by the USPS after they have been installed according to USPS regulations.

3.4 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as postal specialties are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust doors, hardware, and moving parts to function smoothly, and lubricate as recommended by manufacturer. Verify that integral locking devices operate properly.

C. Touch up marred finishes or replace postal specialties that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by postal-specialty manufacturer.

D. Replace postal specialties that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

E. On completion of postal-specialty installation, clean interior and exterior surfaces as recommended by manufacturer.

END OF SECTION

SECTION 105700 - WIRE STORAGE SHELVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes: Epoxy-coated ventilated shelving.

1.3 COORDINATION

A. Coordinate sizes and locations of blocking and backing required for installation of metal storage shelving attached to wall and ceiling assemblies.

B. Coordinate locations and installation of storage shelving that may interfere with ceiling systems including lighting, HVAC, speakers, sprinklers, access panels, electrical switches or outlets, and floor drains.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product. Include rated capacities, construction details, material descriptions, dimensions of individual components and profiles, and finishes for storage shelving.

B. Shop Drawings: For metal storage shelving.

1. Include plans, elevations, sections, and attachment details.
2. Include installation details of connectors, lateral bracing, and special bracing.

C. Samples: For each type of storage shelving and for each color specified, in the following sizes:

1. Vertical Supports: 12 inches tall.
2. Shelves: Full size, but not more than 24 inches wide by 12 inches deep.
3. Connectors: Full size.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal storage shelving to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Shelves: Full-size units equal to 5 percent of amount installed for each type indicated, but no fewer than 5 shelves.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install storage shelving until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at levels intended for building occupants during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 WIRE STORAGE SHELVING

A. Wire-Type, Storage Shelving: Subject to compliance with requirements, provide Rubbermaid Home Products ventilated wire shelving system, or equal. .

1. Framed-Type Wire Shelves: . Material: Ventilated wire storage shelving shall be constructed of Grade C-1008 bright, basic, cold-drawn steel wire with average tensile strength of 100,000 psi (690,000 kPa.
2. Fabrication: Fabricate ventilated wire storage shelving square, rigid, flat, and free of dents or distortion. Fabricate connections to form a rigid structure, free of buckling and warping. Steel wire shall be resistance welded at intersections of cross deck wires spaced at 1 inch (25 mm) increments, unless 1/2 inch (13 mm) increment is specified, and trimmed smooth.
3. Finish: Steel components shall be covered with an iron phosphate coating to ensure a proper bond with the finish coat. The finish coat shall be an epoxy-polyester hybrid powder coating applied at 3 mil to 5 mil (0.08 mm to 0.13 mm) thickness providing a hard, smooth and durable finish. Color: White.

2.2 ANCHORS

A. Wall Anchors: Manufacturer's standard, galvanized-steel anchors designed to secure storage shelving to adjacent wall.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine walls to which storage shelving will be attached for properly located blocking, grounds, or other solid backing for attachment of support fasteners.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install storage shelving level, plumb, square, rigid, true, and with shelves flat and free of dents or distortion. Make connections to form a rigid structure, free of buckling and warping.

1. Install exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.
2. Install braces, straps, plates, brackets, and other reinforcements as needed to support shelf loading and as required for stability.
3. Install shelves in each shelving unit at spacing indicated on Drawings.

3.3 ERECTION TOLERANCES

A. Erect metal storage shelving to a maximum tolerance from vertical of 1/2 inch.

3.4 ADJUSTING

A. Adjust storage shelving so that connectors and other components engage accurately and securely.

B. Touch up marred finishes or replace storage shelving that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by metal storage shelving manufacturer.

C. Replace storage shelving components that have been damaged beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 107113 - EXTERIOR SUN CONTROL DEVICES (BRISE SOLEIL)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Blade design -shade devices.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for supports.

2. Section 084113 “Aluminum-Framed Entrances and Storefronts”

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and manufacturer recommended installation procedures for exterior sun-control devices.

B. Shop Drawings:

1. Include plans, elevations, sections, and details showing profiles, angles, and spacing of blades, frames, and supports.

a. Show unit dimensions related to supporting and adjoining structures and construction. Indicate anchorage details and locations.
b. Show locations for blocking, reinforcement, and supplementary structural support.

2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Structural Calculations: Submit a comprehensive analysis of design loads and thermal movement. Identify moment and shear forces transferred to structure or supports through installation connections.

    a. Provide structural calculations, stamped and signed by a qualified professional engineer.

C. Samples: For each type, provide the following:

1. One complete exterior sun-control device with required components, mounting and associated hardware, and instructions.
2. Fabricated parts indicating fabrication techniques, joinery, fasteners, and accessories.
3. Each different exposed finish color, factory applied on representative aluminum extrusion.
4. Include.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

B. Welding certificates.

C. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

A. Sunshade systems shall be manufactured by a firm with a minimum of 5 years of experience in the design, engineering and fabrication of similar systems.

B. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

C. Welding Qualifications: Qualify procedures and personnel in accordance with the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver shading assemblies when building is enclosed and construction, where assemblies will be installed, is substantially complete.

B. Deliver products in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Store products in accordance with manufacturer's written instructions, protecting materials and finishes from damage.

1.8 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace shade assembly components that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to hardware, metal finishes.
2. Warranty Period:

a. Shading Assembly: 2 years from date of Substantial Completion.

b. Special Finish Warranty Period : 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 EXTERIOR SHADING SYSTEM

A. Basis of Design: Design is based on product manufactured by Arcadia, Inc. Subject to compliance with requirements, provide Arcadia Brise Soleil Series BSD-012. Comply with the following:

1. Provide fixed sunshades and accessories materials, sizes, depths, arrangements and material thickness to be as indicated or as required for optimal performance with respect to strength; durability; and uniform appearance.
2. Include supports, anchorage, and accessories required for complete assembly.
3. Blades shall be 12” high, extruded aluminum airfoil design. Blades shall be factory assembled to outriggers using stainless steel, type F, thread cutting screws through internal screw slots in blades. Welding is not acceptable. Fasteners must be used to allow for replacement of blades, should they become damaged. All fasteners to be hex head.

2.2 PERFORMANCE REQUIREMENTS

A. Sun shade supports: Design and furnish all supports required to design load of up to 60 pounds per square foot (2.87 kPa). The design load includes loads derived from wind, snow (including drift), seismic events and the dead load of the sunshade. Sun

Control members, blades, outriggers, fascia and anchorages shall be demonstrated to withstand the specified design load.

B. Sun shades shall be factory engineered to withstand wind loads, acting upwards and downwards. Minimum design loads shall be calculated to comply with 2019 CBC.

C. Sun shades shall be factory engineered to withstand the thermal stress to which the louvers will be subjected. Base engineering on a surface design temperature change of 180 degrees F (82 degrees C).

D. Sun shades shall be designed to perform under conditions specified herein or required by site conditions with no permanent damage to or deforming of the louver blades or assembly, noise or metal fatigue

2.3 FINISHES

A. Finish: Kynar finish complying with finish manufacturer's written instructions for surface preparation including pretreatment, application, baking.

B. Color: Match Architect's sample.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for supporting members, blocking, inserts, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install exterior sun control devices at locations and in position indicated, securely connected to supports, free of rack, and in proper relation to adjacent construction. Use mounting methods of types described and in compliance with Shop Drawings and fabricator's written instructions.

B. Slip fit frame connections accurately together to form hairline joints, and tighten to secure.

C. Weld frame connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.

1. Field Welding: Comply with the following requirements:

a. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
b. Obtain fusion without undercut or overlap.
c. Remove welding flux immediately.
d. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Corrosion Protection: Coat concealed surfaces of aluminum that come in contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

E. Coordinate exterior sun control devices installation with flashing and joint-sealant installation so these materials are installed in sequence and in a manner that prevents exterior moisture from passing through completed exterior wall and roof assemblies.

3.3 CLEANING AND PROTECTION

A. Touch up factory-applied finishes to restore damaged or soiled areas.

B. Galvanized Surfaces: Clean field welds, connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 107113

SECTION 113013 - RESIDENTIAL APPLIANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Cooking appliances.
2. Refrigeration appliances.
3. Cleaning appliances.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include installation details, material descriptions, dimensions of individual components, and finishes for each appliance.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.

B. Sustainable Design Submittals:

1. ENERGY STAR: Product Data for indicated products, showing compliance with requirements for ENERGY STAR product labeling.

C. Product Schedule: For appliances. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

B. Product Certificates: For each type of appliance.

C. Field quality-control reports.

D. Sample Warranties: For manufacturers' special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each residential appliance to include in operation and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Maintains, within50 miles of Project site, a service center capable of providing training, parts, and emergency maintenance repairs.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain [residential appliances from single source] [and] [each type of residential appliance from single manufacturer].

2.2 PERFORMANCE REQUIREMENTS

A. Electrical Appliances: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Accessibility: Where residential appliances are indicated to comply with accessibility requirements, comply with applicable provisions in the DOJ's 2010 ADA Standards for Accessible Design and 2019 CBC. Comply with the following:

1. 1st Floor Kitchen Cooktop: Contractor to provide range complying with CBC 904.13.1.2.
2. Floors 1 - 4 Common Kitchen Range: Contractor to provide range complying with CBC 904.13.1.2

2.3 APPLIANCES

A. Refer to Appliances Schedule in Drawings for itemization of required appliances.

2.4 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, power connections, and other conditions affecting installation and performance of residential appliances.

B. Examine roughing-in for piping systems to verify actual locations of piping connections before appliance installation.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install appliances according to manufacturer's written instructions.

B. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and that rough openings are completely concealed.

C. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.

D. Range Anti-Tip Device: Install at each range according to manufacturer's written instructions.

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Perform visual, mechanical, and electrical inspection and testing for each appliance according to manufacturers' written recommendations. Certify compliance with each manufacturer's appliance-performance parameters.
2. Operational Test: After installation, start units to confirm proper operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and components.

B. An appliance will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain residential appliances.

END OF SECTION

SECTION 116800 - PLAYFIELD EQUIPMENT AND STRUCTURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes composite structure playground equipment.

1.2 RELATED SECTIONS

A. Section 033000 – Cast-in-Place Concrete: Requirements for concrete for anchoring recreational equipment into the ground.

B. Section 055000 – Metal Fabrications: General requirements for galvanizing.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For playground equipment and structures. Include plans, elevations, sections, details, and attachments to other work.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm whose playground equipment components have been certified by IPEMA's third-party product certification service.

B. Installer Qualifications: An employer of workers approved by manufacturer.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of playground equipment that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 RECREATION EQUIPMENT

A. Specified Manufacturers: As indicated.

B. Acceptable Manufacturers: None identified.

C. Recreation Equipment: Products are indicated on the Drawings. Include all accessories and optional features as indicated for complete and functional equipment for conditions of the Project.

D. Hardware: Manufacturer's standard; commercial-quality; corrosion-resistant; hot-dip galvanized steel and iron, stainless steel, or aluminum; of a secure and vandal-resistant design.

E. Fasteners: Manufacturer's standard; corrosion-resistant; hot-dip galvanized or plated steel and iron, or stainless steel; permanently capped, and theft resistant.

2.2 INSTALLATION MATERIALS

A. Concrete Footings and Foundations: Comply with requirements specified in Section 033000 – Cast-in-Place Concrete.

B. Hardware: Manufacturer’s standard; commercial-quality; corrosion-resistant; hot-dip galvanized steel and iron, stainless steel, or aluminum; of a secure and vandal-resistant design.

C. Fasteners: Manufacturer’s standard; corrosion-resistant; hot-dip galvanized or plated steel and iron, or stainless steel; permanently capped, and theft resistant.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Anchor playground equipment securely, positioned at locations and elevations indicated.

B. Basketball Backstops Installation: Install backstops to be level, plumb and in correct alignment with playing area.

3.2 CLEANING AND PROTECTION

A. Cleaning: Clean completed installation using materials and methods as recommended by product manufacturer.

B. Protection: Provide protective covers and other measures to prevent damage, misuse and soiling of completed installation. Restore damaged finishes.

END OF SECTION

SECTION 122113 - HORIZONTAL LOUVER BLINDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes: Horizontal louver blinds with polymer slats.

B. Related Requirements: Section 061053 "Miscellaneous Rough Carpentry" for wood blocking and grounds for mounting horizontal louver blinds and accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For horizontal louver blinds, include fabrication and installation details.

C. Samples for Verification: For each type and color of horizontal louver blind indicated.

1. Slat: Not less than 12 inches long.
2. Tapes: Full width, not less than 6 inches long.
3. Horizontal Louver Blind: Full-size unit, not less than 16 inches wide by 24 inches long.
4. Valance: Full-size unit, not less than 12 inches wide.

D. Product Schedule: For horizontal louver blinds. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For horizontal louver blinds with polymer slats that have been tested for compliance with CBC/CFC 806.4, flame resistant in accordance with CCR Title 19, Division 1, Chapter 8 , for tests performed by manufacturer and witnessed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For horizontal louver blinds to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Horizontal Louver Blinds: Full-size units equal to 5 percent of quantity installed for each size, color, texture, pattern, and gloss indicated, but no fewer than two units.

1.7 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver horizontal louver blinds in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not install horizontal louver blinds until construction and wet-work and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where horizontal louver blinds are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain horizontal louver blinds from single source from single manufacturer.

2.2 HORIZONTAL LOUVER BLINDS, POLYMER SLATS

A. Product: Subject to compliance with requirements, provide product indicated in “Materials and Colors Schedule” on Drawings, or equal.

B. .Flame-Resistance Rating: Comply with NFPA 701; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

C. Slats: Polymers that are lead free, UV stabilized, integrally colored, opaque, and will not crack or yellow; antistatic, dust-repellent treated.

D. Headrail: Formed steel or extruded aluminum; long edges returned or rolled. Headrail fully encloses operating mechanisms on three sides and ends.

1. Capacity: One blind(s) per headrail unless otherwise indicated.
2. Manual Lift Mechanism:

    a. Lift-Cord Lock: Variable; stops lift cord at user-selected position within full operating range.
    b. Operator: Extension of lift cord(s) through lift-cord lock mechanism to form cord pull.

3. Manual Tilt Mechanism: Enclosed worm-gear mechanism and linkage rod that adjusts ladders.

    a. Tilt: Full.
    b. Operator: Clear-plastic wand.
    c. Over-Rotation Protection: Manufacturer's detachable operator or slip clutch to prevent over rotation of gear.

4. Manual Lift-Operator and Tilt-Operator Lengths: Manufacturer's standard.
5. Manual Lift-Operator and Tilt-Operator Locations: Manufacturer's standard unless otherwise indicated.

E. Bottom Rail: Secures and protects ends of ladders and lift cords. Type: Manufacturer's standard.

F. Lift Cord: Manufacturer's standard braided cord.

G. Ladders: Evenly spaced across headrail at spacing that prevents long-term slat sag. Type: Cloth tape, manufacturer's standard width.

H. Valance: Manufacturer's standard.

I. Mounting Brackets: With spacers and shims required for blind placement and alignment indicated.

1. Type: As indicated.
2. Intermediate Support: Provide intermediate support brackets to produce support spacing recommended by blind manufacturer for weight and size of blind.

J. Hold-Down Brackets and Hooks or Pins: Manufacturer's standard.

K. Colors, Textures, Patterns, and Gloss:

1. Slats: Match Architect's samples for custom color and other characteristics.
2. Components: Provide rails, cords, ladders, and materials exposed to view matching or coordinating with slat color unless otherwise indicated.

2.3 HORIZONTAL LOUVER BLIND FABRICATION

A. Product Safety Standard: Fabricate horizontal louver blinds to comply with WCMA A 100.1 including requirements for corded, flexible, looped devices; lead content of components; and warning labels.

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:

1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which blind is installed less 1/4 inch per side or 1/2 inch total, plus or minus 1/8 inch. Length equal to head-to-sill dimension of opening in which blind is installed less 1/4 inch, plus or minus 1/8 inch.
2. Outside of Jamb Installation: Width and length as indicated, with terminations between blinds of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

C. Concealed Components: Noncorrodible or corrosion-resistant-coated materials. Lift-and-Tilt Mechanisms: With permanently lubricated moving parts.

D. Mounting and Intermediate Brackets: Designed for removal and reinstallation of blind without damaging blind and adjacent surfaces, for supporting blind components, and for bracket positions and blind placement indicated.

E. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to brackets and adjoining construction; type designed for securing to supporting substrate; and supporting blinds and accessories under conditions of normal use.

F. Color-Coated Finish: White. Metal: For components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install horizontal louver blinds level and plumb, aligned and centered on openings, and aligned with adjacent units according to manufacturer's written instructions.

1. Locate so exterior slat edges are not closer than 2 inches from interior faces of glass and not closer than 1/2 inch from interior faces of glazing frames through full operating ranges of blinds.
2. Install mounting and intermediate brackets to prevent deflection of headrails.
3. Install with clearances that prevent interference with adjacent blinds, adjacent construction, and operating hardware of glazed openings, other window treatments, and similar building components and furnishings.

3.3 ADJUSTING

A. Adjust horizontal louver blinds to operate free of binding or malfunction through full operating ranges.

3.4 CLEANING AND PROTECTION

A. Clean horizontal louver blind surfaces after installation according to manufacturer's written instructions.

B. Provide final protection and maintain conditions in a manner acceptable to manufacturer and Installer that ensures that horizontal louver blinds are without damage or deterioration at time of Substantial Completion.

C. Replace damaged horizontal louver blinds that cannot be repaired in a manner approved by Architect before time of Substantial Completion.

D. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain systems.

END OF SECTION

SECTION 122413 - ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Manually operated roller shades with single rollers.

2. Motor-operated roller shades with single rollers.

B. Related Requirements:

1. Section 061053 "Miscellaneous Rough Carpentry" for wood blocking and grounds for mounting roller shades and accessories.

2. Section 079200 "Joint Sealants" for sealing the perimeters of installation accessories for light-blocking shades with a sealant.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.

B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.

C. Samples for Verification: For each type of roller shade.

1. Shadeband Material: Not less than 10 inches square. Mark interior face of material if applicable.

2. Roller Shade: Full-size operating unit, not less than 16 inches wide by 36 inches long for each type of roller shade indicated.

3. Installation Accessories: Full-size unit, not less than 10 inches long.

D. Product Schedule: For roller shades. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of shadeband material.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For roller shades to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Roller Shades: Full-size units equal to 5 percent of quantity installed for each size, color, and shadeband material indicated, but no fewer than two units.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 PERFORMANCE

A. Comply with requirements of Title 19 C.C.R.

2.2 MANUFACTURERS

A. Basis of Design Manufacturer: Subject to compliance with requirements, provide roller shades systems manufactured by Draper, Inc., or comparable product from one of the available manufacturers.

B. Source Limitations: Obtain roller shades from single source from single manufacturer.

2.3 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS (RS-1)

A. Basis of Design Product: Provide Draper, Clutch-Operated FlexShade® CLN, or comparable product from one of the available manufacturers.

B. Available Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Hunter Douglas Contract.

2. Levolor.

3. Silent Gliss Inc.

4. Or equal.

C. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.

1. Bead Chains: Stainless steel.

a. Loop Length: Full length of roller shade.
b. Limit Stops: Provide upper and lower ball stops.

c. Chain-Retainer Type: Chain tensioner, jamb mounted.

2. Spring Lift-Assist Mechanisms: Manufacturer's standard for balancing roller shade weight and for lifting heavy roller shades. Provide for shadebands that weigh more than 10 lb or for shades as recommended by manufacturer, whichever criterion is more stringent.

D. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

1. Roller Drive-End Location: Right side of interior face of shade.

2. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.

3. Shadeband-to-Roller Attachment: Removable spline fitting into integral channel in tube.

E. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

F. Shadebands:

1. Shadeband Material: Light-filtering fabric. As selected by Architect from manufacturer’s “Infinity 2” fabric series.

2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum. Type: Enclosed in sealed pocket of shadeband material.

G. Installation Accessories:

1. Recessed Shade Pocket: Rectangular, extruded-aluminum enclosure designed for recessed ceiling installation; with front, top, and back formed as one piece, end plates, and removable bottom closure panel.

a. Height: Manufacturer's standard height required to enclose roller and shadeband assembly when shade is fully open, but not less than 4 inches.
b. Provide pocket with lip at lower edge to support acoustical ceiling panel.

2. Closure Panel and Wall Clip: Removable aluminum panel designed for installation at bottom of site-constructed ceiling recess or pocket and for snap-in attachment to wall clip without fasteners. Closure-Panel Width: As indicated on Drawings.

3. Installation Accessories Color and Finish: As selected from manufacturer's full range.

2.4 MOTOR-OPERATED, SINGLE-ROLLER SHADES

A. Product: Provide Draper FlexShade® RTS AC , or comparable product from one of the available manufacturers.

B. Available Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Hunter Douglas Contract.

2. Levolor.

3. Silent Gliss Inc.

4. Or equal.

C. Motorized Operating System: Provide factory-assembled, shade-operator system of size and capacity and with features, characteristics, and accessories suitable for conditions indicated, complete with electric motor and factory-prewired motor controls, power disconnect switch, enclosures protecting controls and operating parts, and accessories required for reliable operation without malfunction. Include wiring from motor controls to motors. Coordinate operator wiring requirements and electrical characteristics with building electrical system.

1. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2. Electric Motor: Manufacturer's standard tubular, enclosed in roller.

a. Electrical Characteristics: 110-V ac.
b. Maximum Total Shade Width: As required to operate roller shades indicated.
c. Maximum Shade Drop: As required to operate roller shades indicated.
d. Maximum Weight Capacity: As required to operate roller shades indicated.

3. Remote Control: Electric controls with NEMA ICS 6, Type 1 enclosure for recessed or flush mounting. Provide the following for remote-control activation of shades:

a. Group Control Station: Momentary-contact, three-position, rocker-style, wall-switch-operated control station with open, close, and center off functions for single-switch group control.
b. Color: As selected by Architect from manufacturer's full range.

4. Limit Switches: Adjustable switches interlocked with motor controls and set to stop shades automatically at fully raised and fully lowered positions.

5. Operating Features:

    a. Group switching with integrated switch control; single faceplate for multiple switch cutouts.
    b. Override switch.

D. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

1. Roller Drive-End Location: Right side of interior face of shade.

2. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.

3. Shadeband-to-Roller Attachment: Removable spline fitting into integral channel in tube.

E. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

F. Shadebands:

1. Shadeband Material: Light-filtering fabric. as selected by Architect from manufacturer’s “Infinity 2” fabric series

2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum. Type: Enclosed in sealed pocket of shadeband material.

G. Installation Accessories:

1. Recessed Shade Pocket: Rectangular, extruded-aluminum enclosure designed for recessed ceiling installation; with front, top, and back formed as one piece, end plates, and removable bottom closure panel.

    a. Height: Manufacturer's standard height required to enclose roller and shadeband assembly when shade is fully open, but not less than 4 inches.
    b. Provide pocket with lip at lower edge to support acoustical ceiling panel.

2. Closure Panel and Wall Clip: Removable aluminum panel designed for installation at bottom of site-constructed ceiling recess or pocket and for snap-in attachment to wall clip without fasteners. Closure-Panel Width: As indicated on Drawings.

3. Installation Accessories Color and Finish: As selected from manufacturer's full range.

2.5 SHADEBAND MATERIALS

A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

B. Light-Filtering Fabric: Woven fabric, stain and fade resistant.

1. Source: Roller shade manufacturer.

2. Orientation on Shadeband: Up the bolt.

3. Openness Factor: 10% open.

2.6 ROLLER SHADE FABRICATION

A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F: Outside of Jamb Installation: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible, except as follows:

1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.

2. Railroaded Materials: Railroad material where material roll width is less than the required width of shadeband and where indicated. Provide battens and seams as required by railroaded material to produce shadebands with full roll-width panel(s) plus, if required, one partial roll-width panel located at top of shadeband.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances,and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER SHADE INSTALLATION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.

B. Roller Shade Locations: As indicated on Drawings, Sheet A3.10.

3.3 ADJUSTING

A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

A. Clean roller shade surfaces, after installation, according to manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.

C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain motor-operated roller shades.

END OF SECTION

SECTION 123530 - RESIDENTIAL CASEWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes kitchen and vanity cabinets.

B. Related Requirements:

1. Section 061053 "Miscellaneous Rough Carpentry" for wood blocking for anchoring casework.
2. Section 092216 "Non-Structural Metal Framing" for reinforcements in metal-framed partitions for anchoring casework.
3. Section 123661.19 "Quartz Agglomerate Countertops."

1.3 DEFINITIONS

A. Concealed Surfaces of Casework: Surfaces not usually visible after installation, including sleepers, web frames, dust panels, bottoms of drawers, and ends of casework installed directly against and completely concealed by walls or other casework, and tops of wall cabinets and utility cabinets.

B. Exposed Surfaces of Casework: Surfaces visible when doors and drawers are closed, including visible surfaces in open cabinets or behind glass doors.

C. Semiexposed Surfaces of Casework: Surfaces behind opaque doors or drawer fronts, including interior faces of doors, interiors and sides of drawers, and bottoms of wall cabinets.

1.4 COORDINATION

A. Coordinate layout and installation of blocking and reinforcement in partitions for support of casework.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components, and profiles and finishes for casework.
2. Include rated capacities, operating characteristics, profiles, and finishes for hardware.

B. Shop Drawings: For residential casework.

1. Include plans, elevations, details, and attachments to other work.
2. Show materials, finishes, filler panels, and hardware.
3. Indicate manufacturer's catalog numbers for casework.

C. Samples: For casework and hardware finishes.

D. Samples for Verification: For the following:

1. Casework Finishes: 8-by-10-inch Samples for each type of casework finish.
2. Hardware: One full-size Sample of each type of exposed hardware in each finish required.
3. Base Cabinet: One full-size, 16-inch-wide, finished base cabinet complete with hardware, doors, and drawers but without countertop.
4. Wall Cabinet: One full-size, 12-inch-wide, finished wall cabinet complete with hardware, doors, and adjustable shelves.
5. Full-Size Samples: Maintain at Project site during construction in an undisturbed condition as a standard for judging the completed Work. Unless otherwise indicated, approved sample units may become part of the completed Work if in undisturbed condition at time of Substantial Completion. Notify Architect of their exact locations.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

B. Product Certificates: For casework.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install casework until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.

B. Field Measurements: Where casework is indicated to fit to existing construction, verify dimensions of existing construction by field measurements before fabrication and indicate measurements on Shop Drawings. Provide fillers and scribes to allow for trimming and fitting.

C. Locate concealed framing, blocking, and reinforcements that support casework by field measurements before enclosing them, and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 CABINETS

A. Manufacturer: Subject to compliance with requirements, provide products from manufacturer indicated in “Materials and Colors Schedule” on Drawings, or equal.

B. Door and Drawer Face Style: Flush overlay; faces cover cabinet fronts.

1. Door and Drawer Fronts: Manufacturer’s standard thickness, thermoformed-vinyl-faced panels with vinyl overlay on faces and edges and with thermoset decorative panel backs.

C. Cabinet Style: Frameless.

D. Exposed Cabinet End Finish: Thermoformed-vinyl-faced panels.

E. Wall-Hung-Unit Back Panels: 3/16-inch-thick plywood fastened to rear edge of end panels and to top and bottom rails.

F. Base-Unit Back Panels: 3/16-inch-thick plywood fastened to rear edge of end panels and to top and bottom rails.

G. Drawers: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.

H. Factory Finishing: Finish cabinets at factory.

2.2 CABINET MATERIALS

A. Hardwood Lumber: Kiln dried to 7 percent moisture content.

B. Softwood Lumber: Kiln dried to 10 percent moisture content.

C. Hardwood Plywood: HPVA HP-1.

D. Particleboard: ANSI A208.1, Grade M-2.

E. Particleboard: Straw-based particleboard complying with requirements in ANSI A208.1, Grade M-2, except for density.

F. MDF: Medium-density fiberboard, ANSI A208.2, Grade MD.

G. Exposed Materials:

1. Thermoformed-Vinyl-Faced Panels: MDF, milled to required shapes, with a thermoformed vinyl overlay applied in a vacuum or membrane press.

    a. Color: As indicated in “Materials and Color Schedule” in Drawings.

H. Semiexposed Materials: Unless otherwise indicated, provide the following:

1. Thermoset Decorative Panels: Particleboard or MDF finished with thermally fused, melamine-impregnated decorative paper.

    a. Provide material finished on both sides for shelves, dividers, drawer bodies, and other components with two semiexposed surfaces.
    b. Provide PVC or polyester edgebanding on components with semiexposed edges.
    c. Colors: As selected by Architect from cabinet manufacturer's full range.

I. Concealed Materials: Solid wood or plywood, of any hardwood or softwood species, with no defects affecting strength or utility; particleboard; MDF; or hardboard.

2.3 CABINET HARDWARE

A. General: Manufacturer's standard units complying with BHMA A156.9, of type, size, style, material, and finish [as indicated by manufacturer's designations] [matching Architect's sample] [as selected by Architect from manufacturer's full range] <Insert requirements>.

B. Pulls: Wire pulls.

C. Hinges: Concealed European-style, self-closing hinges.

D. Drawer Guides: Epoxy-coated-metal, self-closing drawer guides; designed to prevent rebound when drawers are closed; with nylon-tired, ball-bearing rollers; and complying with BHMA A156.9, Type B05011 or Type B05091.

E. Door Locks: ANSI/BHMA A156.11, E07121. Provide at locations as indicated on Drawings.

F. Drawer Locks: ANSI/BHMA A156.11, E07041. Provide at locations as indicated on Drawings.

G. Door and Drawer Bumpers: Self-adhering, clear silicone rubber.

1. Doors: Provide one bumper at top and bottom of closing edge of each swinging door.
2. Drawers: Provide one bumper on back side of drawer front at each corner.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of framing and reinforcements, and other conditions affecting performance of casework.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install casework with no variations in adjoining surfaces; use concealed shims. Where casework abuts other finished work, scribe and cut for accurate fit. Provide filler strips, scribe strips, and moldings in finish to match casework.

B. Install casework without distortion so doors and drawers fit the openings, are aligned, and are uniformly spaced. Complete installation of hardware and accessories as indicated.

C. Install casework level and plumb to a tolerance of 1/8 inch in 8 feet.

D. Fasten casework to adjacent units and to backing.

1. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c.

a. Fasteners: No. 10 wafer-head screws sized for not less than 1-1/2-inch penetration into wood framing, blocking, or hanging strips or No. 10 wafer-head sheet metal screws through the metal backing or metal framing behind the wall finish.

3.3 ADJUSTING AND CLEANING

A. Adjust hardware so doors and drawers are centered in openings and operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

B. Clean casework on exposed and semiexposed surfaces. Touch up as required to restore damaged or soiled areas to match original factory finish, as approved by Architect.

END OF SECTION

SECTION 123661.19 - QUARTZ AGGLOMERATE COUNTERTOPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Quartz agglomerate countertops.
2. Quartz agglomerate backsplashes.
3. Quartz agglomerate end splashes.

1.3 ACTION SUBMITTALS

A. Product Data: For countertop materials.

B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.

1. Show locations and details of joints.
2. Show direction of directional pattern, if any.

C. Samples for Initial Selection: For each type of material exposed to view.

D. Samples for Verification: For the following products:

1. Countertop material, 6 inches square.
2. Wood trim, 8 inches long.
3. One full-size quartz agglomerate countertop, with front edge[**and backsplash**], 8 by 10 inches, of construction and in configuration specified.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For quartz agglomerate countertops to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops similar to that required for this Project, and whose products have a record of successful in-service performance.

B. Installer Qualifications: Fabricator of countertops.

C. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and execution.

1. Build mockup of typical countertop as shown on Drawings.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

1.8 COORDINATION

A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 QUARTZ AGGLOMERATE COUNTERTOP MATERIALS

A. Quartz Agglomerate: Solid sheets consisting of quartz aggregates bound together with a matrix of filled plastic resin and complying with ICPA SS-1, except for composition.

B. Product: Subject to compliance with requirements, provide product indicated in “Materials and Colors Schedule” on Drawings, or comparable product from one of the available manufacturers.

C. Available Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cambria.
2. E. I. du Pont de Nemours and Company.
3. LG Chemical, Ltd.
4. Samsung Chemical USA, Inc.
5. Wilsonart LLC.
6. Or equal.

D. Colors and Patterns: As indicated by manufacturer's designations.

E. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

2.2 COUNTERTOP FABRICATION

A. Fabricate countertops according to quartz agglomerate manufacturer's written instructions and the AWI/AWMAC/WI's "Architectural Woodwork Standards."

1. Grade: Custom.

B. Configuration:

1. Front: Straight, slightly eased at top .
2. Backsplash: Straight, slightly eased at corner.
3. End Splash: Matching backsplash.

C. Countertops: 3/4-inch-thick, quartz agglomerate[with wood-trimmed edges] [with front edge built up with same material].

D. Backsplashes: 3/4-inch-thick, quartz agglomerate[with wood-trimmed edges].

E. Fabricate tops with shop-applied edges and backsplashes unless otherwise indicated. Comply with quartz agglomerate manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

F. Joints: Fabricate countertops without joints.

G. Joints: Fabricate countertops in sections for joining in field.

1. Joint Locations: Not within 18 inches of a sink or cooktop and not where a countertop section less than 36 inches long would result, unless unavoidable.
2. Joint Type: Bonded, 1/32 inch or less in width.

H. Cutouts and Holes:

1. Undercounter Plumbing Fixtures: Make cutouts for fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.

a. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop and projecting 3/16 inch into fixture opening.

2. Counter-Mounted Plumbing Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.
3. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.
4. Counter-Mounted Cooktops: Prepare countertops in shop for field cutting openings for cooktops. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.

2.3 INSTALLATION MATERIALS

A. Adhesive: Product recommended by quartz agglomerate manufacturer.

B. Sealant for Countertops: Comply with applicable requirements in Section 079200 "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to receive quartz agglomerate countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install countertops level to a tolerance of 1/8 inch in 8 feet, 1/4 inch maximum. Do not exceed 1/64-inch difference between planes of adjacent units.

B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Predrill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with quartz agglomerate manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

C. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.

D. Secure countertops to subtops with adhesive according to quartz agglomerate manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with quartz agglomerate manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

E. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.

1. Install metal splines in kerfs in countertop edges at joints[**where indicated**]. Fill kerfs with adhesive before inserting splines and remove excess immediately after adjoining units are drawn into position.
2. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.

F. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.

G. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Predrill holes for screws as recommended by manufacturer.

H. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.

1. Seal edges of cutouts in particleboard subtops by saturating with varnish.

I. Apply sealant to gaps at walls; comply with Section 079200 "Joint Sealants."

END OF SECTION

SECTION 124813 - ENTRANCE FLOOR MATS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes: Roll-up rail mats.

1.3 COORDINATION

A. Coordinate size and location of recesses in concrete to receive floor mats and frames.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for floor mats and frames.

B. Shop Drawings:

1. Items penetrating floor mats and frames, including door control devices.
2. Divisions between mat sections.
3. Perimeter floor frames.
4. Custom Graphics: Scale drawing indicating colors.

C. Samples: For the following products, in manufacturer's standard sizes:

1. Floor Mat: Assembled sections of floor mat.
2. Tread Rail: Sample of each type and color.
3. Frame Members: Sample of each type and color.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For floor mats and frames to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 ENTRANCE FLOOR MATS AND FRAMES, GENERAL

A. Structural Performance: Provide roll-up rail mats and frames capable of withstanding the following loads and stresses within limits and under conditions indicated:

1. Uniform floor load of 300 lbf/sq. ft..
2. Wheel load of 350 lb per wheel.

B. Accessibility Standard: Comply with applicable provisions in the DOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1 2019 CBC.

2.2 ROLL-UP RAIL MATS

A. Basis of Design Product: Subject to compliance with requirements, provide entrance mat manufactured by MATTER Surfaces, or equal. Comply with the following:

1. Roll-up, Vinyl-Rail Hinged Mats: Vinyl-acrylic tread rails nominal 1-3/8 inches wide by 11/16 inch high, with slotted or perforated hinges.
2. Tread Inserts: Manufacturer’s standard level-cut, nylon-pile, fusion-bonded carpet with monofilament fiber fillers.
3. Colors, Inserts: Charcoal.
4. Frame: Manufacturer’s standard L-5 frame.
5. Hinges: Vinyl.
6. Mat Size: As indicated.

B. Available Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. C/S Group.
2. Babcock-Davis.
3. Forbo Industries, Inc.
4. JL Industries, Inc.; a division of the Activar Construction Products Group.
5. Kadee Industries, Inc.
6. Nystrom.

2.3 FABRICATION

A. Floor Mats: Shop fabricate units to greatest extent possible in sizes indicated. Unless otherwise indicated, provide single unit for each mat installation; do not exceed manufacturer's recommended maximum sizes for units that are removed for maintenance and cleaning. Where joints in mats are necessary, space symmetrically and away from normal traffic lanes. Miter corner joints in framing elements with hairline joints or provide prefabricated corner units without joints.

2.4 ALUMINUM FINISHES

A. Mill finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and floor conditions for compliance with requirements for location, sizes, minimum recess depth, and other conditions affecting installation of floor mats and frames.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install recessed mat frames and mats to comply with manufacturer's written instructions. Set mats with tops at height recommended by manufacturer for most effective cleaning action; coordinate tops of mat surfaces with bottoms of doors that swing across mats to provide clearance between door and mat.

1. Install necessary shims, spacers, and anchorages for proper location, and secure attachment of frames.
2. Delay setting mats until construction traffic has ended.

3.3 PROTECTION

A. After completing frame installation and concrete work, provide temporary filler of plywood or fiberboard in recesses and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and Project is near Substantial Completion.

END OF SECTION

SECTION 134225 - RESIDENTIAL UNIT MODULES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood-framed, prefabricated residential unit modules

    a. The Owner will engage an independent testing and inspection agency to verify the adequacy of the Contractors quality control; refer to Section 01 40 00 Quality Requirements. Before concealing the exterior wall work obtain the required inspections of same from a representative of the Owners independent testing and inspection agency.

B. Related Sections:

1. Section 011300 Delegated Design.
2. Section 014000 Quality Requirements
3. Section 055100 Metal Stairs
4. Section 055213 Pipe and Tube Railings
5. Section 061600 Sheathing
6. Section 064023 Interior Architectural Woodwork
7. Section 072100 Building Insulation
8. Section 072500 Weather Barriers
9. Section 074210 Composite Framing Support Clip System.
10. Section 074213 Metal Wall Panels
11. Section 076200 Sheet Metal Flashing and Trim.
12. Section 078413 Penetration Firestopping
13. Section 079200 Joint Sealants
14. Section 079219 Acoustical Joint Sealants
15. Section 085113 Aluminum Windows
16. Section 088000 Glazing
17. Section 092116.23 Gypsum Board Shaft-Wall Assemblies
18. Section 092216 Non-Structural Metal Framing
19. Section 092900 Gypsum Board
20. Section 096013 Acoustic Underlayment
21. Section 096513 Resilient Base and Accessories
22. Section 096519 Resilient Tile Flooring
23. Section 097200 Wall Coverings
24. Section 099123 Interior Painting
25. Section 102800 Toilet and Bath Accessories.
26. Section 102819 Shower Enclosures
27. Section 108200 Metal Screens
28. Section 113100 Residential Appliances
29. Section 123530 Residential Casework

ction 123661 Simulated Stone Countertops
31. Section 122413 Roller Window Shades

1.2 PERFORMANCE REQUIREMENTS

A. General: Provide wood-framed, prefabricated residential unit modules meeting or exceeding the following performance requirements:

1. Structural Properties:

a. Wind Loads: As indicated in Structural Drawings.
b. Seismic Loads: As indicated in Structural Drawings.

1) Provide seismic criteria of miscellaneous steel framing, not indicated on Drawings.

c. Deflection Limitations: Base calculations for deflections upon all loads superimposed on the residential unit modules (including curtain walls and other adjacent materials), building structural frame movements, erection tolerances, thermal stresses, and the following. Restrict deflection of residential unit modules to smaller values where member flexibility would result in overstressing of interior and exterior finishes.

1) Design, fabricate and install assemblies, including anchorage, for deflections not to exceed 1/1000 times span or 1/4 inch (whichever is less) parallel to exterior wall at full design loading. Span is defined as the distance between anchor centerlines; for cantilevers, span is defined as the distance between anchor centerline and the end of the cantilever.
2) Design, fabricate and install assemblies, including anchorage, for deflections not to exceed 1/360 times span or 1/4 inch (whichever is less) perpendicular to the exterior wall at full design loading. Span is defined as the distance between anchor centerlines; for cantilevers, span is defined as the distance between anchor centerline and the end of the cantilever.

B. Air Leakage: Air leakage through the exterior faces of residential unit modules shall not exceed 0.06 cfm/sq. ft. of fixed wall area when tested in accordance with ASTM E 283 at a static-air-pressure difference of 6.24 lbf/sq. ft. Water Penetration:

1. Water penetration in this specification is defined as the appearance of uncontrolled water, other than condensation, on any indoor face of any part of the wall.
2. Provision shall be made to drain to the exterior face of the wall any water entering the system.
3. No uncontrolled water penetration shall occur when the residential unit module is tested in accordance with the ASTM E331 for one 15 minute cycle at a static pressure difference of 12 lbf/sq. ft. minimum.

D. T

hermal Movements: Fabricate the residential unit module work to accommodate for such expansion and contraction of component materials, and supporting elements, as will be caused by surface temperatures ranging from +20 to +180 deg F , without causing buckling, failure of joint sealants, undue stress on metal members and fasteners, weld failures, reduction of performance, and other detrimental effects.

1. Dimensions shown on Drawings are based on an assumed design temperature of +70 deg F. Fabrication and erection procedures shall take into account the ambient temperature range at the time of the respective operations.

E. Building Frame Movement: Design, fabricate and install residential unit modules to withstand building movements including thermal movements, loading deflections, shrinkage, creep and similar movements without anchor failures, or structural damage. Thermal movements shall be as specified above. Building frame deflections, shrinkage, creep and other movements shall comply with structural engineer's documentation.

1. Comply with the pass/fail performance criteria of AAMA 501.4 for the project specific building occupancy type for building frame movements caused by seismic and wind induced interstory drifting.

F. Condensation Resistance: Design, fabricate, and install the residential unit modules to prevent the formation of condensation on the interior of any components inboard of the air/water barrier and sheet metal skin of the modules with the building heating and ventilating system in normal operation. HVAC operation parameters are available from the Owner's mechanical engineer and are indicated below. Submit a computer generated thermal analysis showing temperature gradients through each component of the residential unit module and the location of the dewpoint.

1. Winter Design Criteria:

   a. Inside: 70°F. Dry bulb.
   b. Outside: 20 °F. Dry bulb.

2. Summer Design Criteria:

   a. Inside: 75°F. Dry bulb, 50% Relative humidity.
   b. Outside: 89°F. Dry bulb, 73°F. Wet bulb.

G. Thermal Conductance: Design, fabricate, and install the residential unit modules with the following U-value that has been provided by the Owner's mechanical engineer:

1. Opaque Areas: Minimum 0.055.
2. Glazed Areas: Minimum 0.3.

H. Control of Corrosion and Staining: Prevent galvanic and other forms of corrosion as well as staining by isolating metals and other materials from direct contact with incompatible materials. Use specified materials that do not stain exposed surfaces of cladding materials.

I. Design Modifications:

1.

ubmit design modifications necessary to meet the performance requirements and field coordination.

2. Variations in details or materials shall not adversely affect the appearance, durability or strength of components, nor shall such variations cause excessive stress, or deflections, to the building structural frame.
3. Maintain the general design concept without altering size of members, profiles and alignment.

1.3 SUBMITTALS

A. Product Data:

1. Submit, prior to the submission of shop drawings, copies of product data for each proprietary material specified. Submit cutting lists, order sheets, material bills, shipping bills and mill test reports.
2. Submit manufacturer's technical data for each type of accessory and manufactured product required.

B. Material Certificates: Submit, with copies to the Owner's Independent Testing and Inspection Agency, material certificates for the following, signed by the manufacturer and the Contractor. Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards.

1. Wood materials. Include type, and name of manufacturer.
2. Each type and size of anchors, ties, and metal accessory.

C. Production Shop Drawings: Submit shop drawings indicating the following:

1. Content:

   a. Module shapes (elevations and sections), and dimensions.
   b. Lifting and erection inserts.
   c. Location, dimensional tolerances, and details of anchorage devices that are embedded in or attached to structure or other construction.
   d. Other items attached to modules.
   e. Handling procedures, plans and/or elevations showing panel location, and sequence of erection.
   f. Show location of each residential unit module by same identification mark placed on module.
   g. Relationship of residential unit modules to adjacent materials.
   h. Location and configuration of temporary waterproofing.
   i. Firestopping assemblies between modules.

2.

oads: Show the location, type, magnitude and direction of all loads from the residential unit modules to the building structural frame. Show each module, each level, for each facade of the building. Coordinate the location, type, magnitude, and direction of all imposed loadings from the residential unit modules to the base building structural frame with the structural engineer.

D. Test Reports: Submit copies of all testing and inspection reports required within this specification section.

E. Calculations: Submit, for information only, copies of structural calculations indicating complete compliance with the specified performance requirements. Calculations shall be prepared, signed and sealed, by a Professional Engineer registered in the State of California and who is experienced in the design of residential unit modules similar in scope to that required for the project. The engineer shall be experienced with structural mechanics, and window and erection as may be required to properly design the module, anchorage, attachment to backup, and coordinate the glazing and metal cladding systems with the base building structure.

F. Field Test Reports: Submit field testing reports.

G. Preconstruction Sealant Compatibility and Adhesion Testing: Submit test results.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm having a minimum of 5 years successful experience performing custom fabrication and erection of residential unit module work comparable to that shown and specified, in not less than three projects of similar scope to the satisfaction of the Architect, and maintains an organized quality control and testing program, and who retains facilities with sufficient capacity and quality to produce the required panels without causing delay to the project. The residential unit module work includes, but is not necessarily limited to, the following:

1. All preparation for residential unit module work, including but not limited to, coordinated submittals, design application of integral sealants, joint fillers and flashings and gaskets, and sample installations as specified.
2. Fabrication and installation of residential unit modules.
3. All insulation in conjunction with above.
4. All anchors, supports, inserts, and fasteners for the above, design, fabrication and installation of same.
5. All sealants and joint fillers in conjunction with the above.
6. All flashings in conjunction with above.
7. The residential unit module installer shall be responsible for the residential unit module from the point of delivery, including all costs related to breakage after delivery.
8. Residential unit module engineering, including support and connection to building structural framing, shall be performed and sealed by a licensed professional engineer registered in the State of California.

here loading from the residential unit modules transmits forces to the building structural frame which exceed the capacity of the frame to resist such forces, the residential unit module contractor shall engineer, provide, and install all supplemental steel supports and bracing required to stiffen the frame. Architect shall approve loads imposed on structure. The residential unit module engineer shall coordinate through the structural engineer the location, type, magnitude, and direction of all imposed loadings from the residential unit modules to the base building structural frame.

b. Provide all exterior and interior finishes, furnishings, accessories, and miscellaneous materials for residential unit modules indicated on the drawings.

9. The connection systems, where indicated, are suggested for the residential unit module installation. The final design of all connection systems shall be the sole responsibility of the residential unit module subcontractor and thereafter the Contractor for acceptance and inclusion into the Project.

   a. Residential unit modules shall have a minimum of two gravity connections. Where more than two gravity connections are provided, the Contractor shall assess the portion of gravity load assigned to each gravity connection considering module and structure deformations and stiffness. Design gravity connections to have lateral relief to allow for thermal movements in the planes of the modules. Gravity connections may also act as lateral connections.
   b. Except where a gravity connection is also a lateral connection, lateral connections shall not carry gravity loads. Design lateral connections to provide lateral relief to allow for thermal movements in the planes of the modules.
   c. In general, connections shall not offer restraint to loads and deformations except for which specifically designed.

10. Provide all miscellaneous steel framing which serves to extend, align, and stiffen the building structural framing to accommodate residential unit module eccentricities and imposed torsion to the building structural frame inclusive of beam and column outriggers and spandrel beam bracing to resist torsion. The residential unit module engineer shall coordinate through the structural engineer the location, type, magnitude, and direction of all imposed loadings from the residential unit modules to the base building structural frame.

B. Testing laboratories shall be specifically qualified, and AAMA accredited, to conduct field performance tests required by these specifications and acceptable to the Owner and the Architect.

1. The following laboratories are known to comply with the requirements:

2. Pre-Test Meeting: Prior to the start of construction of the field erected test assembly, and at the Architect¢s direction, meet to review methods and sequence of the construction of the assembly. The meeting shall include the Architect, the Contractor, and the subcontractor awarded the residential unit module Work, related subcontractors, the testing and inspection agent, and any other subcontractors whose work requires coordination with this work. Include in the meeting individual foremen who will be supervising the construction of the final Work on the Project.

sting: Conduct tests of each specified test assembly under the direction of the Owners Independent Testing and Inspection Agency in the presence of the Architect, the Contractor, various component manufacturers and fabricators and the Installer for each specified system to be tested. Proceed with testing only after acceptance of the detailed outline of test procedure.

C. Field Testing

1. Test the residential unit module sample installation erected to the building in accordance with the specified field test methods. Conduct the testing of the sample installation under the direction of the testing laboratory in the presence of the Owner, Architect, the Contractor, various component manufacturers and fabricators and the installer for each specified system incorporated in the sample installation.
2. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to 10, 50, and 75-percent completion.

    a. Field Test for Water Leakage:

        1) Water Spray Test with Static Air Pressure Difference: ASTM E1105 and AAMA 503-92 conducted at a Uniform Static Test Pressure of 12 lbf/sq. ft. .
        2) Correct all deficiencies observed as a result of this test.

D. Preconstruction Sealant Compatibility and Adhesion Testing: Test results confirming compatibility and adhesion are mandatory for all concealed and exposed sealant materials in contact with exterior window framing, metal panels, other sealants, flashings, metal framing, and shims prior to full size sample installation construction. Refer to Section 079200, Exterior Joint Sealants for specific testing requirements, and anticipated lead time necessary to perform testing.

E. Standards: Except as modified by governing codes and by the Contract Documents, comply with the applicable provisions and recommendations of the following. This specification governs in case of conflicting requirements.

1. American Architectural Manufacturers Association (AAMA):

    a. AAMA 501.4, Static Test Method for Evaluating Curtain Wall and Storefront Systems Subjected to Seismic and Wind Induced Interstory Drifts.
    b. AAMA 503, Field Testing of Metal Store Fronts, Curtain Walls and Sloped Glazing Systems.

2. American Institute of Steel Construction (AISC):

    a. Specifications for Structural Steel Buildings Allowable Stress Design.

3. American Iron and Steel Institute (AISI):

    a. North American Specification for the Design of Cold-Formed Steel Structural Members.
    b. Standard for Cold-Formed Steel Framing - General Provisions.

merican Society for Testing and Materials (ASTM):

a. ASTM E283, Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences Across the Specimen.
b. ASTM E330, Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
c. ASTM E331, Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
d. ASTM E1105, Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform or Cyclic Static Air Pressure Difference.

5. American Welding Society (AWS):

a. A5.1 "Specifications for Carbon Steel Electrodes for Shielded Metal Arc Welding."
b. A5.4 "Specifications for Stainless Steel Electrodes for Shielded Metal Arc Welding."
c. A5.18 "Specifications for Carbon Steel Filler Metals for Gas Shielded Arc Welding."
d. B2.1 Standard for Welding Procedure and Performance Qualification.
e. D1.1 "Structural Welding Code - Steel."

6. Steel Structures Painting Council (SSPC): "Steel Structures Painting Manual, Vol. 2, Systems and Specifications".

F. Sample Installations: Construct sample installations of the final residential unit modules where shown on the drawings.

1. General: Sample installations will be used as a standard for judging acceptability of work for the Project. Replace unsatisfactory work as directed. Maintain sample installations during construction as a standard for judging acceptability of the residential unit module work. Properly finished, maintained, and performing sample installations shall be retained as a portion of the completed work.
2. Size: Provide full sized sample installations to the extent indicated on the drawings, or if not indicated, as directed by the Architect. Sample installations shall be built on site complete with all glass, aluminum framing, adjacent cladding materials, anchors, connections, flashings, sealants, and joint fillers as accepted on the final shop drawings. Do not take special precautions or use techniques that do not represent those to be used on the work.
3. Refer to the following sections for related materials and requirements for their incorporation into the sample installation(s):

a. Section 061600 Sheathing
b. Section 064023 Interior Architectural Woodwork

c. Section 072100 Building Insulation
d. Section 072500 Weather Barriers
e. Section 074210 Composite Framing Support Clip System.
f. Section 074213 Metal Wall Panels

g.

ction 076200 Sheet Metal Flashing and Trim.
h. Section 078413 Penetration Firestopping
i. Section 079200 Joint Sealants
j. Section 079219 Acoustical Joint Sealants
k. Section 085113 Aluminum Windows
l. Section 088000 Glazing
m. Section 092116.23 Gypsum Board Shaft-Wall Assemblies
n. Section 092216 Non-Structural Metal Framing
o. Section 092900 Gypsum Board
p. Section 096013 Acoustic Underlayment
q. Section 096513 Resilient Base and Accessories
r. Section 096519 Resilient Tile Flooring
s. Section 097200 Wall Coverings
t. Section 099123 Interior Painting
u. Section 102800 Toilet and Bath Accessories.
v. Section 102819 Shower Enclosures
w. Section 108200 Metal Screens
x. Section 113100 Residential Appliances
y. Section 123530 Residential Casework
z. Section 123661 Simulated Stone Countertops
aa. Section 122413 Roller Window Shades

G. Meetings and Coordination:

1. Pre-Installation Meeting: Prior to the installation of the residential unit module work, a meeting shall be held at the project site to review installation procedures and coordination with other work. The meeting shall include the respective Residential Unit Module Subcontractor, Contractor, Owner, Architect, and representatives of other trades affected by the work.
2. Coordinate all aspects of the work with contiguous work and provide components at the proper time and sequence to avoid delays in the work. Placing of such items, including inserts and anchors, shall be accurate in relation to the final location of residential unit modules.
3. Field Measurements: Verify dimensions of supporting structure at project site by accurate field measurement. Tolerances for structure are specified in other sections. Use Contractor's approved benchmarks as basis of measurements.

H. Testing:

1. Owner Testing: The Owner may engage an Independent Testing and Inspection Agency acceptable to the Architect to verify the adequacy of the residential unit module quality control. The Testing Agency shall perform the testing and inspection requirements, interpret them, evaluate the results for compliance with the specifications, and report the findings to the Owner, Architect, and the Contractor.
2. Owners Testing and Inspection Program:

a. The Owners Testing and Inspection Agency shall perform all tests herein specified and any additional tests as may be required including all shop and field work and submit reports to the Owner and the Architect.

e Owners Testing and Inspection Agency shall perform a full time inspection while the residential unit module erection is in process as well as periodic shop inspection.

c. Bolted connections as indicated on the shop drawings shall be inspected in accordance with the applicable provisions of the AISC code.
d. Welding shall be inspected and tested by the Owners Testing and Inspection Agency during shop fabrication as follows:

    1) Certify all welders which have not passed AWS qualification test within the previous 12 months and make inspections and tests as required. Record types and locations of all defects found in the work, and measures required and performed to correct such defects.
    2) Make inspections and tests as required. Record types and locations of all defects found in the work, and measures required and performed to correct such defects.
    3) All welds shall be visually inspected. Twenty five (25%) percent at random shall be measured.
    4) All bolted connections shall be visually inspected. Twenty five (25%) at random shall be checked by a calibrated torque wrench.
    5) All fastening devices and accessories used for the final installations shall be visually inspected to insure compliance with the contract documents.

e. Visual inspection shall also note the following:

    1) Discrepancies in dimensional tolerances of the connection assembly and any corrective procedures.
    2) Observation of installation of flashing and backpanning.

3. Contractors Responsibilities:

    a. Provide a complete set of shop and erection shop drawings.
    b. Furnish casual labor required to facilitate testing.
    c. Provide cutting lists, order lists, material bills, shipping bills, and mill test reports.
    d. Information as to time and place of shipment of material to shops.
    e. Representative sample pieces requested for testing.
    f. Provide proper facilities, including scaffolding, temporary work platforms, hoisting facilities, etc., for inspection of the work in the shop and field.
    g. Each bolting crew and welder shall be assigned an identifying symbol or mark and all shop and field connections shall be so identified so that inspector can refer back to the crew or person making the connection.
    h. The Contractor shall be responsible for the expense of testing, inspection, and corrective measures for work complying with the following:

        1) Work not evidencing compliance with this specification.
        2) Testing to verify the adequacy of the work done without proper notice, without proper supervision or contrary to standard construction practice.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Handling:

eliver all residential unit modules to the project site in such quantities and at such times to assure compliance with the schedule and proper setting sequence.

2. Handle and transport modules in a position consistent with their shape and design in order to avoid stresses which would cause cracking or damage.
3. Lift or support modules only at points shown on the shop drawings.
4. Place non-staining resilient spacers of even thickness between each module.
5. Support modules during shipment on non-staining shock absorbing material.
6. Do not place modules directly on ground.
7. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources.

B. Storage at Jobsite:

1. Store and protect modules to prevent contact with soil, staining, and physical damage.
2. Store modules, unless otherwise specified, with non-staining, resilient supports located in same positions as when transported.
3. Store modules on firm, level, and smooth surfaces to prevent cracking, distortion, warping or other physical damage.
4. Place stored modules so that identification marks are discernable, and so that product can be inspected.
5. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources.
6. Store pallets in single stacks on level ground where directed by the Contractor and cover with waterproof covering to protect the units form inclement weather.

PART 2 - PRODUCTS

2.1 RESIDENTIAL UNIT MODULES

A. Description: Unitized, assemblies to provide a framing grid for installation of interior partitions, finishes, and furnishings, and to which stainless steel flashing acting as a water/vapor barrier, polystyrene insulation, aluminum windows, panels and their anchors will be affixed and erected as assemblies.

B. Insulation:

1. Mineral-Wool Blanket, Unfaced : ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
2. Mineral-Wool Board, Types IA and IB, Unfaced : ASTM C 612, Types IA and IB; with maximum flame-spread and smoke-developed indexes of 15 and zero, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics. Nominal density of 4 lb/cu. ft..
3. Extruded Polystyrene Board Insulation: 3 inch thickness, unless otherwise indicated on the drawings; board insulation shall comply with ASTM C 578, be square edged; of type, density, and compressive strength indicated below:

pe IV, 1.6-lb/cu. ft. minimum density and 25-psi minimum compressive strength.

1) Styrofoam Square Edge; Dow Chemical Co.
2) Formular 250; Owens-Corning.
3) GreenGuard CM Insulation Board; Pact IV Building Products.

4. Adhesive for Bonding Extruded Polystyrene Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.

C. Shims: High density plastic types typically, compressible types at anchors, in the thickness and of the size required to properly support the trusswork. Compressible type shims shall be made from materials which will retain their physical properties when exposed to the climatological extremes of the project site.

2.2 RESIDENTIAL UNIT MODULE ACCESSORIES

A. Cleaner: Provide cleaners of proper formulation for kind of finishes and applications indicated. Do not use acid-type cleaning agents or other cleaning compounds containing caustic or harsh fillers.

B. Sealants: Refer to the following 07 92 00 Joint Sealants and 07 92 19 Acoustical Joint Sealants.

C. Bituminous Paint: Cold-applied bituminous paint complying with ASTM D1187.

D. Slip and Separator Gaskets:

1. Bolted Slip Joints: Non-metallic, low friction material bearing temperature and moisture resistances and low abrasion properties as required to suit performance requirements.
2. Non-Bolted Slip Joints: Non-corrosive, non-toxic impregnated felt, or butyl tape with a pressure sensitive adhesive on one surface which is formulated for proper adhesion to metals indicated; gasket shall bear temperature and moisture resistance properties as required to suit performance criteria; thickness and width as required.

E. Compressible Filler: Premolded closed cell neoprene filler strips with peel off pressure sensitive adhesive one side, complying with ASTM D 1056, Class RE41, 3/8 inch thick, minimum 2-3/4" wide, and having a minimum 50% compressibility.

2.3 FABRICATION

A. General: Fabricate the residential unit modules to the designs, shapes, and sizes shown using the materials specified and shown to produce assemblies which meet or exceed the performance requirements. To the greatest extent possible complete fabrication, assembly, finishing, hardware applications and other work before shipment to Project site.

l welding shall be performed by currently AWS certified welders.

B. Predrill bolt and/or screw holes as indicated, or required, for attachment of module framing and from the attachment of adjacent materials.

C. No combination of bolts and welds shall be used for stress transmission in the same faying face of a single connection.

D. Welding:

1. Welds not specified shall be continuous fillet welds, using not less than the minimum fillet as specified by the AWS.
2. Welding, filler metal, welding techniques and procedures shall be in accordance with AISC Specifications for Structural Steel Buildings Allowable Stress Design and the AWS Structural Welding Code.
3. Do not weld until all adjacent elements to be connected have been aligned, firmly seated and braced. Control heat build-up by limiting voltage, electrode size, and rate. Cracks in either the weld metal or heat affected zone of the base metal are not acceptable.

E. Preassemble the residential unit module work in the shop to the greatest extent possible, so as to minimize field splicing and assembly of modules and facing materials at the project site. Mark modules clearly for reassembly and proper installation.

F. Fabrication Tolerances: As required to achieve erection tolerances and as follows:

1. Overall height and width:

a. 10 feet -0 inches or under: +/- 1/16 inches.
b. 10 feet -0 inches (3 m) to 20 feet -0 inches: +/- 1/16 inches.
c. 20 feet-0 inches (3 m) to 30 feet - 0 inches: +/- 1/16 inches.
d. over 30 feet-0 inches: +/- 1/16 inches.

2. Out of square (difference in length of the two diagonal measurements): 1/8 inch, but not more than 1/4" .
3. Openings (length and width of openings within one panel): +/- 1/8 inch.
4. Insert, plate, handling device, locations: +/- 1/4 inch.

5. All node points (centroids) of each truss shall not vary by more than +/- 1/16 inch in any direction. A shop mock-up of an initial assembly shall be used to verify this tolerance.

G. Attach galvanized steel back panning and stainless steel flashing at supports and as indicated to direct and divert water to building exterior.

H. Fabricate joints in a manner to exclude water, or provide weep holes where water may accumulate.

I. Protection of Metals: Wherever dissimilar metals are in contact, separate such surfaces with a coating of zinc rich primer, bituminous paint, or separation gaskets as the condition requires.

J. Attach extruded polystyrene board and semi-rigid mineral wool board insulation to back

nning and stainless steel flashing as indicated.

K. Finishes: Exposed finish surfaces shall match accepted samples, mock-up panels, and sample installations in all respects. Provide truss panels with square edged, smooth joints prepared for field applied joint sealers.

1. Aluminum Windows: Anchor aluminum windows to module framing in accordance with final shop drawings.

a. Temperature Requirements:

1) Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace materials damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
2) Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

2. Galvanized Surfaces: Clean cut ends of structural steel channels, shapes, plates and bars, welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

L. Shop Priming of Non-Galvanized Steel Items:

1. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces by removing oil, grease, and similar contaminants in accordance with SSPC -SP 1 Solvent Cleaning, followed with the SSPC surface-preparation specifications listed below. Surface preparation shall be done after fabrication and immediately prior to shop painting. Apply shop coat of paint within 4 hours after cleaning and before rust bloom occurs.

a. Exterior Components: SSPC-SP 6, "Commercial Blast Cleaning."

2. Shop Priming: Apply a minimum of one coat of shop primer to uncoated surfaces of metal components, except those to be field welded, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting.

a. Stripe paint corners, crevices, bolts, welds, and sharp edges.

b. Dry Film Thickness of Primer: 3.0 to 5.0 mils, dry film thickness. Apply paint thoroughly and evenly to dry surfaces, free from holidays and pinholes, in accordance with manufacturers directions.

M. Module Identification: Mark each module to correspond to identification mark on shop drawings for module location. Mark each module with date fabricated.

N. Acceptance: Before shipping modules from plant, examine and measure modules to establish conformity with sizes and dimensions shown on shop drawings. Modules whose dimensions vary or whose fastening devices are in excess of specified tolerances are unacceptable and shall be rejected. Discard and replace modules which are cracked, chipped, stained, possess

regular surfaces, ragged or irregular edges, or are otherwise damaged. The Architect reserves the right to reject panels that do not match the accepted samples and visual mock-up.

PART 3 - EXECUTION

3.1 PREPARATION

A. Deliver anchorage devices that are embedded in or attached to the building structural frame before start of such work. Provide locations, setting diagrams, and templates for the proper installation of each anchorage device.

B. Deliver completed residential unit modules to job site. Store upright on dunnage.

C. Protect residential unit modules during erection as follows:

1. Cover tops of residential unit modules with nonstaining, waterproof sheeting at end of each day's work. Cover partially completed structures when work is not in progress. Extend cover a minimum of 24 inches down both sides and hold securely in place.
2. Prevent staining of residential unit modules from sealants, and other sources. Immediately remove such materials without damaging modules.

D. Clean exposed surfaces that are dirty or stained by removing soil, stains, and foreign materials before setting modules.

3.2 INSPECTION

A. Examine surfaces to receive residential unit modules and conditions under which residential unit modules will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 ERECTION

A. Execute residential unit module installation using skilled mechanics.

B. Provide and maintain temporary supports and bracing as required to maintain position, stability and alignment as modules are being permanently connected.

C. Set modules to comply with the requirements indicated on Drawings and Shop Drawings with shims. Place shims toward the concealed face of modules to permit proper installation of joint sealant and backer materials with uniform joints of 3/4 inches, unless greater widths are indicated, and with edges and faces aligned. Install metal anchors, clips, bolts, and other fastening devices as indicated or necessary for erection and support of residential unit modules. Remove temporary shims after modules have been permanently fastened to building structural frame.

D. F
a

sten residential unit modules in place by bolting to adjacent modules, and to embeds attached to the structural frame or by bolting directly to the building structural frame.

3.4 ERECTION TOLERANCES

A. Tolerances for location of residential unit modules shall be as follows:

1. Plan location from building grid datum: Do not exceed 1/8 inches in any bay 20 feet maximum, noncumulative.
2. Variation from level: Do not exceed 1/8 inches in any bay or 20 feet maximum, non-cumulative.
3. Variation from plumb: Do not exceed 1/8 inches in any 20 feet or one story height; noncumulative.
4. Variation in Plane between Adjacent Modules (Lipping): Do not exceed 1/16 inch difference between planes of adjacent units.
5. Joint Width: Do not exceed 1/8 inches for joints 1/2 inch wide or greater.
6. Variation of fastening devices and embedments from established position in plan: Do not exceed 1/4 inches.

3.5 REPAIRS

A. Replace modules that exhibit damage to surfaces, finish, corners or edges which will be exposed to view after erection, or which is broken or cracked due to transportation, handling or erection.

B. Galvanized Surfaces: Clean bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

C. Touchup Painting: Immediately after erection of shop finished items, and at the end of construction activities, clean field welds, bolted connections, and abraded areas of shop applied coatings, and paint exposed areas with the same material as used for shop painting.

3.6 CLEANING, FINISHING, AND PROTECTION

A. In-Progress Cleaning: Clean residential unit modules as work progresses.

B. Finished Work: Leave finished installation clean and free of cracked, chipped, broken, discolored and otherwise defective materials.

C. Provide final protection and maintain conditions in a manner acceptable to installer that ensures that residential unit module work is without damage or deterioration at time of Substantial Completion.

END OF SECTION 134225

SECTION 142123.16 - MACHINE ROOM-LESS ELECTRIC TRACTION PASSENGER ELEVATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes: Machine-room-less electric traction passenger elevators.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for the following:

   a. Attachment plates and angle brackets for supporting guide-rail brackets.
   b. Structural-steel shapes for subsills.
   c. Pit ladders.

1.3 DEFINITIONS

A. Definitions in ASME A17.1/CSA B44 apply to work of this Section.

B. Product Data: For each type of product.

1. Include capacities, sizes, performances, operations, safety features, finishes, and similar information.
2. Include Product Data for car enclosures, hoistway entrances, and operation, control, and signal systems.

C. Shop Drawings:

1. Include plans, elevations, sections, and large-scale details indicating service at each landing, coordination with building structure, relationships with other construction, and locations of equipment.
2. Include large-scale layout of car-control station and standby power operation control panel.
3. Indicate maximum dynamic and static loads imposed on building structure at points of support, and maximum and average power demands.

D. Samples for Verification: For exposed car, hoistway door and frame, and signal equipment finishes; 3-inch-square Samples of sheet materials; and 4-inch lengths of running trim members.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Seismic Qualification Certificates: For elevator equipment, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Manufacturer Certificates: Signed by elevator manufacturer certifying that hoistway and pit layout and dimensions, as indicated on Drawings, and electrical service including standby power generator, as shown and specified, are adequate for elevator system being provided.

D. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For elevators to include in emergency, operation, and maintenance manuals. Submit manufacturer's or Installer's standard operation and maintenance manual, according to ASME A17.1/CSA B44 including diagnostic and repair information available to manufacturer's and Installer's maintenance personnel.

B. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Elevator manufacturer or an authorized representative who is trained and approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle materials, components, and equipment in manufacturer's protective packaging. Store materials, components, and equipment off of ground, under cover, and in a dry location.

1.8 COORDINATION

A. Coordinate installation of inserts, sleeves, block outs, elevator equipment with integral anchors, and other items that are embedded in concrete or masonry for elevator equipment. Furnish templates, inserts, sleeves, elevator equipment with integral anchors, and installation instructions and deliver to Project site in time for installation.

B. Coordinate locations and dimensions of work specified in other Sections that relates to electric traction elevators including pit ladders; sumps and floor drains in pits; entrance subsills; electrical service; and electrical outlets, lights, and switches in hoistways and pits.

1.9 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair, restore, or replace elevator work that fails in materials or workmanship within specified warranty period. Failures include, but are not limited to, operation or control system failure, including excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Product: Subject to compliance with requirements, provide Otis "Gen3" elevator system.

B. Source Limitations: Obtain elevators from single manufacturer. Major elevator components, including driving machines, controllers, signal fixtures, door operators, car frames, cars, and entrances, shall be manufactured by single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with ASME A17.1/CSA B44.

B. Accessibility Requirements: Comply with requirements for accessible elevators in the United States Access Board's ADA-ABA Accessibility Guidelines and with 2019 CBC.

C. Seismic Performance: Elevator system shall withstand the effects of earthquake motions determined according to 2019 CBC and shall comply with elevator seismic requirements in ASME A17.1/CSA B44.

1. The term "withstand" means "the system will remain in place without separation of any parts when subjected to the seismic forces specified."
2. Project Seismic Design Category: As indicated in Drawings.
3. Elevator Component Importance Factor: 1.0.
4. Design earthquake spectral response acceleration short period (Sds) for Project is as indicated in Drawings.
5. Provide earthquake equipment required by ASME A17.1/CSA B44.
6. Provide seismic switch required by ASCE/SEI 7.

2.3 ELEVATORS

A. Elevator System, General: Manufacturer's standard elevator systems. Unless otherwise indicated, manufacturer's standard components shall be used, as included in standard elevator systems and as required for complete system.

B. Elevator Description:

1. Elevator Number(s): Nos. 1 through 6.
2. Rated Load: 3500 lb.
3. Rated Speed: 200 fpm.
4. Operation System: Selective-collective automatic operation.
5. Auxiliary Operations:

    a. Standby-powered lowering.
    b. Battery-powered automatic evacuation.
    c. Earthquake Emergency Operation: Comply with requirements in ASME A17.1/CSA B44 and 2019 CBC.
    d. Automatic dispatching of loaded car.
    e. Nuisance-call cancel.
    f. Loaded-car bypass.
    g. Distributed parking.
    h. Off-peak operation.
    i. Automatic operation of lights and ventilation fans.

6. Car Enclosures:

    a. Inside Width: Not less than 77-1/2 inches from side wall to side wall.
    b. Inside Depth: Not less than 64-1/2 inches from back wall to front wall (return panels).
    c. Inside Height: Not less than 93 inches to underside of ceiling.

d. Front Walls (Return Panels): Satin stainless steel, ASTM A480/480M, No. 4 finish.
e. Car Fixtures: Satin stainless steel, ASTM A480/480M, No. 4 finish.
f. Side and Rear Wall Panels: Satin stainless steel, ASTM A480/480M, No. 4 finish.
g. Reveals: Satin stainless steel, ASTM A480/480M, No. 4 finish.
h. Door Faces (Interior): Satin stainless steel, ASTM A480/480M, No. 4 finish stainless steel.
i. Door Sills: Aluminum.
j. Ceiling: Satin stainless steel, ASTM A480/480M, No. 4 finish.
k. Handrails: 1-1/2 inches round satin stainless steel, at rear of car.
l. Floor Thickness, Including Setting Materials: 3/8 inch above plywood subfloor.

7. Hoistway Entrances:

a. Width: 42 inches.
b. Height: 84 inches.
c. Type: Single-speed side sliding.
d. Frames: Enameled or powder-coated steel.
e. Doors: Enameled or powder-coated steel.
f. Sills: Aluminum.

8. Hall Fixtures: Satin stainless steel, ASTM A480/480M, No. 4 finish.
9. Additional Requirements: Provide inspection certificate in each car, mounted under acrylic cover with frame made from satin stainless steel, ASTM A480/480M, No. 4 finish.

2.4 TRACTION SYSTEMS

A. Elevator Machines: Permanent magnet, variable-voltage, variable-frequency, ac-type hoisting machines and solid-state power converters.

1. Provide regenerative system that complies with the IgCC.
2. Limit total harmonic distortion of regenerated power to 5 percent per IEEE 519.
3. Provide means for absorbing regenerated power when elevator system is operating on standby power.
4. Provide line filters or chokes to prevent electrical peaks or spikes from feeding back into building power system.

B. Fluid for Hydraulic Buffers: Fire-resistant fluid.

C. Inserts: Furnish required concrete and masonry inserts and similar anchorage devices for installing guide rails, machinery, and other components of elevator work. Device installation is specified in another Section.

D. Machine Beams: Provide steel framing to support elevator hoisting machine and deflector sheaves from the building structure. Comply with Section 055000 "Metal Fabrications" for materials and fabrication.

E. Car Frame and Platform: Bolted- or welded-steel units.

F. Guides: Roller guides. Provide guides at top and bottom of car and counterweight frames.

2.5 OPERATION SYSTEMS

A. Provide manufacturer's standard microprocessor operation systems as required to provide type of operation indicated.

B. Auxiliary Operations:

1. Single-Car Battery-Powered Automatic Evacuation: If power fails and car is at a floor, it remains at that floor, opens its doors, and shuts down. If car is between floors, it moves to the next floor above or below, opens its doors, and shuts down. System includes rechargeable battery and automatic recharging system.
2. Automatic Dispatching of Loaded Car: When car load exceeds 80 percent of rated capacity, doors begin closing.
3. Nuisance-Call Cancel: When car calls exceed a preset number while car load is less than a predetermined weight, all car calls are canceled. Preset number of calls and predetermined weight can be adjusted.
4. Loaded-Car Bypass: When car load exceeds 80 percent of rated capacity, car responds only to car calls, not to hall calls.
5. Automatic Operation of Lights and Fan: When elevator is stopped and unoccupied with doors closed, lighting, ventilation fan, and cab displays are de-energized after five minutes and are re-energized before car doors open.
6. Independent Service: Keyswitch in car-control station removes car from group operation and allows it to respond only to car calls. Key cannot be removed from keyswitch when car is in independent service. When in independent service, doors close only in response to door close button.

C. Security features shall not affect emergency firefighters' service. Keyswitch Operation: Push buttons are activated and deactivated by security keyswitches at car-control stations. Key is removable only in deactivated position.

2.6 DOOR REOPENING DEVICES

A. Infrared Array: Provide door reopening device with uniform array of 36 or more microprocessor-controlled, infrared light beams projecting across car entrance. Interruption of one or more light beams shall cause doors to stop and reopen.

B. Nudging Feature: After car doors are prevented from closing for predetermined adjustable time, through activating door reopening device, a loud buzzer shall sound and doors shall begin to close at reduced kinetic energy.

C. Door Delay: Comply with 2019 CBC 11B-407.3.5. Elevator doors shall remain fully open in response to a car call for 5 seconds minimum.

2.7 CAR ENCLOSURES

A. Provide enameled or powder-coated steel car enclosures to receive removable wall panels, withcar roof, access doors, power door operators, and ventilation. Provide standard railings complying with ASME A17.1/CSA B44 on car tops where required by ASME A17.1/CSA B44.

B. Materials and Finishes: Manufacturer's standards, but not less than the following:

1. Subfloor: Exterior, C-C Plugged grade plywood, not less than 7/8-inch nominal thickness.
2. Stainless Steel Wall Panels: Flush, formed-metal construction; fabricated from stainless steel sheet.
3. Fabricate car with recesses and cutouts for signal equipment.
4. Fabricate car door frame integrally with front wall of car.
5. Stainless Steel Doors: Flush, hollow-metal construction; fabricated from stainless steel sheet.
6. Sight Guards: Provide sight guards on car doors.
7. Sills: Extruded or machined metal, with grooved surface, 1/4 inch thick.
8. Metal Ceiling: Flush panels, with incandescent downlights in the center of each panel. Align ceiling panel joints with joints between wall panels.
9. Light Fixture Efficiency: Not less than 35 lumens/W.
10. Ventilation Fan Efficiency: Not less than 3.0 cfm/W.

2.8 HOISTWAY ENTRANCES

A. Hoistway Entrance Assemblies: Manufacturer's standard horizontal-sliding, door-and-frame hoistway entrances complete with track systems, hardware, sills, and accessories. Frame size and profile shall accommodate hoistway wall construction.

B. Fire-Rated Hoistway Entrance Assemblies: Door and frame assemblies shall comply with NFPA 80 and be listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction based on testing at as close-to-neutral pressure as possible according to NFPA 252 or UL 10B. Fire-Protection Rating: 1-1/2 hours.

C. Materials and Fabrication: Manufacturer's standards, but not less than the following:

1. Enameled or Powder-Coated Steel Frames: Formed from cold- or hot-rolled steel sheet. Provide with factory-applied enamel or powder-coat finish; colors as selected by Architect from manufacturer's full range.
2. Star of Life Symbol: Identify emergency elevators with star of life symbol, not less than 3 inches high, on both jambs of hoistway door frames.
3. Enameled or Powder-Coated Steel Doors: Flush, hollow-metal construction; fabricated from cold-rolled steel sheet. Provide with factory-applied enamel or powder-coat finish; colors as selected by Architect from manufacturer's full range.
4. Sight Guards: Provide sight guards on doors matching door edges.
5. Sills: Extruded or machined metal, with grooved surface, 1/4 inch thick.
6. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M.

2.9 SIGNAL EQUIPMENT

A. Provide hall-call and car-call buttons that light when activated and remain lit until call has been fulfilled. Provide vandal-resistant buttons and lighted elements illuminated with LEDs. Comply with CBC 11B-407.4.5 Illumination; level of illumination at the car controls, platform, car threshold, and car landing sill shall be 5 foot candles (54 lux) minimum.

B. Car-Control Stations: Provide manufacturer's standard recessed car-control stations. Mount in return panel adjacent to car door unless otherwise indicated.

1. Mark buttons and switches for required use or function. Use both tactile symbols and Braille.
2. Provide "No Smoking" sign matching car-control station, either integral with car-control station or mounted adjacent to it, with text and graphics as required by authorities having jurisdiction.

C. Emergency Communication System: Two-way voice communication system, with visible signal, which dials preprogrammed number of monitoring station and does not require handset use. System is contained in flush-mounted cabinet, with identification, instructions for use, and battery backup power supply.

D. Firefighters' Two-Way Telephone Communication Service: Provide flush-mounted cabinet in each car and required conductors in traveling cable for firefighters' two-way telephone communication service .

E. Car Position Indicator: Provide illuminated, digital-type car position indicator, located above car door or above car-control station. Also, provide audible signal to indicate to passengers that car is either stopping at or passing each of the floors served. Include travel direction arrows if not provided in car-control station. Comply with CBC 11B-407.4.8.1.1 Size: Characters shall be 1/4-inch high minimum.

F. Hall Push-Button Stations: Provide one hall push-button station at each landing Provide hall push-button stations at each landing as indicated.

1. Provide units with flat faceplate for mounting with body of unit recessed in wall.
2. Equip units with buttons for calling elevator and for indicating desired direction of travel.

G. Hall Lanterns: Units with illuminated arrows; but provide single arrow at terminal landings. Provide the following: Units with flat faceplate for mounting with body of unit recessed in wall and with illuminated elements projecting from faceplate for ease of angular viewing.

H. Hall Annunciator: With each hall lantern, provide audible signals indicating car arrival and direction of travel. Signals sound once for up and twice for down. At manufacturer's option, audible signals may be placed on cars.

I. Fire-Command-Center Annunciator Panel: Provide panel containing illuminated position indicators for each elevator, clearly labeled with elevator designation; include illuminated signal that indicates when elevator is operational and when it is at the designated emergency return level with doors open. Provide standby power elevator selector switch(es), as required by ASME A17.1/CSA B44, adjacent to position indicators. Provide illuminated signal that indicates when normal power supply has failed.

J. Emergency Pictorial Signs: Fabricate from materials matching hall push-button stations, with text and graphics as required by authorities having jurisdiction, indicating that in case of fire, elevators are out of service and exits should be used instead. Provide one sign at each hall push-button station unless otherwise indicated.

K. Audible Signals: Comply with the following:

1. Signal Level: Comply with CBC 11B-407.4.8.2.2 Signal Level: The verbal annunciator shall be 10 dB minimum above ambient, but shall not exceed 80 dB measured at the annunciator.
2. Frequency: Comply with CBC 11B-407.4.8.2.3 Frequency: The verbal annunciator shall have a frequency of 300 Hz minimum to 3000 Hz maximum.

2.10 FINISH MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, commercial steel, Type B, exposed, matte finish.

B. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, commercial steel, Type B, pickled.

C. Stainless Steel Sheet: ASTM A240/A240M, Type 304.

D. Stainless Steel Bars: ASTM A276, Type 304.

E. Stainless Steel Tubing: ASTM A554, Grade MT 304.

F. Aluminum Extrusions: ASTM B221, Alloy 6063.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elevator areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work. Examine hoistways, hoistway openings, and pits as constructed; verify critical dimensions; and examine supporting structure and other conditions under which elevator work is to be installed.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions.

B. Welded Construction: Provide welded connections for installing elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualifications of welding operators.

C. Sound Isolation: Mount rotating and vibrating equipment on vibration-isolating mounts to minimize vibration transmission to structure and structure-borne noise due to elevator system.

D. Lubricate operating parts of systems, including ropes, as recommended by manufacturers.

E. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with car. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.

F. Leveling Tolerance: 1/8 inch, up or down, regardless of load and travel direction. Comply with CBC 11B-407.4.4. Each car shall be equipped with a self-leveling feature that will automatically bring and maintain the car at floor landings within a tolerance of 1/2-inch under rated loading to zero loading conditions.

G. Set sills flush with finished floor surface at landing. Fill space under sill solidly with nonshrink, nonmetallic grout.

H. Locate hall signal equipment for elevators as follows unless otherwise indicated:

1. Place hall lanterns either above or beside each hoistway entrance.
2. Mount hall lanterns at a minimum of 72 inches above finished floor.

3.3 FIELD QUALITY CONTROL

A. Acceptance Testing: On completion of elevator installation and before permitting elevator use (either temporary or permanent), perform acceptance tests as required and recommended by ASME A17.1/CSA B44 and by governing regulations and agencies.

B. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times that tests are to be performed on elevators.

3.4 PROTECTION

A. Temporary Use: Limit temporary use for construction purposes to one elevator. Comply with the following requirements for each elevator used for construction purposes:

1. Provide car with temporary enclosure, either within finished car or in place of finished car, to protect finishes from damage.
2. Provide strippable protective film on entrance and car doors and frames.
3. Provide padded wood bumpers on entrance door frames covering jambs and frame faces.
4. Provide other protective coverings, barriers, devices, signs, and procedures as needed to protect elevator and elevator equipment.
5. Do not load elevators beyond their rated weight capacity.
6. Engage elevator Installer to provide full maintenance service. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleanup, and adjustment as necessary for

proper elevator operation at rated speed and capacity. Provide parts and supplies same as those used in the manufacture and installation of original equipment.

7. Engage elevator Installer to restore damaged work, if any, so no evidence remains of correction. Return items that cannot be refinished in the field to the shop, make required repairs and refinish entire unit, or provide new units as required.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to operate, adjust, and maintain elevator(s).

B. Check operation of each elevator with Owner's personnel present before date of Substantial Completion and again not more than one month before end of warranty period. Determine that operation systems and devices are functioning properly.

3.6 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of elevator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation at rated speed and capacity. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

1. Perform maintenance during normal working hours.
2. Perform emergency callback service during normal working hours with response time of two hours or less.

END OF SECTION

SECTION 149181 - COMPOST CHUTE

PART 1 - GENERAL

1.1 SUMMARY

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Section includes: 304 stainless steel compost chute.

C. Description: Furnish and install where shown on plans 24” diameter compost chute with automatic opening low voltage electrically interlocking doors which includes the following features:

1. Building personnel can be notified if a specific intake door is not properly closed
2. All doors can be locked from a master control panel.
3. All doors can be locked in the event of a life safety alarm.
4. All doors open automatically when opening is pushed and then close automatically after an adjustable period of time.

D. Related Sections:

1. Section 149182 - Trash Chutes.
2. Division 22 - Plumbing: For water service hookups for fire sprinklers and sanitizing units.
3. Division 26 - Electrical: Provision of electrical service.

1.2 REFERENCES

A. ASTM - American Society for Testing and Materials.

1. A240 - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

B. NFPA - National Fire Protection Association.

1. 13 - Standard for the Installation of Sprinkler Systems.
2. 82 - Standard on Incinerators, Waste and Linen Handling Systems and Equipment.

C. UL - Underwriters Laboratories Inc.

D. California Building Code (2010) Chapter 7 Paragraph 707.13 Refuse and Laundry Chutes, Chapter 9 Paragraph 903.2.11.2 and Chapter 12 Paragraph 1224.4.16.

1.3 SUBMITTALS

A. Product Data: Submit product data for each type of chute required. Include standard details and installation instructions for each pre-engineered chute system. Indicate actual selections for sizes and other installation details.

B. Shop Drawings: Submit shop drawings for each type of chute required. Distinguish between factory fabrication and field-assembly work. Show required piping, wiring connections, and conduit runs for wiring. Include layout and installation details and other information not fully detailed in manufacturer's standard product data and the following:

1. Sections and elevations at 1/4-inch per foot scale.
2. Typical landing plats at 1/2-inch per foot scale.
3. Chute fabrication and installation details, including roof flashing, at 1-1/2 inch per foot scale.

1.4 QUALITY ASSURANCE

A. Qualifications

1. Installer: Engage an experienced installer who has successfully completed installation of chutes similar in material, design, and extent to that indicated for this Project.
2. Fabricator: Provide chutes fabricated by a shop that employs skilled workers who have fabricated chutes similar to those required for this Project with a record of successful in-service performance.

B. Regulatory Requirements: Comply with applicable portions of NFPA Standard No. 82.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable manufacturers: Wilkinson-Hi-Rise, 2821 Evans St., Hollywood, FL 33020; Telephone: (800) 231-3888, Chute Source LLC Telephone: (330) 733-3996, Wilkinson of Canada Telephone: (866) 535-0558 or equal.

2.2 MATERIALS

A. Chute Metal: 304 Stainless Steel. Gauge: 0.062-inch thick (U.S. No. 16 gauge).

2.3 INTAKE DOORS

A. Chute Intake Door Units: 304 Stainless steel door (front and back) and trim, 15” x 18” bottom-hinged electrically interlocking, automatic opening intakes with push button pneumatic mechanism designed to preclude the need to grasp, twist or pinch the control mechanism in order to operate the intake door. Slow self-closing with gaskets, positive latching, low voltage electrically interlocked normally closed intake doors with hydraulic closer and operation hardware are to be mounted in an independent compartment as not to reduce the chute throat or thru wall opening volume and with frame suitable for enclosing chase construction. Chute doors to be mounted in a chute section manufactured with a two-sloped throat angle; incorporating a 30º and 60º (respectively) slope. Button is pushed to allow automatic opening of the intake doors. Doors are provided with thumb latch handles if pneumatic mechanism is not functioning. Doors are normally locked and can be disabled from the master control panel.

1. Finish: Satin finish.

B. Chute Discharge Door Units: 16-gauge 304 stainless steel inclined Type “A” “B” label, horizontally rolling door with 165 degree F fusible link. UL label may not be required.

2.4 ACCESSORIES

A. Fire Sprinklers: Intermediate ½” IPS - 155°F, Pendant glass bulb sprinkler. Fire Sprinkler at highest intake, lowest intake, and every other floor between, to be started from highest intake - connection by others. (SUPPLIED/MOUNTED BY CHUTE SUBCONTRACTOR. INSTALLED BY FRAMING SUBCONTRACTOR OR GC).

B. Flushing Spray Unit at Trash Chute: Provide 3/4-inch NPS spray head unit in chute above highest intake door, ready for hot water piping connection. Provide access for head and piping maintenance. Equip spray unit with disinfecting and sanitizing unit, including 1-gallon tank and adjustable proportioning valve with by-pass for manual control of sanitizing and flushing operation.

C. Plumbing Access Door: Provide 15 inches wide x 15 inches high right side hinged, hand operated, self closing, positive latching, UL 1 1/2-hour “B” labeled, stainless steel plumbing access door having stainless steel door trim for installation by forces erecting enclosing shaft wall. Door to have master keyed lock. Cylinder provided by others. Door for access to disinfecting & sanitizing unit above the highest intake door of the chute.

D. Vent: Chute shall extend full diameter through roof to metal top vent cap 3’-0” above roof level with counter flashing and insect screen. A roof curb (44” x 44” x minimum of 8” high) is required for flat roof conditions and is to be provided by others.

E. Isolator Pads & Sound Dampening: BRA-Red Mounts as manufactured by Mason Industries or equal. Install in accordance with trash chute manufacturer’s recommendations using fasteners as manufactured by Hilti, Inc., or equal. Provide manufacturer’s factory applied premium sound dampening (V-Damp 3680, factory applied to the thickness of the metal on the outside of chute.

F. Master Control Panel: A manually actuated Switch shall be provided to disable all intake doors as required for purposes of system shut-down for service and other needs. Supply power will be 110VAC with a 24 VDC output to the chute intake doors interlocks on each floor.

G. Chute Janitor: Fully automatic wash down system for cleaning of trash and linen chutes. A high-pressure nozzle is installed on alternate floors in the chute intakes. Each nozzle will be equipped with a 24V solenoid valve that is controlled by the Chute Janitor control system installed in trash room. This system will also monitor and control the EI door system as well as monitor trash compaction equipment alarms. System will allow for user defined wash cycles and be operated in conjunction with disinfecting and sanitizing unit (D&S), which will also be equipped with a 24V solenoid valve. Access panels to solenoid valves by others.

H. Ultra Quiet Pneumatic Oil Less Air Compressor 4610AC with Automatic Drain Valve. 2 HP Peak, Twin Tank Capacity 4.6 Gallons, Voltage @ 60 Hz 110 Volts, Current 8.5 AMPS to power the chute intake doors.

I. Life Safety System Interlock Switch: An input will be provided to automatically lock all the chute intake doors in the event of a life safety alarm. Connection by others.

2.5 FABRICATION

A. General: Provide chute system of type, service, sizes, and shapes indicated. Fabricate chutes of metals and finishes indicated. Factory-assemble chutes with all-welded joints without spiral crimp seams, bolts, rivets, or clips on the interior. Include chute-support units, expansion joint materials at each floor and roof-termination vent unit with counter flashing. Locate integral intake chute throat sections where indicated to accommodate door units specified. Provide intake and discharge door units of type indicated. Provide the manufacturer’s standard fasteners and installation materials.

B. Roof-Termination Vent Units: Provide vent unit with roof-deck flange. Comply with full-diameter vent size requirements in accordance with NFPA 82 and manufacturer’s details. Provide nonferrous metal roof counter flashing compatible with chute metal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with the chute manufacturer’s instructions and recommendations. Assemble components with tight, non-leaking joints. Anchor securely to supporting structure with sufficient anchorages to withstand impact and wind-load stresses on vent units. Provide for thermal expansion movement of chute sections.

B. Install chutes plumb, without offsets or obstructions, for materials to free-fall within chutes. Install chute systems complete with doors and with safety, sanitizing, and fire-resistive components and accessories. Floor mounts shall be installed on isolator pads as detailed and as recommended by the trash chute manufacturer.

C. Coordination with Roofing: Supply roof vents to roofer for installation.

D. Intake and Discharge Doors: Install doors at heights and locations indicated. Provide anchors, wall-to-chute interfaces, self-closing operation, self-latching and similar installation features to comply with labeling and requirements for fire resistive door construction. Interface door units with throat sections of chutes in a manner to ensure safe, snag-proof, sanitary depositing of materials in chutes by users.

E. Sanitizer Unit: Install sanitizer unit where indicated, cutting and patching chute wall only to extent necessary for installation; maintain fire-resistive construction.

3.2 TESTING

A. Test chute system components after installation. Operate doors and locks to demonstrate that hardware is adjusted and electrical wiring is connected correctly.

B. Operate sanitizing equipment through 1 complete cycle of use and cleanup and demonstrate replenishment of chemicals or cleaning fluids in unit containers.

3.3 DEMONSTRATION

A. Demonstrate use of chute and safety features to the Owner’s personnel.

END OF SECTION

SECTION 149182 - TRASH CHUTES

PART 1 - GENERAL

1.1 SUMMARY

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Section includes Trash and Recycling Chutes.

C. Description: Furnish and install where shown on plans a 30” diameter trash and recycling chute with automatic opening ow voltage electrically interlocking doors which includes the following features:

1. Building personnel can be notified if a specific intake door is not properly closed.
2. All doors can be locked from a master control panel.
3. All doors can be locked in the event of a life safety alarm.
4. All doors open automatically when opening button is pushed and close automatically after an adjustable period of time.

D. Related Sections:

1. Division 22 - Plumbing: For water service hookups for fire sprinklers and sanitizing units.
2. Division 26 - Electrical: Provision of electrical service.

1.2 REFERENCES

A. ASTM - American Society for Testing and Materials.

1. A240 - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

B. NFPA - National Fire Protection Association.

1. 13 - Standard for the Installation of Sprinkler Systems.
2. 82 - Standard on Incinerators, Waste and Linen Handling Systems and Equipment.

C. UL - Underwriters Laboratories Inc.

1.3 SUBMITTALS

A. Product Data: Submit product data for each type of chute required. Include standard details and installation instructions for each pre-engineered chute system. Indicate actual selections for sizes and other installation details.

B. Shop Drawings: Submit shop drawings for each type of chute required. Distinguish between factory fabrication and field-assembly work. Show required piping, wiring connections, and conduit runs for wiring. Include layout and installation details and other information not fully detailed in manufacturer's standard product data and the following:

1. Sections and elevations at 1/4-inch per foot scale.
2. Typical landing plats at 1/2-inch per foot scale.
3. Chute fabrication and installation details, including roof flashing, at 1-1/2 inch per foot scale.

1.4 QUALITY ASSURANCE

A. Qualifications

1. Installer: Engage an experienced installer who has successfully completed installation of chutes similar in material, design, and extent to that indicated for this Project.
2. Fabricator: Provide chutes fabricated by a shop that employs skilled workers who have fabricated chutes similar to those required for this Project with a record of successful in-service performance.

B. Regulatory Requirements: Comply with applicable portions of NFPA Standard No. 82.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable manufacturers: Wilkinson-Hi-Rise, 2821 Evans St., Hollywood, FL 33020; Telephone: (800) 231-3888, Chute Source LLC Telephone: (330) 733-3996, Wilkinson of Canada Telephone: (866) 535-0558 or equal.

2.2 MATERIALS

A. Chute Metal: Hot-dip, zinc-coated, commercial-quality steel sheet, with G90 coating. Gauge: 0.062-inch thick (U.S. No. 16 gauge).

2.3 INTAKE DOORS

A. Chute Intake Door and Frame Units: Provide ASTM A240, Type 430 stainless steel, self closing intake door units with positive latch and latch handle as shown on the drawings.

1. Locate units at heights indicated. UL Labeled Door Units: Provide B-labeled door units, 1-1/2 hour fire rated with 30-minute temperature rise of 250 degrees Fahrenheit. All doors to include stainless steel trim embossed with the words “RUBBISH” or “RECYCLING”.
2. Chute Door Type: 15” x 18” bottom-hinged with Automatic button opening pneumatic mechanism is designed to preclude the need to grasp, twist, or pinch the control mechanism in order to operate the intake door, slow self-closing with gaskets, positive latching, low voltage electrically interlocked normally closed intake doors with hydraulic closer and operation hardware are to be mounted in an independent compartment as not to reduce the chute throat volume and with frame suitable for enclosing chase construction. Chute doors to be mounted in a chute section manufactured with a two sloped throat angle; incorporating a 30º and 60º (respectively) slope. Button is pushed to allow automatic opening of the intake door. Doors are provided with thumb latch and pull handles if pneumatic mechanism is not functioning. Doors are normally locked and can be disabled from the master control panel.
   a. Finish: Satin finish.

B. Chute Discharge Door Units:

1. 16-gauge galvaneal inclined Type “A” “B” label, horizontally rolling door with 165 degree F fusible link.

2.4 ACCESSORIES

A. Fire Sprinklers: Intermediate ½” IPS - 155°F, Pendant glass bulb sprinkler. Fire Sprinkler at highest intake, lowest intake, and every other floor between, to be started from highest intake - connection by others. (SUPPLIED/MOUNTED BY CHUTE SUBCONTRACTOR. INSTALLED BY FRAMING SUBCONTRACTOR OR GC).

B. Flushing Spray Unit at Trash Chute: Provide 3/4-inch NPS spray head unit in chute above highest intake door, ready for hot water piping connection. Provide access for head and piping maintenance. Equip spray unit with disinfecting and sanitizing unit, including 1-gallon tank and adjustable proportioning valve with by-pass for manual control of sanitizing and flushing operation.

C. Isolator Pads & Sound Dampening: BRA-Red Mounts as manufactured by Mason Industries, or equal. Install in accordance with trash chute manufacturer’s recommendations using fasteners as manufactured by Hilti, Inc., or equal. Provide manufacturer’s factory applied premium sound dampening (V-Damp 3680 or equivalent) factory applied to the thickness of the metal on the outside of chute.

D. Master Control Panel: A manually actuated Switch shall be provided to disable all intake doors as required for purposes of system shut-down for service and other needs. Supply power will be 110VAC with a 24 VDC output to the chute intake doors interlocks on each floor.

E. Ultra Quiet Pneumatic Oil Less Air Compressor 4610AC with Automatic Drain Valve. 2 HP Peak, Twin Tank Capacity 4.6 Gallons, Voltage @ 60 Hz 110 Volts, Current 8.5 AMPS to power the chute intake doors.

F. Plumbing Access Door: Provide 15 inches wide x 15 inches high right side hinged, hand operated, self closing, positive latching, UL 1 1/2-hour “B” labeled, stainless steel plumbing access door having stainless steel door trim for installation by forces erecting enclosing shaft wall. Door to have master keyed lock. Cylinder provided by others. Door for access to disinfecting & sanitizing unit above the highest intake door of the chute.

G. Vent: Chute shall extent full diameter through roof to metal top vent cap 3’-0” above roof level with counter flashing and insect screen. A roof curb (44” x 44” x minimum of 8” high) is required for flat roof conditions and is to be provided by others.

H. Life Safely System Interlock Switch: An input will be provided to automatically lock all the chute intake doors in the event of life safety alarm. Connection by others.

2.5 FABRICATION

A. General: Provide chute system of type, service, sizes, and shapes indicated. Fabricate chutes of metals and finishes indicated. Factory-assemble chutes with all-welded joints without spiral crimp seams, bolts, rivets, or clips on the interior. Include chute-support units, expansion joint materials at each floor and roof-termination vent unit with counter flashing. Locate integral intake chute throat sections where indicated to accommodate door units specified. Provide intake and discharge door units of type indicated. Provide the manufacturer’s standard fasteners and installation materials.

B. Roof-Termination Vent Units: Provide vent unit with roof-deck flange. Comply with full-diameter vent size requirements in accordance with NFPA 82 and manufacturer’s details. Provide nonferrous metal roof counter flashing compatible with chute metal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with the chute manufacturer’s instructions and recommendations. Assemble components with tight, non-leaking joints. Anchor securely to supporting structure with sufficient anchorages to withstand impact and wind-load stresses on vent units. Provide for thermal expansion movement of chute sections.

B. Install chutes plumb, without offsets or obstructions, for materials to free-fall within chutes. Install chute systems complete with doors and with safety, sanitizing, and fire-resistive components and accessories. Floor mounts shall be installed on isolator pads as detailed and as recommended by the trash chute manufacturer.

C. Coordination with Roofing: Supply roof vents to roofer for installation.

D. Intake and Discharge Doors: Install doors at heights and locations indicated. Provide anchors, wall-to-chute interfaces, self-closing operation, self-latching and similar installation features to comply with labeling and requirements for fire resistive door construction. Interface door units with throat sections of chutes in a manner to ensure safe, snag-proof, sanitary depositing of materials in chutes by users.

E. Sanitizer Unit: Install sanitizer unit where indicated, cutting and patching chute wall only to extent necessary for installation; maintain fire-resistive construction.

3.2 TESTING

A. Test chute system components after installation. Operate doors and locks to demonstrate that hardware is adjusted and electrical wiring is connected correctly.

B. Operate sanitizing equipment through 1 complete cycle of use and cleanup, and demonstrate replenishment of chemicals or cleaning fluids in unit containers.

3.3 DEMONSTRATION

A. Demonstrate use of chute and safety features to the Owner’s personnel.

END OF SECTION

SECTION 210517 - SLEEVES AND SLEEVE SEALS FOR FIRE-SUPPRESSION PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sleeves.
2. Sleeve-seal systems.
3. Grout.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral water stop unless otherwise indicated.

B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

D. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

E. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

2.2 SLEEVE-SEAL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:

1. Advance Products & Systems, Inc.
2. CALPICO, Inc.

3. Metraflex Company (The).

C. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Sealing Elements: NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Stainless steel.
3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.3 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Non shrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

2. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through fire rated partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 079200 "Joint Sealants."

E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire stop materials. Comply with requirements for fire stopping specified in Section for "Penetration Fire stopping."

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.3 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above Grade:

   a. Piping Smaller than NPS 6: Cast-iron wall sleeves.
   b. Piping NPS 6 and Larger: Cast-iron wall sleeves.

2. Exterior Concrete Walls below Grade:

   a. Piping Smaller than NPS 6 Cast-iron wall sleeves with sleeve-seal system.

      1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.

   b. Piping NPS 6 and Larger: Cast-iron wall sleeves with sleeve-seal systemized-steel-pipe sleeves with sleeve-seal system.

      1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

3. Concrete Slabs-on-Grade:

   a. Piping Smaller Than NPS 6 : Cast-iron wall sleeves with sleeve-seal system

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

b. Piping NPS 6 and Larger: Cast-iron wall sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

4. Concrete Slabs above Grade:

a. Piping Smaller Than NPS 6: PVC-pipe sleeves.
b. Piping NPS 6 and Larger: PVC-pipe sleeves.

5. Fire Rated Partitions:

a. Piping Smaller Than NPS 6: PVC-pipe sleeves.
b. Piping NPS 6 and Larger: Galvanized-steel-sheet sleeves.

END OF SECTION

SECTION 210518 - ESCUTCHEONS FOR FIRE-SUPPRESSION PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Escutcheons.
2. Floor plates.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

A. One-Piece, Cast-Iron Type: With galvanized finish and setscrew fastener.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

C. One-Piece, Plastic Split Type: With chrome-plated finish and spring-clip fasteners.

2.2 FLOOR PLATES

A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. Escutcheons for New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
b. Bare Piping at Floor Penetrations in Finished Spaces: One-piece, floor plate with cast-iron flange
c. Bare Piping at Wall and Ceiling Penetrations in Finished Spaces: One-piece, plastic split type with polished, chrome-plated finish.
d. Bare Piping in Unfinished Service Spaces: One-piece, plastic split type with polished, chrome-plated finish.
e. Bare Piping in Equipment Rooms: One-piece, plastic split type with polished, chrome-plated finish.
f. Bare Piping at Exterior Wall Penetrations: One-piece, cast-iron type with galvanized finish

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping: One-piece, floor-plate type.

3.2 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION

SECTION 210553 - IDENTIFICATION FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Equipment-Label Schedule: Include a listing of all equipment to be labeled and the proposed content for each label.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: Aluminum, 0.02-inch-thick, with predrilled holes for attachment hardware.
2. Attachment:

    a. Zinc-plated jack chain
    b. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include description and/or purpose of equipment. Equipment requiring labels shall include, but is not limited to the following:

1. Main drain valve
2. Inspector’s Test
3. Test and drain
4. Auxiliary drain
5. Main control valve
6. Zone control valve

C. Equipment-Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch (A4) bond paper. Tabulate equipment type, quantity, drawing numbers where

equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted.

B. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

C. Pipe-Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; pipe size; and an arrow indicating flow direction.

1. Hydraulic Nameplate: Provide on each riser. Per 2016 CBC Chapter 35, NFPA 13 section 25.5.2, sign shall include:

   a. Location of the design area or areas
   b. Discharge densities over the design area or areas
   c. Required flow and pressure of the system at the base of the riser
   d. Occupancy classification or commodity classification and maximum permitted storage height and configuration
   e. Hose stream allowance included in addition to the sprinkler demand
   f. The name of the installing contractor
   g. Required flow and pressure of the system at the water supply source.
   h. Required flow and pressure of the system at the discharge side of the fire pump where a fire pump is installed.
   i. Type or types and number of sprinklers or nozzles installed including the orifice size, temperature rating,
   j. orientation, K-Factor, sprinkler identification number (SIN) for sprinkler heads when applicable, and response type.
   k. The minimum discharge flow rate and pressure required from the hydraulically most demanding sprinkler.
   l. The required pressure settings for pressure reducing valves.
   m. For deluge sprinkler systems, the required flow and pressure at the hydraulically most demanding sprinkler or nozzle.
   n. The protection area per sprinkler based on the hydraulic calculations
   o. The edition of NFPA 13 to which the system was designed and installed.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 LABEL INSTALLATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Locate equipment labels where accessible and visible.

D. Piping Color-Coding: Painting of piping is specified in Section 099123 "Interior Painting."

E. Pipe-Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
3. At access doors, manholes, and similar access points that permit view of concealed piping.
4. Near major equipment items and other points of origination and termination.
5. Spaced at maximum intervals of [25 feet along each run. Reduce intervals to 12 feet in areas of congested piping and equipment.
6. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

END OF SECTION

SECTION 211313 - WET-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipes, fittings, and specialties.
2. Hose valves.
3. Sprinklers.
4. Pressure gages.

B. The contractor shall furnish all equipment, materials, tools, labor, engineering, drawings, etc. necessary for a complete fire protection system, with said system being made ready for the operations in accordance with the requirements of the Authority Having Jurisdiction. The purpose of the contract drawings and specifications is to convey to the contractor the scope of work required, all of which the Contractor is responsible to furnish, install, adjust, and make operable. The omission by the Owner of any system component required by the Authority Having Jurisdiction in the specifications shall not relieve the Contractor of the responsibility for providing such necessity, without additional cost to the owner. The Contractor shall visit the site before submitting a bid and shall examine all existing physical conditions that may be material to the performance of his work. No extra payment will be allowed to the contractor as a result of extra work made necessary by his failure to do so. Any case of error, omission, discrepancy or lack of clarity shall be promptly identified to the owner, Architect, Engineer for clarification prior to the bid due date.

C. The Contractor shall provide all devices and equipment required by these specifications. Under no circumstances will the Contractor omit any equipment or devices without the written directive of the Owner.

D. This Section specifies materials, methods, and equipment to be used for automatic sprinkler system or a combine standpipe system and related fire protection piping to 5 ft outside building.

E. Each wet pipe zone shall begin with:

1. Zone control valve with tamper switch.
2. Check Valve
3. Flow switch.
4. Inspectors test and drain valve.
5. Pressure gauges.

F. This Section specifies design criteria for fire protection system. Zone and main piping layouts of fire protection system have been established, as it relates to architecture, structure and mechanical/electrical systems. Fire Protection Contractor, based on these

layouts, shall produce installation drawings which are also referred to as shop drawings in this Specification.

1.2 ACTION SUBMITTALS

A. Contractor shall submit complete system packages. Partial submittals will be rejected.

B. Product Data

1. Provide data from manufacturer on the following devices, including installation, maintenance, and testing procedures, dimensions, wiring diagrams, etc. Where any devices that are provided or furnished involve work by someone other than the Contractor, submit additional data copies directly to the Contractor. At a minimum, the following data sheets shall be provided:

    a. Sprinklers and escutcheons.
    b. Pipe, fittings and hangers.
    c. Control valves.
    d. Tamper switches.
    e. Flow switches.
    f. Exterior Weatherproof Waterflow Alarm.
    g. Sprinkler Heads.
    h. Sprinkler Head Cabinet.
    i. Hanger Assemblies
    j. Pressure Gauges.
    k. Seismic Bracing & Restraint materials.
    l. Check valves.
    m. Fire stopping materials (including installation detail).

2. Include items listed in product section and additional items required to provide complete installation.
3. Indicate by red marking or arrow, items to be used where more than 1 item appears on manufacturer’s catalog sheet.

C. Shop Drawings: For wet-pipe sprinkler systems.

1. Contractor shall review Design Drawings and Specifications and shall produce Shop Drawings.
2. Contractor shall consult with Architect during development of piping layout to avoid conflicts with general appearance. Pipe routing is a critical issue due to attributes of this building.
3. Contractor shall participate in coordination process and shall not install piping prior to coordination with other trades.
4. Prepare shop drawings with a minimum scale of 1/8 inch = 1 foot-0 inch for plans, and 1/4 inch = 1 foot-0 inch for details. Show all piping, sprinklers, hangers, type of pipe, tube connections, and outlets when welding is planned, shop drawings shall indicate the sections to be shop welded and the type of welded fittings to be used.

D. Changes

1. Make no changes in installation from layout as shown on the design drawings unless change is specifically approved by the Engineer and AHJ. This does not include minor revisions for the purpose of coordination.
2. Any pipe fabricated and/or installed before all approvals are obtained at the Contractor's own expense and responsibility. Any changes made to the approved drawings other than as stated above are at the Contractor's own expense and responsibility.

E. As-Built Drawings

1. Maintain at the site an up-to-date marked set of as-built drawings, which shall be corrected and delivered to the Owner upon completion of work.
2. Upon completion, furnish the Owner with 3 sets of reproducible prints, and one set in electronic Revit and PDF format of each reviewed shop drawing, revised to show "as-built" conditions.

F. Samples

1. Provide one sample of each type of specialty sprinkler and escutcheon, as applicable.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Sprinkler systems, drawn to scale, on which items of other systems and equipment are shown and coordinated with each other, using input from installers of the items involved.

B. Qualification Data: For qualified Installer.

C. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Final Inspection and Test

1. The Contractor shall make arrangements with the Owner, Owner's commissioning agent, Architect, Engineer for final inspection and witnessing of the final acceptance tests. The Owner, Architect, and the Engineer will witness the final inspection.
2. Perform all tests and inspections required by the referenced codes and standards, the AHJ, and the Owner.
3. When the Engineer visits the job site for final inspection and tests after being advised by the Contractor that the work is complete and ready for test, if the work has not been completed or the final acceptance tests are unsatisfactory, the Contractor shall be responsible for the Engineer's extra time and expenses for reinspection and witnessing the retesting of the work. Such extra fees shall be deducted from payments by the Owner to the Contractor.
4. Upon completion of final inspections and tests, as required by appropriate NFPA Standards, submit copies of Standard Contractor's Material and Test Certificate.

B. Operation and Maintenance Instructions

1. At the completion of the work, provide a small scale plan of building indicating the locations of all control valves, low point drains, and inspector's test valves. The plans shall be neatly drawn and color-coded to indicate the portion of the building protected by each system, framed under glass and permanently mounted on the wall at the riser room.

C. Furnish one copy of NFPA 25 and bound set of printed operating and maintenance instructions to the Owner, and adequately instruct the Owner's maintenance personnel in proper operation and test procedures of all fire protection components provided, furnished, or installed..

1.5 QUALITY ASSURANCE

A. Testing Agency: All materials shall be UL listed or FM approved for their intended use.

B. Regulatory Agencies: State and local building codes and ordinances, and fire department requirements shall apply.

C. The Contractor shall be fully experienced and licensed in all aspects of the fire protections systems herein specified.

D. Similar materials shall be from a single manufacturer.

1.6 SPARE PARTS

A. A.Provide and install one spare sprinkler cabinet, complete with 12 sprinklers, including all types and temperature ratings used throughout the installation. The cabinet shall be equipped with sprinklers and special sprinkler wrenches required for each type of sprinkler installed.

B. Confer with the Owner's representative for exact location of cabinet.

1.7 GUARANTEE

A. The Contractor shall guarantee all materials and workmanship for a period of one year beginning with the date of final acceptance by the Owner. The Contractor shall be responsible during the design, installation, testing and guarantee periods for any damage caused by his (or his subcontractors') work, materials, or equipment.

1.8 PRODUCT DELIVERY

A. Delivery of Materials: Delivery of all materials and equipment to the job site shall be scheduled to assure compliance with the predetermined construction schedules.

B. Storage of Materials, Equipment and Fixtures: Contractor shall be responsible for storage of materials on job site, including furnishing of any storage facilities or structures required.

C. Handling of Materials and Equipment: Contractor shall be responsible for on-site handling of materials and equipment.

1.9 JOB CONDITIONS

A. Damage: Protect all unfinished work to prevent damage and furnish protection of all surrounding areas where necessary.

B. Leak Damage: The Contractor shall be responsible during the installation and testing periods of the sprinkler system for any damage to the work of others, to the building or its contents caused by leaks in any equipment, by unplugged or disconnected pipes or fittings, or by overflow, and shall pay for the necessary replacements or repairs to work of others damaged by such leakage.

1.10 EMERGENCY SERVICE

A. The Contractor shall provide emergency repair service for the sprinkler system within four hours of a request for such service by the Owner during the warranty period. This service shall be available on a 24-hour per day, seven-day per week basis.

1.11 TRAINING

A. The Contractor shall conduct two training sessions of four hours each to familiarize the facility personnel with the features, operation and maintenance of the sprinkler systems. Training sessions shall be scheduled by the Owner at a mutually agreeable time to the Contractor and the Owner.

1.12 PERMITS AND FEES

A. Pay for all permits, fees and charges required for this work.

PART 2 - PRODUCTS

2.1 GENERAL

A. All components shall be used in accordance with the manufacturer’s recommendations and its UL listing and/or FM approval.

B. The naming of manufacturers in the specifications shall not be construed as eliminating the materials, products or services of other manufacturers and suppliers providing approved equivalent items.

C. The substitutions of materials or products other than those named in the specifications are subject to proper approval of the Owner granted in writing.

2.2 MATERIALS

A. Materials and Equipment

1. Materials and equipment in system shall be new and current products of manufacturer regularly engaged in production of such materials and equipment.
2. Where 2 or more pieces of equipment are required to perform interrelated functions, they shall be products of 1 manufacturer.
3. Clean and cap pipe after fabrication and prior to placing pipe in building.
4. Mark pipe with tags that can be removed during installation so no permanent markings remain on unpainted pipe located in exposed areas.

B. CPVC Material

1. The piping system fittings and pipe shall be constructed from quality CPVC material. Ball valves and check valves shall be constructed of PVC/CPVC molded by Spears® Manufacturing Company or equal.

C. Approval Guides:

1. Unless otherwise shown, products shall be UL Listed in the latest publication of the UL Fire Protection Equipment Directory or Approved in the latest Factory Mutual Approval Guide for service intended.

2.3 STEEL PIPE AND FITTINGS

A. Feed Mains and Branch Piping in Ordinary Hazard Rooms greater than 400 sq. ft.

1. Carbon steel pipe, Schedule 10, ASTM A795, ASTM A53 or A135, roll-grooved for mechanical fittings.
2. Carbon steel pipe, Schedule 40, ASTM A795, ASTM A53 or A135, cut-grooved for mechanical fittings.

    a. Provide metal pipe’s exposed threads with corrosion inhibitive paint.
    b. Pipe shall be new, rated for 175 psi working pressure, conforming to ASTM specifications, and have the manufacturer’s name and brand along with the applicable ASTM standard marked on each length of pipe.

        1) Pipe used shall be black steel and must comply with the specifications of the American Society for Testing and Materials, ASTM A53 for welded and seamless steel pipe.
        2) Schedule 40 piping is required for sizes 2 inches and less. Pipe ends shall be threaded or roll grooved in accordance with NFPA 13.
        3) Schedule 10 piping shall be provided for sizes 2½ inches and larger. Pipe ends shall be welded or roll grooved in accordance with NFPA 13.

4) Hot-dipped galvanized pipe shall be used when exposed to the outside.
5) Hot-dipped galvanized pipe shall be used for drain pipe.

B. Fittings and Joints

1. Cast iron threaded, Class 125, 175 psi WOG pressure rating, ANSI B16.4.
2. Cast iron flanged, Class 125, 175 psi WOG pressure rating, ANSI B16.1.
3. Grooved:
4. Ductile iron or malleable iron, grooved for mechanical coupling, 175 psi WOG pressure rating, malleable iron conforming to ASTM A536 for ductile iron and ASTM A47 for malleable iron.
5. Fitting, gasket and coupling shall be furnished by same manufacturer.
6. Acceptable manufacturers: Victaulic, Gruvlok or Viking Corp.
7. Grooved fittings and couplings shall be produced by the same manufacturer.
8. Grooved couplings shall be dimensionally compatible with pipe.
9. Screwed fittings shall be cast iron, 175 pound class, black, and in accordance with ANSI B 16.4 or malleable iron, 175 pound class, black and in accordance with ANSI B 16.3. Bushings shall not be used.
10. Fitting, gasket and coupling shall be furnished by same manufacturer.
11. Galvanized, cast iron, threaded fittings, 175 psi WOG pressure rating, ANSI B16.4.
12. Fittings shall be hot-dipped galvanized when installed on galvanized piping.
13. Weld-o-lets welded to piping in fabrication shops are permitted. No welding allowed at project site.
14. Weld fittings shall be steel, standard weights, black, and in accordance with ASME B 16.9, ASME B 16.25, ASME B 16.5, ASME B 16.11 and ASTM A 234.
15. Pipe-o-lets or similar clamp on or saddle type fittings are not allowed as fittings.
16. Saddle type devices that strap or clamp onto piping are not allowed.

C. CPVC Compatibility

1. ONLY system compatible materials including, but not limited to solvent cements, caulks, sealants, cutting oils and thread pastes as noted by the CPVC fire sprinkler piping system manufacturer’s installation instructions should be used in contact with this system

2.4 CPVC PIPE AND FITTINGS

A. Pipe in this article is available in NPS 3/4 to NPS 3 (DN 20 to DN 80) and must be installed in a fire-rated enclosure.

B. Feed Mains and Branch Piping

1. CPVC Pipe, All CPVC fire sprinkler pipe shall be manufactured in the U.S.A. in accordance with ASTM D 1784.

a. Pipe shall be manufactured to SDR 13.5 dimensions in strict compliance to ASTM F442 for end product use.

b. All CPVC fire sprinkler pipe shall be listed by Underwriters Laboratory (UL) and/or FM Approvals (FM Global) for use in light hazard wet pipe systems and bear their authorized certification marks.

2. FITTINGS: All CPVC fire sprinkler fittings shall be manufactured in the U.S.A. from a Chlorinated Polyvinyl Chloride (CPVC) compound having a Cell Classification of 23447 in accordance with ASTM D1784. Fittings shall be manufactured in strict compliance to ASTM F438 or F439, as applicable. All CPVC fire sprinkler fittings shall be certified by NSF International for potable water service.
3. All CPVC fire sprinkler fittings shall be listed by Underwriters Laboratory (UL) and/or FM Approvals (FM Global) for use in light hazard wet pipe systems and bear their authorized certification marks

C. PIPE: All CPVC fire sprinkler pipe shall be manufactured in the U.S.A. from a Chlorinated Polyvinyl Chloride (CPVC) compound having a Cell Classification of 23447 in accordance with ASTM D1784. Pipe shall be manufactured to SDR 13.5 dimensions in strict compliance to ASTM F442. All CPVC fire sprinkler fittings shall be certified by NSF International for potable water service. Sprinkler pipe shall be rated to 175psi @ 150° F for use in light hazard wet fire sprinkler systems.

D. FITTINGS AND VALVES: Pipe, fitting and valve material shall meet or exceed the requirements of ASTM D1784.

E. SOLVENT CEMENT: All CPVC solvent cement shall be a primerless, one-step type manufactured in strict compliance to ASTM F493 and approved for use with CPVC fire sprinkler systems. All CPVC solvent cement shall be certified by NSF International for potable water service.

F. THREAD SEALANT: Thread sealant shall be that approved by the fitting manufacturer for use with CPVC fire sprinkler products. All thread sealant shall be certified by NSF International for potable water service.

G. BASIC USE: All CPVC fire sprinkler fittings and pipe shall be listed by Underwriters Laboratories (UL®) and/or FM Approvals® (FM Global) as applicable for use in light hazard wet pipe systems and bear their authorized certification marks.

1. All CPVC fire sprinkler fittings and pipe shall be listed by Underwriters Laboratories (UL®) for use in Low Pressure Dry Pipe and Pre-Action Systems and bear their authorized certification mark. CPVC system shall be installed in accordance with its listing and manufacturers installation instructions.
2. All CPVC fire sprinkler fittings and pipe shall carry a working pressure of 175 psi @ 150°F. All CPVC fire sprinkler fittings shall be installed with UL® Listed CPVC fire sprinkler pipe in accordance with the manufacturer’s installation instructions and Addendums.

2.5 VALVES

A. Gate Valve:

1. Acceptable manufacturers: Kennedy, Milwaukee Valve Co., Mueller, Nibco, Stockham, Victaulic.
2. Outside screw and yoke (OS&Y), gate valve, bronze body and trim or cast iron body bronze mounted and rated for 175 psi, non-shock cold water working pressure, Nibco F-607-OTS or equal.

B. Check Valve:

1. Acceptable manufactures: Tyco Fire Products, Reliable, Viking Corp.
2. Iron body, bronze seat, stainless steel clapper with a replaceable rubber seal and 175 psi nonshock cold water working pressure. Viking Model G-1 or equal.

C. Ball Valve:

1. Acceptable manufacturers: Nibco, Milwaukee Valve Co., Mueller, Victaulic.

D. Butterfly Valve:

1. Acceptable manufacturers: Victaulic, Kennedy, Milwaukee Valve Co.
2. Victaulic Series 705 Firelock or equal for valve sizes 2-1 /2” to 8”.
3. Milwaukee Valve Co., Series BB or equal.
4. Kennedy Valve Co., Fig. 0IG.

E. Test and Drain Valves:

1. Acceptable manufacturers: AGF, Victaulic or equal.
2. AGF Test and Drain Victaulic Style 720 TestMaster II or equal may be installed.

F. Drain Valves:

1. Acceptable manufacturers: Kennedy, Nibco or equal.
2. Thread-in bonnet bronze globe valves, rated to 175 psi non-shock cold water working pressure.
3. Low point drain valves shall have, 3/4" brass nipple with 3/4" male hose threads and cap.

2.6 TAMPER SWITCH

A. Acceptable manufacturers: Potter, System Sensor or equal.

B. Outside screw and yoke (OS&Y) supervisory switch, NEMA 4 enclosure, provided with 2 sets of contacts rated at 2.5 Amps at 30 VDC and 15 Amps at 125/250 VAC. Equal to Potter OSYSU¬2. Provide with cover tamper kit. For areas identified as hazardous locations, provide “EX” Model.

C. Control valve supervisory switch, NEMA 4 enclosure, provided with 2 sets of contacts rated at 2.5 Amps at 30 VDC and 15 Amps at 125/250 VAC. Equal to Potter PCVS-2. Provide [with] [without] optional cover tamper kit. For areas identified as hazardous locations, provide “EX” Model.

D. Tamper switch shall be capable of transmitting signal during first 2 revolutions of handwheel or during 1/5 of travel distance of valve control apparatus from its normal position.

E. Unit shall be compatible with Fire Alarm System.

2.7 FLOW SWITCH

A. Acceptable manufacturers: Potter, System Sensor, or equal.

B. Vane type waterflow switch for use in wet sprinkler systems, 450 psi service pressure rating, 10 gpm minimal flow rate to activate alarm, 2 sets of SPDT (Form C) contacts rated at 2 Amps at 30 VDC and 15 Amps at 125/250 VAC. Provide with optional cover tamper kit. Equal to Potter VSR-F.

C. Unit shall be compatible with Fire Alarm System. Potter model VSR-F or equal.

2.8 SPRINKLERS

A. Fire sprinklers installed on wet system shall be of one manufacturer throughout the building. No mixing of sprinkler brands shall be permitted.

B. Manufacturers: Unless otherwise noted below, shall be manufactured by Viking Corp., Tyco Fire Products or Reliable.

C. Automatic, having temperature rating suitable for location.

D. Light Hazard and Ordinary Hazard occupancies shall be Quick Response type sprinkler heads.

E. Architect will review deviations from the specified styles for approval prior to installation.

F. Provide the following type of sprinkler head.

1. Unfinished areas such as areas with no ceiling, mechanical spaces, storage, etc.

    a. Quick response, brass Upright, 1/2" orifice, intermediate temperature class (175°F), Viking, VK 3001 sprinkler.
    b. Quick response, brass Pendent, 1/2" orifice, intermediate temperature class (175°F), Viking, VK 302 sprinkler.

2. In areas with ceilings.

    a. Concealed Residential Pendent, 1/2” orifice, ordinary temperature class (155^{o}F) glass bulb, Viking Freedom Concealed Pendent, VK468 sprinkler, with 135^{o}F rated cover plate, flush with ceiling or equal. Cover plate shall match ceiling color and shall be factory-painted (i.e. by manufacturer).
    b. Concealed Standard Pendent, 1/2" orifice, intermediate temperature class (155°F) glass bulb, Viking Mirage QR Concealed Pendent, VK4621

sprinkler, with 135°F temperature rated cover plate, flush with ceiling or equal. Cover plate color shall match ceiling color and shall be factory-painted (i.e. by manufacturer).

3. In areas with ceilings exposed to outside environmental conditions.

   a. Semi-Recessed Pendent, 1/2” orifice, intermediate temperature class (200^{o}F) glass bulb, Polyester and Electroless Nickel PTFE coated (ENT), Viking Quick Response, VK 3021 sprinkler, coating should match ceiling color and should be factory painted. (i.e by manufacturer)

4. In areas where ceiling conditions do not permit installation of pendent head or finished area where sidewall head provides better coverage of hazard.

   a. Polished Chrome Sidewall, 1/2" orifice, ordinary temperature class (175°F), 2- piece adjustable chrome escutcheon, Viking Microfast model, HSW horizontal or VSW vertical sidewall with Viking E-1 escutcheon or equal.

5. In unfinished areas where conditions do not permit installation of upright or pendent head.

   a. Brass Sidewall, 1/2" orifice, ordinary temperature class (175°F), Viking Microfast model, HSW horizontal or VSW vertical sidewall or equal.
   b. Viking Model Microfast or equal.

6. Below duct sprinkler shall be pendent type. Sprinkler guard shall be provided where sprinkler heads are located below 7 feet from finished floor.

G. Submit samples for examination and approvals.

H. Temperature ratings of sprinkler heads shall vary if installed close to heat sources, under skylights or in special hazard areas.

I. Sprinkler Cabinets:

1. Complete with required number of spare sprinkler heads of each type and temperature
2. rating and special wrenches per NFPA 13
3. Provide multiple cabinets to meet this requirement.
4. Coordinate cabinet locations with Owner's representative.

2.9 HANGERS

A. Provide hangers to support piping: in perfect alignment without sagging or interference, to permit free expansion and contraction, and meet requirements of NFPA 13.

B. Riser clamps shall not protrude more than 2" beyond edge of hole. Provide Anvil Fig. 261 or equal.

C. Concrete expansion anchors are to be Hilti, Rawl, or Phillips concrete fasteners.

2.10 EARTHQUAKE BRACING

A. Sprinkler and standpipe system shall be protected from earthquake influence in accordance with requirements of NFPA 13 and as outlined in Section 20 0549 - Seismic Anchorage and Restraints.

B. Provide flexible couplings, bracing, and other components required, compatible with piping material and jointing system used.

C. Seismic detailing shall be included on Fire Protection System layout shop drawings.

2.11 PRESSURE GAGES

A. Acceptable manufacturers: Potter-Roemer, Viking or equal.

B. Pressure gauges shall be 3-1/2", corrosion resistant moving parts, polycarbonate window, and provided with connection not smaller than 1/4” NPT.

C. Include shutoff valve with provisions for draining on each pressure gauge.

2.12 DIELECTRIC FITTINGS

A. Acceptable manufacturers: Epco Sales, Inc., Lochinvar, Watts Regulator Co., Wilkins or equal.

B. Insulating nipple, metal casing, inert thermoplastic lining, Clearflow dielectric fitting by Perfection Corporation.

C. Dielectric unions 2" and smaller; dielectric flanges 2" and larger; with iron female pipe thread to copper solder joint or brass female pipe thread end connections, non-asbestos gaskets and pressure rating of not less than 175 psig at 180ºF.

2.13 SLEEVES FOR WALL/FLOOR PENETRATIONS

A. Sleeves through walls and floors shall be of a type that can be made watertight and fire stopped.

1. Sleeve sizes shall be as required by NFPA 13 and 14 for Earthquake Protection.

2.14 SIGNS

A. Provide standard metal signs in English in accordance with NFPA 13.

1. Provide hydraulic calculation information signs at risers in accordance with NFPA 13.

PART 3 - EXECUTION

3.1 GENERAL

A. Product Delivery

1. Delivery of Materials: Delivery of all materials and equipment to the job site shall be scheduled to assure compliance with the predetermined construction schedules.
2. Storage of Materials, Equipment and Fixtures: Contractor shall be responsible for storage of materials on job site, including furnishing of any storage facilities or structures required.
3. Handling Materials and Equipment: Contractor shall be responsible for on-site handling of materials and equipment.

B. Clean-up

1. Maintain the premises free from accumulation of waste materials or rubbish caused by this work.
2. At the completion of the work, removed all surplus materials, tools, etc., and leave the premises clean.

C. Leak Protection

1. Damage: Protect all unfinished work to prevent damage and furnish protection of all surrounding areas where necessary.
2. Leak Damage: The Contractor shall be responsible during the installation and testing periods of the fire protection system for any damage to the work of others, to the building or its contents caused by leaks in any equipment, by unplugged or disconnected pipes or fittings, or by overflow, and shall pay for the necessary replacements or repairs to work of others damaged by such leakage.

D. Safety

1. All work shall be performed in compliance with the Occupational Safety and Health Act of 1970 and the Construction Safety Act Standards.
2. Contractor shall attend all job safety meetings.

3.2 FABRICATION

A. Pipe Ends

1. Ream and remove burrs after cutting pipe. Standard wall pipe ends shall be welded, threaded, cut grooved, or plain end.

2. Thin wall pipe ends shall be plain end, welded or roll grooved in accordance with the fitting manufactures' recommendation.
3. Threads shall be in accordance with ASME B1.20.1. Each thread on light wall pipe shall be gauged before the fitting is made-up.

B. Grooved Ends

1. Pipe minimum thickness, squareness and out-of roundness shall be in accordance with the coupling manufacturers specifications.
2. Pipe surface shall be free of indentations, projections, or roll marks from the end of the pipe to the groove.

C. Welding

1. No field welding of sprinkler/standpipe piping shall be permitted.
2. Headers risers, feed mains, cross mains and branch lines may be shop welded using acceptable welding fittings. Welding methods shall comply with all the requirements of AWS B2.1.
3. Certified records shall be maintained upon the completion of each weld, welder shall stamp an imprint of their identification into the side of the pipe adjacent to the weld.

3.3 INSPECTION

A. Investigate site conditions; verify utility locations and elevations before start of excavation.

B. Discrepancies will be forwarded to Architect/Engineer before proceeding with construction

3.4 INSTALLATION

A. A clean set of prints or shop drawings shall be maintained at the site and marked up to show any changes.

B. Piping shall be installed above ceilings except in areas where there is no ceiling. Install piping in exposed areas as high as possible using necessary fittings and auxiliary drains to maintain maximum clear head room.

C. Install hydraulically designed sprinkler system and associated accessories according to requirements of NFPA 13 and as shown on drawings.

D. Install pipe and fittings according to recommendations of pipe manufacturer.

E. Keep materials within listed temperature range to assure jointing in accordance with manufacturer's requirements.

F. Pipe and fittings shall be of corresponding materials when assembled.

G. For underground pipe, in lieu of thrust blocks; anchors and tie rods can be provided. Tie rods shall be 3/4" diameter steel rod. Clamps shall be 3/8" thick by 2" wide steel. Each clamp shall be secured with four 5/8" diameter bolts.

H. Apply asphaltum or corrosion inhibitive paint to tie rods, clamps and bolts of underground pipe.

I. Provide readily removable fittings at end of cross-mains. Minimum size of flushing connection shall be 2".

J. Provide test connection for each flow switch.

K. Discharge test connections inside building to receptacles provided as part of plumbing system or to drain standpipe.

L. Drain line detailed adjacent to sprinkler risers shall be considered as part of Sprinkler System from combination test/auxiliary drain valve for each zone or sub-zone shown on plans to plumbing receptacle.

M. Provide auxiliary drains at low points of systems. Where trapped section of pipe exceeds 5 gallons, drain shall consist of, as a minimum: valve, 3/4" brass nipple with 3/4" male hose threads, and cap.

N. Identify valve with brass tag denoting which flow switch is being tested, when test valves are located remote from flow switch.

O. Clamp-on or saddle type fittings are not allowed. Outlet fittings inserted into holes drilled into piping or pipe-o-lets are not allowed.

P. Provide reducing fittings or provide shop fabricated weld-o-lets to change pipe sizes in sprinkler/standpipe systems. No bushings or grooved reducing couplings, such as Victaulic Style 750, are allowed.

Q. Feed sprinkler heads, installed in finished ceilings, with swing joint or return bend arrangement for final positioning in ceiling grid pattern during construction phases. Sprinklers are required to be installed in the center of ceiling tiles.

R. Provide minimum 1” outlets with sprigs or drops for sprinklers located in shelled spaces.

S. Provide tamper switch on each shutoff valve.

T. Provide locking device with each shutoff valve to prevent inadvertent closing of valve. Keys shall be indexed to identify valve location.

U. Install sprinkler heads as recommended by manufacturer. Sprinklers shall be set level and at locations to avoid interference with spray pattern of sprinkler. When ducts and lights are obstructions to sprinkler distribution, provide additional heads beneath obstruction.

V. Make joints of threaded pipe by cutting pipe square and reaming inside.

W. Coat exposed threads with corrosion inhibitive paint. Use joint compound sparingly.

X. Install joints for mechanical coupled pipe according to manufacturer's recommendations. Use manufacturer’s gasket lubricant sparingly.

Y. Pipe shall be cut grooved for Schedule 40 steel pipe or roll grooved for Schedule 10 steel pipe as specified by coupling manufacturer.

Z. Welded joints shall be made in fabrication shop. No welding allowed at project site.

AA. Hang pipe from building members using concrete inserts or beam clamps. Expansion type inserts may be used for branch piping.

BB. Support piping in accordance with NFPA 13 Seismic Anchorage and Restraints, and in accordance with State and Local seismic restraint requirements.

CC. Provide seismic restraint details and calculation with sprinkler shop drawings.

DD. Provide pressure gauges as required in manufacturer’s installation instructions, and as required per NFPA.

EE. Generally install capped tees in lieu of couplings for future connections.

FF. CPVC Compatibility During Construction

1. Provide a posted notice on the jobsite with a list of prohibited activities that may affect the integrity of the CPVC system:

    a. DO NOT stack, support, hang equipment, or hang flexible wire/cable, especially communications cable, or other material on the fire sprinkler system.
    b. ONLY system compatible materials including, but not limited to solvent cements, caulks, sealants, cutting oils and thread pastes as noted by the CPVC fire sprinkler piping system manufacturer’s installation instructions should be used in contact with this system.
    c. DO NOT expose CPVC products to incompatible substances, such as cutting oils, non-water-based paints, packing oils, traditional pipe thread paste and dope, fungicides, termiticides, insecticides, detergents, building caulks, adhesive tape, solder flux, flexible wire/ cable (with special consideration for communications cabling), and non-approved spray foam insulation materials.
    d. DO NOT expose CPVC products to edible oils, solvents, or glycol-based anti-freeze fluids.
    e. DO NOT expose CPVC products to open flame, solder, and soldering flux.
    f. DO NOT handle CPVC products with gloves contaminated with oils (hydrocarbons) or other incompatible materials.

3.5 SPRINKLERS

A. General

1. Sprinklers below ceilings off of exposed piping shall be listed and approved regular bronze upright type, in upright position. Listed and approved regular bronze pendent type may be used where necessary due to clear height requirements, duct interference, etc.
2. Pendent sprinklers shall be installed where suspended ceilings are located shall be concealed type and center of tile.
3. Sprig-ups shall be provided wherever necessary to provide proper deflector distances in accordance with NFPA 13 requirements.
4. Provide flex head for suspended T-bar ceiling to accommodate 1” minimum seismic movement.
5. Provide sprinkler below duct with minimum width 4 ft and above.

B. Sprinkler Guards and Water Shields

1. Provide guards on sprinklers within 7 feet of finished floor or wherever sprinklers may be subject to mechanical damage.

C. Drains

1. Provide main drain valves at system control valves, sized in accordance with NFPA 13 and AHJ requirements that extend piping to exterior.
2. Provide all auxiliary drains where necessary.
3. Pipe all drains and auxiliary drains to locations where water drained will not damage stock, equipment, vehicles, planted areas, etc., or injure personnel.
4. Plugs used for auxiliary drains shall be brass.
5. All piping and fittings downstream of drain valve and gang drain shall be hotdipped galvanized.
6. The Contractor shall comply with all water discharge restrictions.

3.6 VALVES

A. General

1. Valves shall be installed with sufficient clearance for operation, testing and maintenance.
2. Where wafer bodied valves are used, they shall be installed so that the discs do not interfere with other components.

B. Control valves shall be installed so that valve position indicator is visible.

C. Drain, test, and trim valves.

1. Valves shall be installed no more than 7 feet 0 inches above the finished floor and shall be accessible.

D. Backflow Preventers

1. Install backflow preventers of reduced pressure detector assembly type with clearances required by AHJ and in compliance with manufacturer’s recommendations for inspection, testing and maintenance.

E. Floor Control Valves

1. Provide floor control valve assemblies within the stair enclosure on all floors. Each floor control valve assembly shall be equipped with a control valve, tamper switch, flow switch, inspector's test/drain trim assembly, pressure-relief valve not less than ½-inch in size and set to operate at 175 psi, and pressure-reducing device set at
2. Pressure-reducing valves will require discharging to a gang drain.

3.7 PRESSURE GAUGES

A. Gauges shall be located where not subject to freezing.

B. Gauges shall be provided vertically, with three-way valve with 1/4-inch plugged outlet, and as follows:

1. Above and below wet system riser check valves.
2. At each water supply and inlet of floor control valve.
3. At inlet and outlet of each pressure-reducing floor control valve.
4. At inlet of each pressure-reducing fire hose valve.
5. At top of each standpipe.

3.8 HANGERS, SUPPORTS, AND EARTHQUAKE BRACING

A. General

1. All piping must be substantially supported from building structure and only approved types of hangers shall be used. Piping lines under ducts shall not be supported from duct work, but hall be supported from building structure with trapeze hangers where necessary or from steel angles supporting duct work in accordance with NFPA 13.
2. All thread rods shall not be bent.
3. Hanger components shall be ferrous.
4. Powder driven studs shall be specifically listed for use in the required seismic zone.

B. Feed and Cross Mains

1. Install at least one hanger per length of pipe up to 8 feet in length joined by grooved couplings.
2. Use flexible couplings where more than two couplings are used per run.

C. Risers

1. Standpipes shall be supported at lowest level and alternate levels above using riser clamp.
2. Provide flexible couplings in standpipe.

D. System Headers

1. Install pipe saddle supports complete with flange bolted to floor.

E. Earthquake Protection

1. Install flexible joints and sway braces in accordance with NFPA 13, Section 9.3.

3.9 SLEEVINGS, WALL AND FLOOR PENETRATIONS

A. Set Schedule 40 sleeves in place for all pipes passing through openings in fire resistance rated construction when required by UL listing for fire stopping method utilized.

B. Provide clearance between the sprinkler piping and sleeves in accordance with NFPA and FM. The space between sleeve and pipe shall be filled with noncombustible, UL listed fire stopping materials. Provide chrome wall plates at each side of wall.

C. Sleeves through floors shall be watertight. Penetrations through fire rated construction shall be adequately fire stopped to maintain the fire resistance rating required.

3.10 SIGNS

A. Valves

1. Secure to each valve with corrosion resistant wire or chain, sign stating, “Control valve.”

B. Hydraulic Design Information

1. Secure to each system riser with corrosion resistant fasteners.

3.11 WATER FLOW ALARMS AND SUPERVISORY DEVICES

A. Alarm Bells

1. Electric bells and wiring diagrams shall be delivered to the alarm contractor for installation and wiring.

B. Alarm and Supervisory Switches

1. Deliver wiring diagrams to alarm contractor.
2. Install alarm water flow switches in accordance with switch and valve manufacturers’ instructions.
3. Install and adjust valve supervisory switches in accordance with switch manufacturers’ instructions.

3.12 INSPECTOR’S TEST

A. Provide inspector’s test connections, as specified in NFPA 13, at required points for testing each waterflow alarm device. Special discharge nozzle shall have same size orifice as smallest orifice sprinklers installed.

B. Provide 1-inch sight glass if inspector's test discharge cannot be readily observed while operating valve.

C. Pipe all inspector's test connections discharging to atmosphere to location where water drained will not damage stock, equipment, vehicles, planted areas, etc., or injure personnel.

D. Splash blocks shall be provided where inspector's test discharge could produce damage to surroundings.

E. All pipe and fittings downstream of inspector's test valve shall be galvanized.

3.13 STANDPIPE IN BUILDINGS DURING CONSTRUCTION

A. Temporary or permanent standpipes shall be provided during construction (if required by the AHJ), extending up with each floor as construction progresses. Installation of standpipes in buildings under construction shall comply with the appropriate sections of CBC Section 905.10.

3.14 SYSTEM ACCEPTANCE

A. Tests

1. General system test shall be coordinated with the Owner's representatives for training and witnessed by the AHJ and Owner's commissioning agent. Problems noted during testing such as air or water leaks, difficulty in operating valves, alarm failures, etc. shall be corrected before the Contractor leaves the job.
2. Hydrostatically test all piping, including fire department connections between the check valve and connection, at 200 psi for two hours. If the highest static pressure at the lowest point in the system exceeds 150 psi, the system shall be tested at 50 psi more than the highest static pressure.
3. Flow Tests

    a. Main drain shall be opened wide until pressure stabilizes then slowly closed, noting and recording flowing (residual) and static (non-flow) pressure.
    b. Pressure-reducing floor control valves and fire hose valves shall be tested noting inlet and outlet pressures under non-flowing and flowing conditions. Record results.
    c. Pilot-operated pressure-reducing valves shall be tested as specified in (b). Adjust pilot for design pressures.
    d. Backflow preventers shall be forward-flow tested.

4. Pipe shall not be concealed until satisfactorily pressure tested.
5. Conduct drain test. Record static pressure and residual pressure per NFPA 13.
6. Owner's representative or engineer may witness tests. Contractor shall notify Owner and Engineer a minimum of 3 days in advance to allow for participation.
7. Log of tests shall be kept at job site and shall identify:

    a. Who performed test.

b. Time of test.
c. Date of test.
d. Section of system tested.
e. Results of test.
f. Along with completed Contractor's Material and Test Certification form(s) from NFPA 13 and NFPA 14.

8. Operate flow switches to test that signals are transmitted to Fire Alarm Control Panel.
9. Include test for tamper switches.

B. Valve Operation

1. Operate each valve through its entire range. Adjust valve packing glands.

a. Hose valves shall be capped during the test.

2. Threads for hose valve/wall hydrant outlets and fire department inlets shall be verified to conform to those used by the AHJ.

C. Water Flow and Supervisory Devices

1. Coordinate testing of electric components with the alarm contractor.
2. Each water flow device shall be tested in accordance with NFPA 72 by opening the inspectors test or alarm test valve.
3. Each valve supervisory device shall be tested by operating the valve wheel/crank.
4. Verify all signals have been noted by the fire alarm control panel and each audible alarm device operates.

D. Contractor’s material and test certificates shall be completed for each system/floor and signed by the Contractor and witnessed by the Owner’s representative/AHJ.

E. Training

1. General – In addition to the tests required in Parts A through C and witnessed by the Owner’s representative(s), conduct one/two hour training sessions to familiarize the representatives with all operating features of the system, including control valve, drain and test valve locations and operations.
2. Provide Owner’s representatives with:

a. A small scale plan of the system/building showing locations of control, drain and test valves.
b. Component manufacturers’ inspection and testing manuals.
c. Two copies of NFPA 25.

3. Spare Parts

a. Provide 12 spare sprinklers of all types and ratings that are installed, in a steel cabinet complete with special sprinkler wrenches. Install cabinet as directed by Owner.

3.15 ADJUSTMENT AND CLEANING

A. Cleaning: Flush all piping in accordance with NFPA Standards for test procedures.

B. Ensure underground feed pipe has been flushed, to clear out construction debris, prior to connecting aboveground fire protection system to it.

C. Maintain the premises free from accumulation of waste materials or rubbish caused by this work

3.16 BONDING

A. Provide underground cast iron and underground ductile iron pipe with metallic bond at each joint.

B. Bond wire shall be type RHW-USE size 1/0 neoprene-jacketed copper conductor shaped to stand clear of joint.

3.17 CPVC

A. INSTALLATION PROCEDURES:

1. All CPVC fire sprinkler fittings shall be installed to UL® Listed CPVC fire sprinkler pipe in accordance with Spears® Manufacturing Company FlameGuard® CPVC Fire Sprinkler Products Installation Instructions (FG-3) and Addendums. National Fire Protection Association (NFPA) Standards 13, 13D, and 13R must be referenced for design and installation requirements in conjunction with the Installation Instructions and applicable local codes. Installation practices such as pipe support spacing, bracing, allowance for thermal expansion/contraction, solvent cementing and handling and storage shall be in accordance with the manufacturer’s instructions and this specification.

B. TESTING

1. After the system is installed and any solvent cement is cured, the system shall be hydrostatically tested per the manufacturer’s installation instructions in the FG-3 literature and the requirements of the applicable plumbing or mechanical code.

C. LIMITATIONS

1. Spears® Manufacturing Company FlameGuard® Fire Sprinkler System is rated for use to a maximum working pressure Of working pressure of 175 psi @ 150F.

D. WARRANTY

1. Spears® Manufacturing Company shall provide a limited lifetime warranty after date of product shipment

E. TECHNICAL DATA

1. APPLICABLE STANDARDS

    a. ANSI/NSF Standard 14 Plastic Piping Components and Related Materials
    b. ANSI/NSF Standard 61 Drinking Water System Components – Health Effects
    c. ASTM D1784 Specification for Rigid Poly (Vinyl Chloride)(PVC) Compounds and Chlorinated Poly (Vinyl Chloride)(CPVC) Compounds
    d. ASTM F493 Specification for Solvent Cements for Chlorinated Poly (Vinyl Chloride) CPVC Plastic Pipe and Fittings

2. APPLICABLE CODES

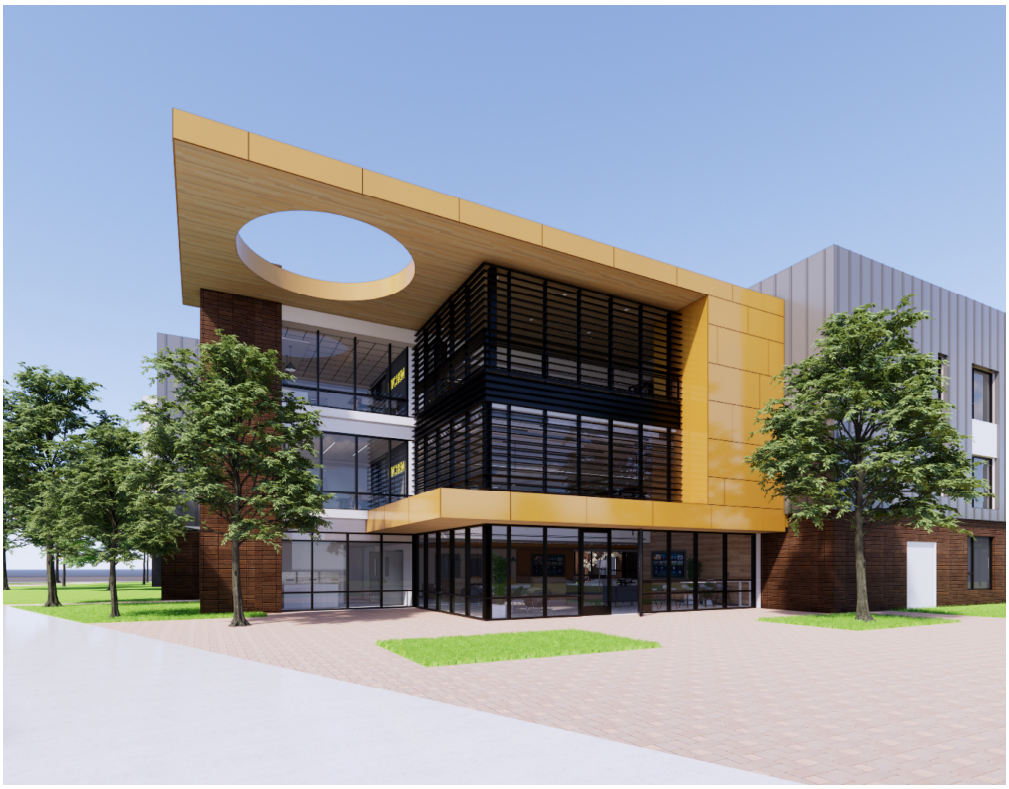
    a. BOCA, Basic Building, Mechanical Plumbing Codes
    b. IAPMO, Uniform Plumbing Code
    c. ICC, International Building, Mechanical and Plumbing Codes
    d. ICBO, Uniform Building and Mechanical Codes
    e. SBCCI, Standard Building, Mechanical and Plumbing Codes

END OF SECTION

Compton College
Student Housing

Increment 2 - Part 2

1111 E. Artesia Blvd., Compton, CA 90221



Specifications

DSA SUBMITTAL
VOLUME 4

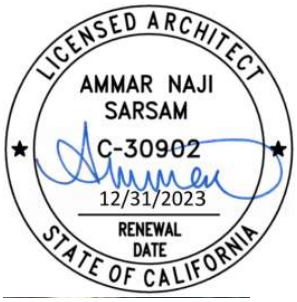
April 17, 2023

HPI architecture

ARCHITECT

HPI Architecture
115 22nd Street
Newport Beach, CA 92663
Tel. (949) 675-6442
Fax: (949) 675-4543

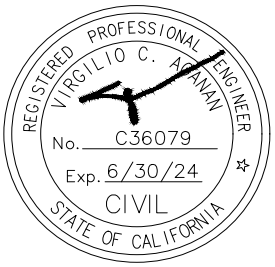
Contacts: Ammar Sarsam, Principal



CIVIL ENGINEER

VCA ENGINEERS, INC.
1041 S. Garfield Ave. #210
Alhambra, CA 91801
Tel. (323) 729-6098
Fax: (323) 729-6043

Contact: Virgil Aoanan



LANDSCAPE ARCHITECT

RLA
8841 Research Drive, Suite 200
Irvine, CA 92618
Tel. (949) 387-1323

Contact: TRAVIS EBBERT

STRUCTURAL ENGINEER

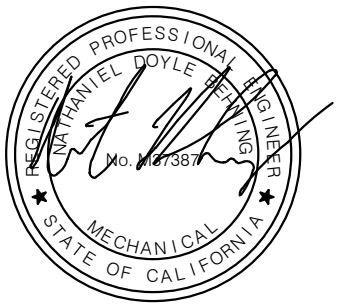
JOHN A. MARTIN & ASSOCIATES (JAMA)
950 S. Grand Ave. Ste. 400
Los Angeles, CA 90015
Tel. (213) 483-6490

Contact: Shane Fitzgerald

MECHANICAL/PLUMBING

P2S, Inc.
5000 East Spring Street, 8th Floor
Long Beach, California 90815
Tel. (562) 497-2999

Contact: Nate Behning

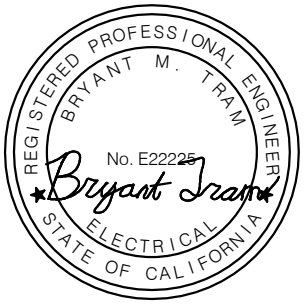


SIGND: 03/22/2023

ELECTRICAL, FIRE ALARM, TECHNOLOGY (DATA/SECURITY/AV), & SOLAR

P2S, Inc.
5000 East Spring Street, 8th Floor
Long Beach, California 90815
Tel. (562) 497-2999

Contact: Bryant Tram



SIGND: 03/22/2023

FIRE PROTECTION ENGINEER

P2S, Inc.
5000 East Spring Street, 8th Floor
Long Beach, California 90815
Tel. (562) 497-2999

Contact: Andres Jimenez

SIGND: 03/22/2023

VOLUME 4 TABLE OF CONTENTS

DIVISION 01 - GENERAL REQUIREMENTS

Refer to VOLUME 1 Project Manual for General Requirements applicable to this portion of the Work. VOLUME 1 is wholly incorporated by reference with INCREMENT 02 Scope of Work described in this document.

DIVISION 22 - PLUMBING

DIVISION 23 - HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)

END OF TABLE OF CONTENTS

SECTION 220000 - GENERAL PLUMBING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SCOPE

A. Basic plumbing requirements specifically applicable to Division 22 Sections.

B. Work includes but is not necessarily limited to the following:

1. Labor, materials, services, equipment, and appliances required for completion of tasks as indicated on drawing or in specification or as inherently necessary to prepare spaces and systems for new installations as follows:

a. Plumbing systems and equipment

1.3 DRAWINGS AND SPECIFICATIONS

A. Drawings accompanying these Specifications show intent of Work to be done. Specifications shall identify quality and grade of installation and where equipment and hardware is not particularly specified, Contractor shall provide submittals for all products and install them per manufacturers' recommendations, and in a first class manner.

B. Examine Drawings and Specifications for elements in connection with this Work; determine existing and new general construction conditions and be familiar with all limitations caused by such conditions.

C. Plans are intended to show general arrangement and extent of Work contemplated. Exact location and arrangement of parts shall be determined after the Owner has reviewed equipment, as Work progresses, to conform in best possible manner with surroundings, and as directed by the Owner's Representative.

D. Contract Documents are in part diagrammatic and intended to show the scope and general arrangement of the Work under this Contract. The Contractor shall follow these drawings in laying out the equipment, piping and ductwork. Drawings are not intended to be scaled for roughing in measurements or to serve as shop drawings. Where job conditions require minor changes or adjustments in the indicated locations or arrangement of the Work, such changes shall be made without change in the Contract amount.

E. Follow dimensions without regard to scale. Where no figures or notations are given, the Plans shall be followed.

1.4 UTILITIES

A. Location and sizes of electrical, mechanical and plumbing service facilities are shown in accordance with data secured from existing record drawings and site observations. Data shown are offered as an estimating guide without guarantee of accuracy. Check and verify all data given, and verify exact location of all utility services pertaining to Work prior to excavation or performing Work.

1.5 APPLICABLE REFERENCE STANDARDS, CODES AND REGULATIONS:

A. Meet requirements of all state codes having jurisdiction.

B. State of California Code of Regulations:

1. Title 8, Industrial Relations
2. Title 19, State Fire Marshal Regulations
3. Current California Building Code (CBC), Title 24, Part 2
4. Current California Electrical Code, Title 24, Part 3
5. Current California Mechanical Code, Title 24, Part 4
6. Current California Plumbing Code, Title 24, Part 5
7. Current California Fire Code, Title 24, Part 9
8. Current California Standards Code, Title 24, Part 12
9. Title 24, Energy Conservation Standards
10. California Green Building Standard Code, Title 24, Part 11

C. Additional Referenced Standards:

1. ASME American Society of Mechanical Engineers
2. ASTM American Society for Testing and Materials
3. NEMA National Electrical Manufacturer’s Association
4. NFPA National Fire Protection Association Standards
5. PDI Plumbing and Drainage Institute
6. UL Underwriters Laboratories

D. Codes and ordinances having jurisdiction over Work are minimum requirements; but, if Contract Documents indicate requirements, which are in excess of those minimum requirements, then requirements of the Contract Documents shall be followed. Should there be any conflicts between Contract Documents or codes or any ordinances having jurisdiction, report these to the Owner’s Representative.

E. Obtain permits, and request inspections from authority having jurisdiction.

1.6 PROJECT AND SITE CONDITIONS

A. The arrangement of and connection to equipment shown on the drawings is based upon information available and is not intended to show exact dimensions peculiar to a specific manufacturer. The Drawings are, in part, diagrammatic and some features of the illustrated equipment installations may require revision to meet actual equipment installation requirements. Structural supports, housekeeping pads, piping connections and adjacent equipment may have to be altered to accommodate the equipment provided. No additional payment will be made for such revisions or alterations.

B. Examine all Drawings and Specifications to be fully cognizant of all work required under this Division.

C. Examine site related work and surfaces before starting work of any Section.

D. Install Work in locations shown on approved Drawings, unless prevented by Project conditions.

E. Prepare shop drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission from the Owner's Representative before proceeding.

F. Plumbing Contractor shall be fully responsible to survey all underground utilities prior to installation of any utilities.

G. Beginning work of any Section constitutes acceptance of conditions.

H. All connections to site piping shall be done by the plumbing contractor.

I. All work shall be performed in a clean and workmanlike manner. Care shall be exercised to minimize any inconvenience or disturbance to other areas of the building which are to remain in operation. Isolate work areas by means to keep dust and dirt within the construction area.

J. All piping into stem walls and footings shall be double half lap wrapped with 1/8" thick "Armaflex" insulation. The contractor shall also provide blocked out areas in stem wall and footing. All piping shall avoid the lower 8" of the footing.

K. All existing piping damaged during construction shall be repaired with materials to match existing by the contractor.

1.7 COOPERATION WITH WORK UNDER OTHER DIVISIONS

A. Cooperate with other trades to facilitate general progress of Work. Allow all other trades every reasonable opportunity for installation of their work.

B. Work under this Division shall follow general building construction closely. Set pipe sleeves and inserts and verify that openings for chases and pipes are provided.

C. Work with other trades in determining exact location of outlets, pipes, and pieces of equipment to avoid interference with lines required to maintain proper installation of Work.

D. Make such progress in the Work to not delay work of other trades.

E. Coordinate with electrical contractor prior to ordering equipment for available voltages at all equipment locations.

F. Mechanical Work shall have precedence over the other in the following sequence:

1. Soil and waste piping
2. Hydronic piping
3. Ductwork
4. Fire sprinkler piping
5. Domestic water piping

1.8 DISCREPANCIES

A. The Contractor shall check all Drawings furnished him immediately upon their receipt and shall promptly notify the Owner's Representative of any discrepancies. Figures marked on Drawings shall in general be followed in preference to scale measurements. Piping and instrumentation diagrams shall in general govern floor plans and sections. Large-scale drawings shall in general govern small-scale drawings.

B. Where requirements between Drawings and Specifications conflict, the more restrictive provisions shall apply.

C. If any part of the Specifications or Drawings appears unclear or contradictory, apply to Owner's Representative for interpretation and decision as early as possible, including during bidding period. Do not proceed with such work without Owner Representatives decision. Beginning work of any Section constitutes acceptance of conditions.

1.9 CHANGES

A. The Contractor shall be responsible to make and obtain approval from the Owner's Representative for all necessary adjustments in piping and equipment layouts as required to accommodate the relocations of equipment and/or devices, which are affected by any approved authorized changes or Product substitutions. All changes shall be clearly indicated on the "Record" drawings.

1.10 SUBMITTALS

A. Refer to Division 01 for additional requirements.

B. The manufacturer, contractor or supplier shall include a written statement that the submitted equipment, hardware or accessory complies with the requirement of that particular specification section.

C. The manufacturer shall resubmit the specification section showing compliance with each respective paragraphs and specified items and features in that particular specification section.

D. All **exceptions** shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.

E. Note that prior to acceptance of submittals for review, a submittal schedule shall be submitted to the owner's representative.

F. Submit all division 22 shop drawings and product data grouped and referenced by the specification technical section numbers in one complete submittal package. Individual or partial submittals are not acceptable and will be returned without review.

G. Shop Drawings:

1. Provide all shop drawings in latest version of Revit/AutoCAD format and PDF format.
2. Drawings shall be a 30 inches by 42 inches in size with a minimum scale of 1/4-inch per foot, except as specified otherwise.
3. Include installation details of equipment indicating proposed location, layout and arrangement, accessories, piping, and other items that must be shown to assure a coordinated installation.
4. Indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices.
5. If equipment is disapproved, revise drawings to show acceptable equipment and resubmit.
6. The Contractor shall be responsible for all equipment ordered and/or installed prior to receipt of shop drawings returned from the Owner's Representative bearing the Owner's Representative stamp of "Reviewed". All corrections or modifications to the equipment as noted on the shop drawings shall be performed and equipment removed from the job site at the request of the Owner's Representative without additional compensation.

H. Whenever more than one manufacturer's product is specified, the first named product is the basis of design used in the Work and the use of alternate-named manufacturer's products or substitutes may require modifications in that design.

I. Proposed Products List: Include Products as required by the individual section in this Division.

J. The Contractor shall be responsible for all equipment ordered and/or installed prior to receipt of shop drawings returned from the Owner's Representative bearing the Owner's Representative stamp of "Reviewed". All corrections or modifications to the equipment as noted on the shop drawings shall be performed and equipment removed from the job site at the request of the Owner's Representative without additional compensation.

K. Manufacturer's Data: For each manufactured item, provide current manufacturer's descriptive literature of cataloged products, certified equipment drawings, diagrams, performance and characteristic curves if applicable, and catalog cuts.

L. Standard Compliance: When materials or equipment provided by the Contractor must conform to the standards of organizations such as American National Standards Institute (ANSI) or American Water Works Association (AWWA), submit proof of such

conformance to the Owner Representative for approval. If an organization uses a label or listing to indicate compliance with a particular standard, the label or listing will be acceptable evidence, unless otherwise specified. In lieu of the label or listing, submit a certificate from an independent testing organization, which is competent to perform acceptance testing and is approved by the Owner Representative. The certificate shall state that the item has been tested in accordance with the specified organization's test methods and that the item conforms to the specified organization's standard.

M. Certified Test Reports: Before delivery of materials and equipment, certified copies of all test reports specified in individual sections shall be submitted for approval.

N. Certificates of Compliance or Conformance: Submit manufacturer's certifications as required on products, materials, finish, and equipment indicated in the technical sections. Certifications shall be documents prepared specifically for this Contract. Pre-printed certifications and copies of previously submitted documents will not be acceptable. The manufacturer's certifications shall name the appropriate products, equipment, or materials and the publication specified as controlling the quality of that item. Certification shall not contain statements to imply that the item does not meet requirements specified, such as "as good as"; or "achieve the same end use and results as materials formulated in accordance with the referenced publications"; or "equal or exceed the service and performance of the specified material." Certifications shall simply state that the item conforms to the requirements specified. Certificates shall be printed on the manufacturer's letterhead and shall be signed by the manufacturer's official authorized to sign certificates of compliance or conformance.

1.11 PROJECT RECORD DOCUMENTS

A. Refer to Division 01 for additional requirements.

1. All changes, deviations and information recorded on the “Project Record Drawings” set during Construction shall be redrafted onto the latest version of AutoCAD or Revit, where applicable.
2. Submit completed shop drawings to the Owner prior to completion in AutoCAD format. Contractor hand marked or drafted redlined “Project Record Drawings” will not be accepted.

1.12 PRODUCT ALTERNATIVES OR SUBSTITUTIONS

A. Refer to General Conditions and Division 01 for additional requirements.

1.13 OPERATING INSTRUCTIONS

A. Furnish approved operating instructions for systems and equipment indicated in the technical sections for use by operation and maintenance personnel.

1.14 MANUFACTURER'S RECOMMENDATIONS

A. Where installation procedures or any part thereof are required to be in accordance with manufacturer's recommendations, furnish printed copies of the recommendations prior to installation. Installation of the item shall not proceed until recommendations are received. Failure to furnish recommendations shall be cause for rejection of the equipment or material.

1.15 DELIVERY AND STORAGE

A. Refer to Division 01 for additional requirements.

B. Handle, store, and protect equipment and materials in accordance with the manufacturer's recommendations and with the requirements of NFPA 70B P, Appendix I, titled "Equipment Storage and Maintenance During Construction." Replace damaged or defective items with new items.

1.16 GUARANTEE

A. Except as may be specified under other sections in the Specifications, guarantee all equipment furnished under the Specifications for a period of one year from date of project acceptance against defective workmanship and material and improper installation. Upon notification of failure, correct deficiency immediately and without cost to the Owner.

B. Standard warranty of manufacturer shall apply for replacement of parts after expiration of the above period. Manufacturer shall furnish replacement parts to the Owner for their service agency as directed.

PART 2 - PRODUCTS

Not Applicable.

PART 3 - EXECUTION

3.1 GENERAL

A. Obtain and pay for all permits and inspections, including any independent testing required to verify standard compliance, and deliver certificates for same to the Owner’s Representative.

3.2 WORK RESPONSIBILITIES

A. The drawings indicate diagrammatically the desired locations or arrangement of piping, equipment, etc., and are to be followed as closely as possible. Proper judgment must be exercised in executing the work to secure the best possible installation in the available space and to overcome local difficulties due to space limitations or interference with structural conditions.

B. The Contractor is responsible for the correct placing of Work and the proper location and connection of Work in relation to the work of other trades. Advise appropriate trade as to locations of access panels.

C. In the event changes in the indicated locations or arrangements are necessary, due to developed conditions in the building construction or rearrangement of furnishings or equipment, such changes shall be made without extra cost, providing the change is ordered before the ductwork, piping, etc. and work directly connected to same is installed and no extra materials are required.

D. Where equipment is furnished by others, verify dimensions and the correct locations of this equipment before proceeding with the roughing-in of connections.

E. All scaled and figured dimensions are approximate of typical equipment of the class indicated. Before proceeding with any work, carefully check and verify all dimensions, sizes, etc. with the drawings to see that the equipment will fit into the spaces provided without violation of applicable codes.

F. Should any changes to the Work indicated on the Drawings or described in the Specifications be necessary in order to comply with the above requirements, notify the Owner immediately and cease work on all parts of the contract, which are affected until approval for any required modifications to the construction has been obtained from the Owner.

G. Be responsible for any cooperative work, which must be altered due to lack of proper supervision or failure to make proper provisions in time. Such changes shall be under direction of the Owner and shall be made to his satisfaction. Perform all Work with competent and skilled personnel.

H. All work, including aesthetic as well as mechanical aspects of the Work, shall be of the highest quality consistent with the best practices of the trade.

I. Replace or repair, without additional compensation, any work, which, in the opinion of the Owner, does not comply with these requirements.

3.3 PAINTING

A. Refer to Division 09 Painting for additional requirements.

B. Factory Applied:

1. Plumbing equipment shall have factory-applied painting systems which shall, as a minimum, meet the requirements of NEMA ICS 6 corrosion-resistance test, except equipment specified to meet requirements of ANSI C37.20 shall have a finish as specified in ANSI C37.20.
2. Refer to individual sections of this Division for more stringent requirements.

C. Field Applied:

1. Paint all plumbing equipment as required to touch up, to match finish on other equipment in adjacent spaces or to meet safety criteria.
2. Paint all exposed plumbing piping, valves, supports, hangers and appurtenances. Provide minimum 5 mils dry film thickness.
3. Paint shall be a high performance polyurethane enamel coating system.
4. Acceptable primer manufacturers include:

    a. Ameron Amershield VOC, Tnemec's Series 1075 (1074) Endura-Shield, semi-gloss (gloss) sheen or equal.

5. Acceptable paint manufacturers include:

    a. Ameron, Tnemec or engineer approved equal.

END OF SECTION

SECTION 220500 - COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems.
2. Dielectric fittings.
3. Transition fittings.
4. Mechanical sleeve seals.
5. Sleeves.
6. Escutcheons.
7. Grout.
8. Plumbing demolition.
9. Equipment installation requirements common to equipment sections.
10. Concrete bases.
11. Supports and anchorages.

1.2 DEFINITIONS

A. Finished Spaces: Spaces other than plumbing and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and plumbing equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:

1. ABS: Acrylonitrile-butadiene-styrene plastic.
2. CPVC: Chlorinated polyvinyl chloride plastic.
3. PE: Polyethylene plastic.
4. PVC: Polyvinyl chloride plastic.

1.3 SUBMITTALS

A. Submittals shall be formatted per Section 220000 “General Plumbing Requirements”. The manufacturer shall resubmit the specification section showing compliance with each respective paragraphs and specified items and features in that particular specification section. All **exceptions** shall be clearly identified by referencing respective paragraph and other requirements. Next to each specification item, indicate the following:

1. “No Exception Taken”.
2. “Exception”. All exceptions shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.

B. Product Data: For the following:

1. Transition fittings.
2. Dielectric fittings.
3. Mechanical sleeve seals.
4. Escutcheons.

C. Welding certificates.

1. Welding certificates.
2. Product Information for approval before purchase
3. Operation and Maintenance Manuals

1.4 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for Plumbing Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.6 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for plumbing installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for plumbing items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 22 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

C. All plumbing pipe, tube and fittings shall be manufactured exclusively in the United States.

2.2 JOINING MATERIALS

A. Refer to individual Division 22 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.

C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

E. Brazing Filler Metals:

1. Conform to AWS A5.8.
2. Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
3. Use 15% silver brazing filler metal without flux.

F. Welding Filler Metals: Comply with AWS D10.12. for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

G. Solvent Cements for Joining Plastic Piping:

1. ABS Piping: ASTM D 2235.
2. CPVC Piping: ASTM F 493.
3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
4. PVC to ABS Piping Transition: ASTM D 3138.

2.3 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.

D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.

E. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

F. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

2.4 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Manufacturers:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Metraflex Co.

2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Stainless steel. Include two for each sealing element.
4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.5 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with set screws.

E. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.

F. PVC Pipe: ASTM D 1785, Schedule 40.

G. Molded PE: Reusable, PE, tapered-cup shaped, and smooth-outer surface with nailing flange for attaching to wooden forms.

2.6 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Type: With set screw.

1. Finish: Polished chrome-plated.

D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.

1. Finish: Polished chrome-plated.

2.7 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PLUMBING DEMOLITION

A. Refer to Division 01 Section “Cutting and Patching” and Division 02 Section “Selective Structure Demolition” for general demolition requirements and procedures.

B. Disconnect, demolish, and remove plumbing systems, equipment, and components indicated to be removed.

1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
2. Equipment to Be Removed: Disconnect and cap services and remove equipment.
3. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
4. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.2 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 22 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons for penetrations of walls, ceilings, and floors.

M. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

N. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

O. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

P. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for materials.

Q. Verify final equipment locations for roughing-in.

R. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.3 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 22 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402, for safe-handling practice of cleaners, primers, and solvent cements.
2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 Appendixes.
3. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
4. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
5. PVC Nonpressure Piping: Join according to ASTM D 2855.
6. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.

J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

K. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

L. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.

1. Plain-End Pipe and Fittings: Use butt fusion.
2. Plain-End Pipe and Socket Fittings: Use socket fusion.

M. Fiberglass Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

3.4 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.5 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install plumbing equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.6 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section "Cast-in-Place Concrete."

3.7 ERECTION OF METAL SUPPORTS AND ANCHORAGES.

A. Refer to Division 05 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing materials and equipment.

C. Field Welding: Comply with AWS D1.1.

3.8 GROUTING

A. Mix and install grout for plumbing equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

END OF SECTION

SECTION 220513 - COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.3 QUALITY ASSURANCE

A. Bearings: Bearing loads and bearing life shall be determined using AFBMA 9 - Load Ratings and Fatigue Life for Ball Bearings, and AFBMA 11 - Load Ratings and Fatigue Life for Roller Bearings.

B. Comply with NEMA MG 1 unless otherwise indicated.

C. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.

D. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

E. Motor Efficiency: Motors one horsepower and larger shall exceed current NEMA Premium Efficiency standards.

F. Structural Seismic Performance: Refer to Division 22 Section “Vibration and Seismic Controls for Plumbing Piping and Equipment.”

1.4 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.

3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

1.5 SUBMITTALS

A. Submittals shall be formatted per Section 220000 “General Plumbing Requirements”. The manufacturer shall resubmit the specification section showing compliance with each respective paragraphs and specified items and features in that particular specification section. All **exceptions** shall be clearly identified by referencing respective paragraph and other requirements. Next to each specification item, indicate the following:

1. “No Exception Taken”.
2. “Exception”. All exceptions shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.

B. Product Data: For each motor, provide operating weights; and manufacturer's technical data on specified features, performance, electrical ratings, and characteristics. Motor performance; percent efficiency, power factor, torque, RPM, power (W) and current vs. percent of rated power output (Horsepower) curves.

C. Operation and maintenance manual for the motor and installed devices.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified:

1. U.S. Motors.
2. General Electric.
3. Siemens Motors.
4. Baldor - Reliance.
5. Westinghouse.
6. Or equal.

B. Or Equal: Where products are specified by manufacturers name and accompanied by the term "or equal", comply with provisions in Division 01. Specific procedures must be followed before use of an unnamed product or manufacturer.

2.2 GENERAL MOTOR REQUIREMENTS

A. Comply with NEMA MG 1 unless otherwise indicated.

2.3 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.4 SINGLE-PHASE MOTORS

A. Motor shall be an electronic commutation (EC) motor specifically designed for HVAC applications. AC induction type motors are not acceptable.

B. Motors shall be ECM, variable-speed, DC, brushless motors specifically designed for use with single phase, 60 hertz electrical input as shown on Drawings. Motor shall be complete with and operated by a single-phase integrated controller/inverter that operates the wound stator and senses rotor position to electronically commutate the stator. All motors shall be designed for synchronous rotation.

C. Motor rotor shall be permanent magnet type with near zero rotor losses. Motor shall have built-in soft start and soft speed change ramps.

D. Motor shall be able to be mounted with shaft in horizontal or vertical orientation.

E. Motor shall be permanently lubricated with ball bearings.

F. Motor shall maintain a minimum of 70% efficiency over its entire operating range.

G. Provide manual (or optional remote) fan speed output control as indicated on Drawings for field adjustment of motor speed. Inductors shall be provided to minimize harmonic distortion and line noise.

H. Overload Protection:

1. Automatic Speed Control: In the event of overheating or overloading, the motor electronics slow the motor to operate within its acceptable range.
2. Thermal Overload: Internally fused, one-shot type as a last resort to prevent fires.
3. Locked Rotor: If the motor sees a locked rotor condition, it will automatically shut itself down, then try to restart 3 times. After the 3rd try, the motor will not attempt to restart until the power is cycled.

2.5 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Premium efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Enclosure: Totally enclosed fan-cooled (TEFC), cast-iron (may use steel mounting base on 140-T frame series). IEC Protection: IP-44.

E. VFD Compatibility: “Inverter Ready” per NEMA Standard MG1, Part 31.4.4.2.

1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
2. Insulation: Class F or H insulation, with Class B temperature rise, non-hygroscopic.
3. Shaft Grounding Kit to reduce current flow through bearings, which has damaged many motors on campus.

F. Variable torque Ratio: 10:1 minimum.

G. Rotor Balance Requirement: 0.08 Inches per second maximum vibration.

H. Bearings: Shielded antifriction bearings suitable for application specific radial and thrust loading.

1. The manufacturer’s analysis, and selection, shall ensure bearings will have an L_{10} life of not less than 130,000 hours for direct-drive and not less than 40,000 hours for belt-drive.
2. Bearing styles and types matching special loading requirements. Over-sized bearings as required.
3. Ensure motor bearings conform to requirements for Variable Frequency Drive applications.

I. Mounting Feet: Cast-iron precision machined flatness for accurate motor base mounting alignment per NEMA MG1.

1. Foot-to-foot flatness from mounting hole to mounting hole shall not exceed 0.005 inches.

J. Conduit Boxes: Shall be over-sized NEMA, gasketed, repositionable box for field conduit routing adjustment, with grounding connection.

K. Lifting Lugs: For frame sizes 215 and above, permanent lifting provisions, such as eye bolts, shall be provided.

2.6 ADDITIONAL REQUIREMENTS FOR POLYPHASE MOTORS

A. Outdoor Applications: For outdoor applications provide “rain-proof” motors with options listed below Outdoor motor features listed below offer better environmental enclosure protection, and are in “addition to the required features” of protected indoor motors:

1. IEC Ingress Protection Rating: IP-54.
2. Epoxy paint on enclosure and rotor.
3. Shaft slingers.
4. Stainless steel nameplate and hardware.

B. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

C. Motors Used with Variable Frequency Controllers:

1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
2. Premium-Efficient Motors: Class B temperature rise; Class F insulation.
3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.
5. Shaft Grounding Kit to reduce current flow through bearings.

D. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.

2.7 SHAFT GROUNDING RINGS

A. Manufacturers:

1. Electro Static Technology Inc. - Aegis SGR product line.
2. Inpro/Seal, a division of Waukesha Bearings Corporation - CDR product line.
3. Or equal.

B. Provide shaft grounding rings (SGRs) on 3-phase motors 1/2 hp or larger intended for used with variable-frequency drives (VFDs). The SGRs may be furnished by the motor manufacturer as an integral part of the motor, furnished factory-installed by the equipment manufacturer, or furnished for field installation by the equipment installer.

C. Description: Circumferential micro-fiber ring with metal frame, designed to conduct VFD induced bearing currents from the motor shaft to ground. Provides protection recommended in NEMA MG 1. Provide with mounting kit including bolts and bracket, or conductive epoxy to adhere to motor casing, to ensure ground connection from the SGR to the motor frame.

D. Provide SGRs on at least one end of the motor.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive field-installed motors for compliance with requirements, installation tolerances, maintenance clearances and other conditions affecting performance.

B. Examine roughing-in of conduit systems to verify actual locations of conduit connections before motor installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 MOTOR INSTALLATION

A. Anchor each motor assembly to base, adjustable rails, or other support, arranged and sized according to manufacturer's written instructions. Attach by bolting. Level and align motor with base. Align motors, bases, shafts, pulleys and belts with driven equipment, or couplers. Tension belts according to manufacturer's written instructions.

B. Comply with mounting and anchoring requirements specified in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment."

C. Connect motor leads to power source using rings and bolts or split bolts as needed. Insulation of connected motor leads shall be of the highest quality and designed to withstand the same temperature as the internal windings. Ordinary electrical tape is not generally suitable for this service and shall not be used as the only means of insulation. Wire nuts are prohibited.

D. Motor power leads shall be marked at the source and at the connection box on the motor.

3.3 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:

1. Run each motor with its controller. Demonstrate correct rotation, alignment, and speed at motor design load.
2. Test interlocks and control features for proper operation.
3. Verify that current in each phase is within nameplate rating.

B. Testing: Owner’s Representative may engage a qualified testing agency to perform the following field quality-control testing:

1. Perform each electrical test and visual and mechanical inspections stated in NETA ATS, Section 7.15.1 and certify compliance with test parameters.

C. After the Owner’s testing agency is finished, correct any malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and the University shall retest.

3.4 CLEANING

A. After completing equipment installation, inspect unit components. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.

B. Clean motors, on completion of installation, according to manufacturer's written instructions.

END OF SECTION

SECTION 220516 - EXPANSION FITTINGS AND LOOPS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Rubber union connector packless expansion joints.
2. Flexible-hose packless expansion joints.
3. Metal-bellows packless expansion joints.
4. Externally pressurized metal-bellows packless expansion joints.
5. Rubber packless expansion joints.
6. Grooved-joint expansion joints.
7. Alignment guides and anchors.
8. Pipe loops and swing connections.

1.3 ACTION SUBMITTALS

A. Submittals shall be formatted per Section 220000 “General Plumbing Requirements”. The manufacturer shall resubmit the specification section showing compliance with each respective paragraphs and specified items and features in that particular specification section. All **exceptions** shall be clearly identified by referencing respective paragraph and other requirements. Next to each specification item, indicate the following:

1. “No Exception Taken”.
2. “Exception”. All exceptions shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.

B. Product Data: For each type of product.

C. Delegated-Design Submittal: For each anchor and alignment guide, including analysis data, signed and sealed by the qualified professional engineer responsible for their preparation.

1. Design Calculations: Calculate requirements for thermal expansion of piping systems and for selecting and designing expansion joints, loops, and swing connections.
2. Anchor Details: Detail fabrication of each anchor indicated. Show dimensions and methods of assembly and attachment to building structure.

3. Alignment Guide Details: Detail field assembly and attachment to building structure.
4. Schedule: Indicate type, manufacturer's number, size, material, pressure rating, end connections, and location for each expansion joint.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product Certificates: for each type of expansion joint, from manufacturer.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For expansion joints to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe and Pressure-Vessel Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Compatibility: Products shall be suitable for piping service fluids, materials, working pressures, and temperatures.

B. Capability: Products to absorb 200 percent of maximum axial movement between anchors.

2.2 PACKLESS EXPANSION JOINTS

A. Rubber Union Connector Expansion Joints RUEJ-01:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Amber/Booth Company, Inc.; a VMC Group Company.
    b. Flex-Hose Co., Inc.
    c. Flexicraft Industries.

2. Material: Twin reinforced-rubber spheres with external restraining cables.

3. Minimum Pressure Rating: 150 psig at 170 deg F, unless otherwise indicated.
4. End Connections for NPS 2 and Smaller: Threaded.

B. Flexible-Hose Packless Expansion Joints FHEJ-01:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Flex Pression Ltd.
    b. Flex-Hose Co., Inc.
    c. Metraflex Company (The).

2. Description: Manufactured assembly with inlet and outlet elbow fittings and two flexible-metal-hose legs joined by long-radius, 180-degree return bend or center section of flexible hose.
3. Flexible Hose: Corrugated-metal inner hoses and braided outer sheaths.
4. Expansion Joints for Copper Tubing NPS 2 and Smaller: Copper-alloy fittings with solder-joint end connections.

    a. Bronze hoses and single-braid bronze sheaths with 450 psig at 70 deg F and 340 psig at 450 deg F ratings.
    b. Bronze hoses and double-braid bronze sheaths with 700 psig at 70 deg F and 500 psig at 450 deg F ratings.

5. Expansion Joints for Copper Tubing NPS 2-1/2 to NPS 4: Copper-alloy fittings with threaded end connections.

    a. Stainless-steel hoses and single-braid, stainless-steel sheaths with 300 psig at 70 deg F and 225 psig at 450 deg F ratings.
    b. Stainless-steel hoses and double-braid, stainless-steel sheaths with 420 psig at 70 deg F and 315 psig at 450 deg F ratings.

6. Expansion Joints for Steel Piping NPS 2 and Smaller: Carbon-steel fittings with threaded end connections.

    a. Stainless-steel hoses and single-braid, stainless-steel sheaths with 450 psig at 70 deg F and 325 psig at 600 deg F ratings.
    b. Stainless-steel hoses and double-braid, stainless-steel sheaths with 700 psig at 70 deg F and 515 psig at 600 deg F ratings.

7. Expansion Joints for Steel Piping NPS 2-1/2 to NPS 6: Carbon-steel fittings with flanged end connections.

    a. Stainless-steel hoses and single-braid, stainless-steel sheaths with 200 psig at 70 deg F and 145 psig at 600 deg F ratings.
    b. Stainless-steel hoses and double-braid, stainless-steel sheaths with 275 psig at 70 deg F and 200 psig at 600 deg F ratings.

8. Expansion Joints for Steel Piping NPS 8: Carbon-steel fittings with welded end connections.

a. Stainless-steel hoses and single-braid, stainless-steel sheaths with 125 psig at 70 deg F and 90 psig at 600 deg F ratings.
b. Stainless-steel hoses and double-braid, stainless-steel sheaths with 165 psig at 70 deg F and 120 psig at 600 deg F ratings.

C. Metal-Bellows Packless Expansion Joints MBEJ-01:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Adsco Manufacturing LLC.
b. Expansion Joint Systems, Inc.
c. Metraflex Company (The).

2. Standards: ASTM F1120 and EJMA's "Standards of the Expansion Joint Manufacturers Association, Inc."
3. Type: Circular, corrugated bellows with external tie rods.
4. Minimum Pressure Rating: 175 psig, unless otherwise indicated.
5. Configuration: Single joint with base and double joint with base class(es), unless otherwise indicated.
6. Expansion Joints for Copper Tubing: Single- or multi- ply phosphor-bronze bellows, copper pipe ends, and brass shrouds.

a. End Connections for Copper Tubing NPS 2 and Smaller: Solder joint.
b. End Connections for Copper Tubing NPS 2-1/2 to NPS 4: threaded.
c. End Connections for Copper Tubing NPS 5 and Larger: Flanged.

7. Expansion Joints for Steel Piping: Single- or multi- ply stainless-steel bellows, steel pipe ends, and carbon-steel shroud.

a. End Connections for Steel Pipe NPS 2 and Smaller: Threaded.
b. End Connections for Steel Pipe NPS 2-1/2 and Larger: Flanged.

D. Externally Pressurized Metal-Bellows Packless Expansion Joints EPEJ-01:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Flex-Hose Co., Inc.
b. Mason Industries, Inc.
c. Metraflex Company (The).

2. Minimum Pressure Rating: 200 psig, unless otherwise indicated.
3. Description:

a. Totally enclosed, externally pressurized, multi-ply, stainless-steel bellows isolated from fluid flow by an internal pipe sleeve.
b. Carbon-steel housing.
c. Drain plugs and lifting lug for NPS 3 and larger.
d. Bellows shall have operating clearance between the internal pipe sleeves and the external shrouds.

e. Joints shall be supplied with a built-in scale to confirm the starting position and operating movement.
f. Joint Axial Movement: 8 inches of compression and 2 inches of extension.

4. Permanent Locking Bolts: Set locking bolts to maintain joint lengths during installation. Temporary welding tabs that are removed after installation in lieu of locking bolts are not acceptable.
5. End Connection Configuration: Flanged; one raised, fixed and one floating flange.

E. Rubber Packless Expansion Joints REJ-01:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Flex-Hose Co., Inc.
b. Mason Industries, Inc.
c. Metraflex Company (The).

2. Standards: ASTM F1123 and FSA's "Technical Handbook: Non-Metallic Expansion Joints and Flexible Pipe Connectors."
3. Material: Fabric-reinforced rubber complying with FSA-PSJ-703.
4. Arch Type: Single or multiple arches with external control rods.
5. Spherical Type: Single or multiple spheres with external control rods.
6. Minimum Pressure Rating for NPS 1-1/2 to NPS 4: 150 psig at 220 deg F.
7. Minimum Pressure Rating for NPS 5 and NPS 6: 140 psig at 200 deg F.
8. Minimum Pressure Rating for NPS 8 to NPS 12: 140 psig at 180 deg F.
9. Material for Fluids Containing Acids, Alkalis, or Chemicals: Butyl rubber Chlorosulfonyl-polyethylene rubber Ethylene-propylene-diene terpolymer rubber.
10. Material for Fluids Containing Gas, Hydrocarbons, or Oil: Buna-N Chlorosulfonated polyethylene synthetic rubber.
11. Material for Water: Butyl rubber Buna-N Chlorosulfonated polyethylene synthetic rubber Chlorosulfonyl-polyethylene rubber Ethylene-propylene-diene terpolymer rubber Natural rubber.
12. End Connections: Full-faced, integral steel flanges with steel retaining rings.

2.3 GROOVED-JOINT EXPANSION JOINTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Anvil International.
2. Shurjoint-Apollo Piping Products USA Inc.
3. Victaulic Company.

B. Description: Factory-assembled expansion joint made of several grooved-end pipe nipples, couplings, and grooved joints.

C. Standard: AWWA C606, for grooved joints.

D. Nipples: Galvanized, ASTM A53/A53M, Schedule 40, Type E or S, steel pipe with grooved ends.

E. Couplings: Seven, flexible type for steel-pipe dimensions. Include ferrous housing sections, Buna-N gasket suitable for diluted acid, alkaline fluids, and cold and hot water ethylene-propylene-diene terpolymer rubber gasket suitable for cold and hot water, and bolts and nuts.

2.4 ALIGNMENT GUIDES AND ANCHORS

A. Alignment Guides AG-01:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Flex-Hose Co., Inc.
   b. Mason Industries, Inc.
   c. Metraflex Company (The).

2. Description: Steel, factory-fabricated alignment guide, with bolted two-section outer cylinder and base for attaching to structure; with two-section guiding slider for bolting to pipe.

B. Anchor Materials:

1. Steel Shapes and Plates: ASTM A36/A36M.
2. Bolts and Nuts: ASME B18.10 or ASTM A183, steel hex head.
3. Washers: ASTM F844, steel, plain, flat washers.
4. Mechanical Fasteners: Insert-wedge-type stud with expansion plug anchor for use in hardened portland cement concrete, with tension and shear capacities appropriate for application.

   a. Stud: Threaded, zinc-coated carbon steel.
   b. Expansion Plug: Zinc-coated steel.
   c. Washer and Nut: Zinc-coated steel.

5. Chemical Fasteners: Insert-type stud, bonding-system anchor for use with hardened portland cement concrete, with tension and shear capacities appropriate for application.

   a. Bonding Material: ASTM C881/C881M, Type IV, Grade 3, two-component epoxy resin suitable for surface temperature of hardened concrete where fastener is to be installed.
   b. Stud: ASTM A307, zinc-coated carbon steel with continuous thread on stud, unless otherwise indicated.
   c. Washer and Nut: Zinc-coated steel.

PART 3 - EXECUTION

3.1 EXPANSION JOINT INSTALLATION

A. Install expansion joints of sizes matching sizes of piping in which they are installed.

B. Install metal-bellows expansion joints according to EJMA's "Standards of the Expansion Joint Manufacturers Association, Inc."

C. Install rubber packless expansion joints according to FSA-PSJ-703.

D. Install grooved-joint expansion joints to grooved-end steel piping.

3.2 PIPE LOOP AND SWING CONNECTION INSTALLATION

A. Install pipe loops cold-sprung in tension or compression as required to partly absorb tension or compression produced during anticipated change in temperature.

B. Connect risers and branch connections to mains with at least five pipe fittings, including tee in main.

C. Connect risers and branch connections to terminal units with at least four pipe fittings, including tee in riser.

D. Connect mains and branch connections to terminal units with at least four pipe fittings, including tee in main.

3.3 ALIGNMENT-GUIDE AND ANCHOR INSTALLATION

A. Install alignment guides to guide expansion and to avoid end-loading and torsional stress.

B. Install one guide(s) on each side of pipe expansion fittings and loops. Install guides nearest to expansion joint not more than four pipe diameters from expansion joint.

C. Attach guides to pipe, and secure guides to building structure.

D. Install anchors at locations to prevent stresses from exceeding those permitted by ASME B31.9 and to prevent transfer of loading and stresses to connected equipment.

E. Anchor Attachments:

1. Anchor Attachment to Black Steel Pipe: Attach by welding. Comply with ASME B31.9 and ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
2. Anchor Attachment to Galvanized-Steel Pipe: Attach with pipe hangers. Use MSS SP-69, Type 42, riser clamp welded to anchor.
3. Anchor Attachment to Copper Tubing: Attach with pipe hangers. Use MSS SP-69, Type 24; U bolts bolted to anchor.

F. Fabricate and install steel anchors by welding steel shapes, plates, and bars. Comply with ASME B31.9 and AWS D1.1/D1.1M.

1. Anchor Attachment to Steel Structural Members: Attach by welding.
2. Anchor Attachment to Concrete Structural Members: Attach by fasteners. Follow fastener manufacturer's written instructions.

G. Use grout to form flat bearing surfaces for guides and anchors attached to concrete.

END OF SECTION

SECTION 220517 - SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sleeves.
2. Stack-sleeve fittings.
3. Sleeve-seal systems.
4. Sleeve-seal fittings.
5. Grout.
6. Silicone sealants.

1.3 ACTION SUBMITTALS

A. Submittals shall be formatted per Section 220000 “General Plumbing Requirements”. The manufacturer shall resubmit the specification section showing compliance with each respective paragraphs and specified items and features in that particular specification section. All exceptions shall be clearly identified by referencing respective paragraph and other requirements. Next to each specification item, indicate the following:

1. “No Exception Taken”.
2. “Exception”. All exceptions shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.

B. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Steel Pipe Sleeves: ASTM A53/A53M, Type E, Grade B, Schedule 40, galvanized, with plain ends and integral welded water stop collar.

B. Galvanized-Steel Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

2.2 STACK-SLEEVE FITTINGS

A. Manufactured, cast-iron sleeve with integral clamping flange for use in waterproof floors and roofs. Include clamping ring, bolts, and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with setscrews.

2.3 SLEEVE-SEAL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Thunderline Modular Seals; Link-Seal
2. Metraflex Co.
3. Advance Products & Systems, Inc.

B. Description:

1. Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
2. Designed to form a hydrostatic seal of 20 psig minimum.
3. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
4. Pressure Plates: Stainless steel.
5. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.
6. Link-Seal shall be the basis of design.

2.4 GROUT

A. Description: Non-shrink, for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

A. Silicone, S, NS, 25, NT: Single-component, non-sag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant, ASTM C920, Type S, Grade NS, Class 25, Use NT.

B. Silicone, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint

sealant; ASTM C920, Type S, Grade P, Class 25, Uses T and NT. Grade P Pourable (self-leveling) formulation is for opening in floors and other horizontal surfaces that are not fire rated.

C. Silicone Foam: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, non-shrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Sleeves are not required for core-drilled holes, except where spill control is required

B. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

C. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes

D. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
2. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

E. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint.

F. Fire-Resistance-Rated Penetrations, Horizontal Assembly Penetrations, and Smoke Barrier Penetrations: Maintain indicated fire or smoke rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire- and smoke-stop materials. Comply with requirements for firestopping and fill materials specified in Section 078413 "Penetration Firestopping."

3.2 STACK-SLEEVE-FITTING INSTALLATION

A. Install stack-sleeve fittings in new slabs as slabs are constructed.

1. Install fittings that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
2. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing. Comply with requirements for flashing specified in Section 076200 "Sheet Metal Flashing and Trim."
3. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.
4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
5. Use silicone sealant to seal the space around outside of stack-sleeve fittings.

B. Fire-Resistance-Rated Penetrations, Horizontal Assembly Penetrations, and Smoke Barrier Penetrations: Maintain indicated fire or smoke rating of floors at pipe penetrations. Seal pipe penetrations with fire- and smoke-stop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.3 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.4 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position water stop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Use grout to seal the space around outside of sleeve-seal fittings.

3.5 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above Grade:

a. Piping Smaller Than NPS 6: Galvanized Steel pipe sleeves.
b. Piping NPS 6 and Larger: Galvanized Steel pipe sleeves .

2. Exterior Concrete Walls below Grade:

a. Piping Smaller Than NPS 6: Galvanized Steel pipe sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

b. Piping NPS 6 and Larger: Galvanized Steel pipe sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

3. Concrete Slabs-on-Grade:

a. Piping Smaller Than NPS 6: Galvanized steel pipe sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

b. Piping NPS 6 and Larger: Galvanized steel pipe sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

4. Concrete Slabs above Grade:

a. Piping Smaller Than NPS 6: Steel pipe sleeves.
b. Piping NPS 6 and Larger: Steel pipe sleeves.

5. Interior Partitions:

a. Piping Smaller Than NPS 6: Steel pipe sleeves.
b. Piping NPS 6 and Larger: Galvanized-steel sheet sleeves.

END OF SECTION

SECTION 220518 - ESCUTCHEONS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Escutcheons.
2. Floor plates.

1.3 DEFINITIONS

A. Existing Piping to Remain: Existing piping that is not to be removed and that is not otherwise indicated to be removed and salvaged, or removed and reinstalled.

1.4 ACTION SUBMITTALS

A. Submittals shall be formatted per Section 220000 “General Plumbing Requirements”. The manufacturer shall resubmit the specification section showing compliance with each respective paragraphs and specified items and features in that particular specification section. All exceptions shall be clearly identified by referencing respective paragraph and other requirements. Next to each specification item, indicate the following:

1. “No Exception Taken”.
2. “Exception”. All exceptions shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.

B. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. BrassCraft Manufacturing Co.; a Masco company.

2. Keeney Manufacturing Company (The).
3. Mid-America Fittings, Inc.

2.2 ESCUTCHEONS

A. One-Piece, Steel Type: With polished, chrome-plated finish and setscrew fastener.

B. One-Piece, Stainless-Steel Type: With polished stainless-steel finish.

C. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.

D. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped steel or brass with polished, chrome-plated finish and spring-clip fasteners.

E. One-Piece, Stamped-Steel Type: With polished, chrome-plated finish and spring-clip fasteners.

F. Split-Plate, Stamped-Steel Type: With polished, chrome-plated finish; concealed and exposed-rivet hinge; and spring-clip fasteners.

2.3 FLOOR PLATES

A. Split Floor Plates: Cast brass with concealed hinge.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.

1. Escutcheons for New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep pattern.
b. Chrome-Plated Piping: One-piece steel with polished, chrome-plated finish.
c. Insulated Piping: One-piece steel with polished, chrome-plated finish.
d. Insulated Piping: One-piece stainless steel with polished stainless-steel finish.
e. Insulated Piping: One-piece cast brass with polished, chrome-plated finish.
f. Insulated Piping: One-piece stamped steel with polished, chrome-plated finish.
g. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece steel with polished, chrome-plated finish.
h. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece stainless steel with polished stainless-steel finish.

i. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece cast brass with polished, chrome-plated finish.
j. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece stamped steel with polished, chrome-plated finish.
k. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece steel with polished, chrome-plated finish.
l. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece stainless steel with polished stainless-steel finish.
m. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece cast brass with polished, chrome-plated finish.
n. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece stamped steel with polished, chrome-plated finish.
o. Bare Piping in Unfinished Service Spaces: One-piece steel with polished, chrome-plated finish.
p. Bare Piping in Unfinished Service Spaces: One-piece cast brass with polished, chrome-plated finish.
q. Bare Piping in Unfinished Service Spaces: One-piece stamped steel with polished, chrome-plated finish.
r. Bare Piping in Equipment Rooms: One-piece steel with polished, chrome-plated finish.
s. Bare Piping in Equipment Rooms: One-piece cast brass with polished, chrome-plated finish.
t. Bare Piping in Equipment Rooms: One-piece stamped steel with polished, chrome-plated finish.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping One-piece, floor plate.

3.2 FIELD QUALITY CONTROL

A. Using new materials, replace broken and damaged escutcheons and floor plates.

END OF SECTION

SECTION 220519 - METERS AND GAGES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Bimetallic-actuated thermometers.
2. Filled-system thermometers.
3. Thermowells.
4. Dial-type pressure gages.
5. Gage attachments.
6. Test plugs.

B. Related Requirements:
1. Section 221119 "Domestic Water Piping Specialties" for water meters.

1.3 ACTION SUBMITTALS

A. Submittals shall be formatted per Section 220000 “General Plumbing Requirements”. The manufacturer shall resubmit the specification section showing compliance with each respective paragraphs and specified items and features in that particular specification section. All exceptions shall be clearly identified by referencing respective paragraph and other requirements. Next to each specification item, indicate the following:

1. “No Exception Taken”.
2. “Exception”. All exceptions shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.

B. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of meter and gage from manufacturer.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 BIMETALLIC-ACTUATED THERMOMETERS

A. Manufacturers

1. Ashcroft Commercial Inc.
2. Trerice, H. O. Co.
3. Weiss Instruments, Inc.
4. Or approved equal.

B. Standard: ASME B40.200.

C. Case: Liquid-filled and sealed type(s); stainless steel with 3-inch nominal diameter.

D. Dial: Nonreflective aluminum with permanently etched scale markings and scales in degrees F and degrees C.

E. Connector Type(s): Union joint, adjustable angle, with unified-inch screw threads.

F. Connector Size: 1/2 inch, with ASME B1.1 screw thread.

G. Stem: 0.25 or 0.375 inch in diameter; stainless steel.

H. Window: Double strength glass.

I. Ring: Stainless steel.

J. Element: Bimetal coil.

K. Pointer: Dark-colored metal.

L. Accuracy: Plus, or minus 1 percent of scale range.

2.2 FILLED-SYSTEM THERMOMETERS

A. Manufacturers

1. Ashcroft Commercial Inc.
2. Trerice, H. O. Co.
3. Weiss Instruments, Inc.
4. Or approved equal.

B. Direct-Mounted, Metal-Case, Vapor-Actuated Thermometers:

1. Standard: ASME B40.200.
2. Case: Sealed type, cast aluminum; 4-1/2-inch nominal diameter.
3. Element: Bourdon tube or other type of pressure element.
4. Movement: Mechanical, with link to pressure element and connection to pointer.
5. Dial: Nonreflective aluminum with permanently etched scale markings graduated in deg F.
6. Pointer: Dark-colored metal.
7. Window: Double strength glass.
8. Ring: Stainless steel.
9. Connector Type(s): Union joint, adjustable, 180 degrees in vertical plane, 360 degrees in horizontal plane, with locking device; with ASME B1.1 screw threads.
10. Thermal System: Liquid-filled bulb in copper-plated steel, aluminum, or brass stem and of length to suit installation.

    a. Design for Thermowell Installation: Bare stem.

11. Accuracy: Plus or minus 1 percent of scale range.

2.3 THERMOWELLS

A. Thermowells:

1. Standard: ASME B40.200.
2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
3. Material for Use with Copper Tubing: CNR or CUNI.
4. Material for Use with Steel Piping: CRES.
5. Type: Stepped shank unless straight or tapered shank is indicated.
6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, ASME B1.20.1 pipe threads.
7. Internal Threads: 1/2, 3/4, and 1 inch, with ASME B1.1 screw threads.
8. Bore: Diameter required to match thermometer bulb or stem.
9. Insertion Length: Length required to match thermometer bulb or stem.
10. Lagging Extension: Include on thermowells for insulated piping and tubing.
11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

B. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.4 PRESSURE GAGES

A. Manufacturers

1. Ashcroft Commercial Inc.
2. Trerice, H. O. Co.
3. Weiss Instruments, Inc.
4. Or approved equal.

B. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:

1. Standard: ASME B40.100.
2. Case: Liquid-filled type(s); cast aluminum; 4-1/2-inch nominal diameter.
3. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
4. Pressure Connection: Brass, with NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
5. Movement: Mechanical, with link to pressure element and connection to pointer.
6. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
7. Pointer: Dark-colored metal.
8. Window: Double strength glass.
9. Ring: Stainless steel.
10. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

2.5 GAGE ATTACHMENTS

A. Snubbers: ASME B40.100, brass; with NPS 1/2, ASME B1.20.1 pipe threads and piston-type surge-dampening device. Include extension for use on insulated piping.

B. Valves: Brass ball, with NPS 1/2, ASME B1.20.1 pipe threads.

2.6 TEST PLUGS

A. Description: Test-station fitting made for insertion into piping tee fitting.

B. Body: Brass or stainless steel with core inserts and gasketed and threaded cap. Include extended stem on units to be installed in insulated piping.

C. Thread Size: NPS 1/2, ASME B1.20.1 pipe thread.

D. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F.

E. Core Inserts: EPDM self-sealing rubber.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install thermowells with socket extending to center of pipe and in vertical position in piping tees.

B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

C. Install thermowells with extension on insulated piping.

D. Fill thermowells with heat-transfer medium.

E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

F. Provide remote-mounted thermometer bulbs in thermowells and install cases on panels; connect cases with tubing and support tubing to prevent kinks. Use minimum tubing length.

G. Provide direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.

H. Install remote-mounted pressure gages on panel.

I. Provide valve and snubber in piping for each pressure gage for fluids.

J. Provide test plugs in piping tees.

K. Provide thermometers in the following locations:

1. Inlet and outlet of each water heater.
2. Inlets and outlets of each domestic water heat exchanger.
3. Inlet and outlet of each domestic hot-water storage tank.
4. Inlet and outlet of each remote domestic water chiller.

L. Provide pressure gages in the following locations:

1. Building water service entrance into building.
2. Inlet and outlet of each pressure-reducing valve.
3. Suction and discharge of each domestic water pump.

3.2 CONNECTIONS

A. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.

3.3 ADJUSTING

A. Adjust faces of meters and gages to proper angle for best visibility.

3.4 THERMOMETER SCHEDULE

A. Thermometers at inlet and outlet of each domestic water heater shall be one of the following:

1. Liquid-filled, bimetallic-actuated type.

B. Thermometers at inlets and outlets of each domestic water heat exchanger shall be one of the following:

1. Liquid-filled, bimetallic-actuated type.

C. Thermometers at inlet and outlet of each domestic hot-water storage tank shall be one of the following:

1. Liquid-filled, bimetallic-actuated type.

D. Thermometer stems shall be of length to match thermowell insertion length.

3.5 THERMOMETER SCALE-RANGE SCHEDULE

A. Scale Range for Domestic Cold-Water Piping: 0 to 100 deg F.

B. Scale Range for Domestic Cold-Water Piping: 0 to 150 deg F.

C. Scale Range for Domestic Cold-Water Piping: 30 to 240 deg F.

D. Scale Range for Domestic Hot-Water Piping: 0 to 250 deg F.

E. Scale Range for Domestic Hot-Water Piping: 20 to 240 deg F.

F. Scale Range for Domestic Hot-Water Piping: 30 to 240 deg F.

3.6 PRESSURE-GAGE SCHEDULE

A. Pressure gages at discharge of each water service into building shall be one of the following:

1. Liquid-filled, direct-mounted, metal case.

B. Pressure gages at inlet and outlet of each water pressure-reducing valve shall be one of the following:

1. Liquid-filled, direct-mounted, metal case.

C. Pressure gages at suction and discharge of each domestic water pump shall be one of the following:

1. Liquid-filled, direct-mounted, metal case.

3.7 PRESSURE-GAGE SCALE-RANGE SCHEDULE

A. Scale Range for Water Service Piping: 0 to 100 psi.

B. Scale Range for Water Service Piping: 0 to 160 psi.

C. Scale Range for Water Service Piping: 0 to 200 psi.

D. Scale Range for Domestic Water Piping: 0 to 100 psi.

E. Scale Range for Domestic Water Piping: 0 to 160 psi.

F. Scale Range for Domestic Water Piping: 0 to 200 psi.

G. Scale Range for Domestic Water Piping: 0 to 300 psi.

END OF SECTION

SECTION 220523 – GENERAL DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Brass ball valves.
2. Bronze ball valves.
3. Bronze lift check valves.
4. Bronze swing check valves.
5. Bronze gate valves.
6. CPVC ball valves.
7. CPVC swing check valves.
8. Chainwheels.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene-diene terpolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. NRS: Nonrising stem.

E. OS&Y: Outside screw and yoke.

F. RS: Rising stem.

G. SWP: Steam working pressure.

1.4 ACTION SUBMITTALS

A. Submittals shall be formatted per Section 220000 “General Plumbing Requirements”. The manufacturer shall resubmit the specification section showing compliance with each respective paragraphs and specified items and features in that particular specification section. All **exceptions** shall be clearly identified by referencing respective paragraph and other requirements. Next to each specification item, indicate the following:

1. “No Exception Taken”.
2. “Exception”. All exceptions shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.

B. Product Data: For each type of valve.

1. Certification that products comply with NSF 61and NSF 372.

C. The Manufacturer, Contractor or Supplier Shall Include A Written Statement That The Submitted Equipment, Hardware Or Accessory Complies With The Requirement Of This Particular Specification Section.

1. The Manufacturer Shall Resubmit This Specification Section Showing Compliance with Each Respective Paragraphs and Specified Items And Features.
2. All Exceptions Shall Be Clearly Identified by Referencing Respective Paragraph And Other Requirements Along With Proposed Alternative.
3. Individual or Partial Submittals Are Not Acceptable and Will Be Returned Without Review.

1.5 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
2. ASME B31.1 for power piping valves.
3. ASME B31.9 for building services piping valves

C. NSF Compliance: NSF 61 for valve materials for potable-water service.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, and soldered ends.
3. Protect threads, flange faces, grooves, and weld ends.
4. Set ball valves open to minimize exposure of functional surfaces.
5. Set check valves in either closed or open position.
6. Set gate valves closed to prevent rattling.
7. Set butterfly valves closed or slightly open.

B. Use the following precautions during storage:

1. Maintain valve end protection.

2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use operating handles or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B1.20.1 for threads for threaded end valves.
2. ASME B16.1 for flanges on iron valves.
3. ASME B16.5 for flanges on steel valves.
4. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
5. ASME B16.18 for solder-joint connections.
6. ASME B31.9 for building services piping valves.

C. AWWA Compliance: Comply with AWWA C606 for grooved-end connections.

D. NSF Compliance: NSF 61 and NSF 372 for valve materials for potable-water service.

E. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.

F. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

G. RS Valves in Insulated Piping: With 2-inch stem extensions.

H. Valve Sizes: Same as upstream piping unless otherwise indicated.

I. Valve Bypass and Drain Connections: MSS SP-45.

J. Valve Actuator Types:

1. Gear Actuator: For quarter-turn valves NPS 8 and larger.
2. Handlever: For quarter-turn valves smaller than NPS 6.
3. Chainwheel: Device for attachment to gear, handlever, or stem; of size and with chain for mounting height, according to "Valve Installation" Article.

K. Valves in Insulated Piping:

1. Include 2-inch stem extensions.

2. Extended operating handles of nonthermal-conductive material and protective sleeves that allow operation of valves without breaking vapor seals or disturbing insulation.
3. Memory stops that are fully adjustable after insulation is applied.

2.2 BRASS BALL VALVES

A. Brass Ball Valves, Two-Piece with Full Port and Brass Trim, Threaded or Soldered Ends:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Apollo Flow Controls; Conbraco Industries, Inc.
    b. NIBCO INC.
    c. Red White Valve Corp.

2. Description:

    a. Standard: MSS SP-110 or MSS SP-145.
    b. CWP Rating: 600 psig.
    c. Body Design: Two piece.
    d. Body Material: Forged brass.
    e. Ends: Threaded and soldered.
    f. Seats: PTFE.
    g. Stem: Brass.
    h. Ball: Chrome-plated brass.
    i. Port: Full.

B. Brass Ball Valves, Three-Piece with Full Port and Brass Trim:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Jomar Valve.
    b. KITZ Corporation.
    c. WATTS.

2. Description:

    a. Standard: MSS SP-110.
    b. CWP Rating: 600 psig.
    c. Body Design: Three piece.
    d. Body Material: Forged brass.
    e. Ends: Threaded and soldered.
    f. Seats: PTFE.
    g. Stem: Brass.
    h. Ball: Chrome-plated brass.
    i. Port: Full.

2.3 BRONZE BALL VALVES

A. Bronze Ball Valves, One-Piece with Bronze Trim:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Apollo Flow Controls; Conbraco Industries, Inc.
    b. NIBCO INC.
    c. WATTS.

2. Description:

    a. Standard: MSS SP-110.
    b. CWP Rating: 400 psig.
    c. Body Design: One piece.
    d. Body Material: Bronze.
    e. Ends: Threaded.
    f. Seats: PTFE.
    g. Stem: Bronze.
    h. Ball: Chrome-plated brass.
    i. Port: Reduced.

B. Bronze Ball Valves, Two-Piece with Full Port, and Bronze or Brass Trim, Threaded or Soldered Ends:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Apollo Flow Controls; Conbraco Industries, Inc.
    b. Milwaukee Valve Company.
    c. NIBCO INC.

2. Description:

    a. Standard: MSS SP-110 or MSS-145.
    b. CWP Rating: 600 psig.
    c. Body Design: Two piece.
    d. Body Material: Bronze.
    e. Ends: Threaded and soldered.
    f. Seats: PTFE.
    g. Stem: Bronze or brass.
    h. Ball: Chrome-plated brass.
    i. Port: Full.

C. Bronze Ball Valves, Two-Piece with Full Port, and Bronze or Brass Trim, Press Ends:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Apollo Flow Controls; Conbraco Industries, Inc.
    b. NIBCO INC.
    c. WATTS.

2. Description:

    a. Standard: MSS SP-110 or MSS-145.
    b. CWP Rating: Minimum 200 psig.
    c. Body Design: Two piece.
    d. Body Material: Bronze.
    e. Ends: Press.
    f. Press Ends Connections Rating: Minimum 200 psig.
    g. Seats: PTFE or RTPFE.
    h. Stem: Bronze or brass.
    i. Ball: Chrome-plated brass.
    j. Port: Full.
    k. O-Ring Seal: EPDM or Buna-N.

D. Bronze Ball Valves, Two-Piece with Full Port and Stainless-Steel Trim:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Apollo Flow Controls; Conbraco Industries, Inc.
    b. NIBCO INC.
    c. WATTS.

2. Description:

    a. Standard: MSS SP-110 or MSS-145.
    b. CWP Rating: 600 psig.
    c. Body Design: Two piece.
    d. Body Material: Bronze.
    e. Ends: Threaded or soldered.
    f. Seats: PTFE.
    g. Stem: Stainless steel.
    h. Ball: Stainless steel, vented.
    i. Port: Full.

E. Bronze Ball Valves, Three-Piece with Full Port and Bronze or Brass Trim:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Apollo Flow Controls; Conbraco Industries, Inc.

b. NIBCO INC.
c. WATTS.

2. Description:

a. Standard: MSS SP-110.
b. CWP Rating: 600 psig.
c. Body Design: Three piece.
d. Body Material: Bronze.
e. Ends: Threaded.
f. Seats: PTFE.
g. Stem: Bronze or brass.
h. Ball: Chrome-plated brass.
i. Port: Full.

2.4 BRONZE SWING CHECK VALVES

A. Bronze Swing Check Valves with Bronze Disc, Class 125:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Apollo Flow Controls; Conbraco Industries, Inc.
b. NIBCO INC.
c. Stockham; Crane Energy Flow Solutions.

2. Description:

a. Standard: MSS SP-80, Type 3.
b. CWP Rating: 200 psig.
c. Body Design: Horizontal flow.
d. Body Material: ASTM B 62, bronze.
e. Ends: Threaded or soldered. See valve schedule articles.
f. Disc: Bronze.

B. Bronze Swing Check Valves with Nonmetallic Disc, Class 125:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Apollo Flow Controls; Conbraco Industries, Inc.
b. Crane; Crane Energy Flow Solutions.
c. NIBCO INC.

2. Description:

a. Standard: MSS SP-80, Type 4.
b. CWP Rating: 200 psig.

c. Body Design: Horizontal flow.
d. Body Material: ASTM B 62, bronze.
e. Ends: Threaded or soldered. See valve schedule articles.
f. Disc: PTFE.

C. Bronze Swing Check Valves with Bronze Disc, Class 150:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Apollo Flow Controls; Conbraco Industries, Inc.
b. Crane; Crane Energy Flow Solutions.
c. NIBCO INC.

2. Description:

a. Standard: MSS SP-80, Type 3.
b. CWP Rating: 300 psig.
c. Body Design: Horizontal flow.
d. Body Material: ASTM B 62, bronze.
e. Ends: Threaded or soldered. See valve schedule articles.
f. Disc: Bronze.

D. Bronze Swing Check Valves with Nonmetallic Disc, Class 150:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Crane; Crane Energy Flow Solutions.
b. Milwaukee Valve Company.
c. NIBCO INC.

2. Description:

a. Standard: MSS SP-80, Type 4.
b. CWP Rating: 300 psig.
c. Body Design: Horizontal flow.
d. Body Material: ASTM B 62, bronze.
e. Ends: Threaded or soldered. See valve schedule articles.
f. Disc: PTFE.

2.5 BRONZE GATE VALVES

A. Bronze Gate Valves, NRS, Class 125:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Apollo Flow Controls; Conbraco Industries, Inc.
b. KITZ Corporation.
c. NIBCO INC.

2. Description:

a. Standard: MSS SP-80, Type 1.
b. CWP Rating: 200 psig.
c. Body Material: Bronze with integral seat and screw-in bonnet.
d. Ends: Threaded or solder joint.
e. Stem: Bronze.
f. Disc: Solid wedge; bronze.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron, bronze, or aluminum.

B. Bronze Gate Valves, RS, Class 125:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Apollo Flow Controls; Conbraco Industries, Inc.
b. KITZ Corporation.
c. NIBCO INC.

2. Description:

a. Standard: MSS SP-80, Type 2.
b. CWP Rating: 200 psig.
c. Body Material: Bronze with integral seat and screw-in bonnet.
d. Ends: Threaded or solder joint.
e. Stem: Bronze.
f. Disc: Solid wedge; bronze.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron, bronze, or aluminum.

C. Bronze Gate Valves, NRS, Class 150:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Apollo Flow Controls; Conbraco Industries, Inc.
b. NIBCO INC.
c. WATTS.

2. Description:

a. Standard: MSS SP-80, Type 1.
b. CWP Rating: 300 psig.
c. Body Material: Bronze with integral seat and union-ring bonnet.

d. Ends: Threaded.
e. Stem: Bronze.
f. Disc: Solid wedge; bronze.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron, bronze, or aluminum.

D. Bronze Gate Valves, RS, Class 150:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Apollo Flow Controls; Conbraco Industries, Inc.
b. NIBCO INC.
c. WATTS.

2. Description:

a. Standard: MSS SP-80, Type 2.
b. CWP Rating: 300 psig.
c. Body Material: Bronze with integral seat and union-ring bonnet.
d. Ends: Threaded.
e. Stem: Bronze.
f. Disc: Solid wedge; bronze.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron, bronze, or aluminum.

2.6 CPVC BALL VALVES

A. CPVC Ball Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Georg Fischer Inc.
b. IPEX USA LLC.
c. Spears Manufacturing Company.

2. Description:

a. Standard: MSS SP-122.
b. Pressure Rating and Temperature: 125 psig or 150 psig at 73 deg F temperature.
c. Body Material: CPVC.
d. Body Design: Union or Non-Union type.
e. End Connections for Valves NPS 2 and Smaller: Detachable, socket or threaded.
f. End Connections for Valves NPS 2-1/2 to NPS 4: Detachable, socket, threaded or flanged.
g. Ball: CPVC; full port.

h. Seals: PTFE or EPDM-rubber O-rings.
i. Handle: Tee shaped.

2.7 CPVC BALL CHECK VALVES

A. CPVC Ball Check Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Georg Fischer Inc.
b. IPEX USA LLC.
c. Spears Manufacturing Company.

2. Description:

a. Standard: MSS SP-122.
b. Pressure Rating and Temperature: 125 psig or 150 psig.
c. Body Material: CPVC.
d. Body Design: Union or Non-Union ball check.
e. End Connections for Valves NPS 2 and Smaller: Detachable, socket or threaded.
f. End Connections for Valves NPS 2-1/2 to NPS 4: Detachable, socket, threaded or flanged.
g. Ball: CPVC.
h. Seals: EPDM or FKM-rubber O-rings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install valve tags. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

F. Check Valves: Install check valves for proper direction of flow.

1. Swing Check Valves: In horizontal position with hinge pin level.
2. Center-Guided and Plate-Type Check Valves: In horizontal or vertical position, between flanges.
3. Lift Check Valves: With stem upright and plumb.

G. Install chainwheels on operators for gate valves NPS 4 and larger and more than 96 inches above floor. Extend chains to 60 inches above finished floor.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If ball valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.

B. Select valves with the following end connections:

1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option or press-end option is indicated in valve schedules below.
2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
3. For Grooved-End Copper Tubing and Steel Piping: Grooved.

C. If check valve applications are not indicated, use the following:

1. Pump-Discharge Check Valves:

a. NPS 2 and Smaller: Bronze swing check valves with bronze or nonmetallic disc.

b. NPS 2-1/2 and Larger for Domestic Water: Iron swing check valves with lever and weight or spring; or iron, center-guided, metal-seat or resilient-seat check valves.

D. Use gate valves for shutoff service only.

3.5 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Brass ball valve, one piece. Provide with threaded or solder-joint ends.
2. Bronze ball valve, one piece with bronze or stainless-steel trim. Provide with threaded or solder-joint ends.
3. Brass ball valves, two-piece with full-port and brass or stainless-steel trim. Provide with threaded or solder-joint ends.
4. Bronze ball valves, two-piece with full-port and bronze, brass or stainless-steel trim. Provide with threaded or solder-joint ends.
5. Brass ball valves, three-piece with full port and brass or stainless-steel trim.
6. Bronze ball valves, three-piece with full port and bronze, brass or stainless-steel trim.
7. Bronze ball valves, two-piece with regular port and bronze or stainless-steel trim.
8. Bronze swing check valves with bronze disc, Class 125 or Class 150, with soldered or threaded end connections.
9. Bronze gate valves, NRS, RS, Class 125 or Class 150 with soldered or threaded ends.

B. Pipe NPS 2-1/2 and Larger:

1. Steel and Iron Valves, NPS 2-1/2 to NPS 4: May be provided with threaded ends instead of flanged ends.
2. Steel ball valves, Class 150 with full-port.
3. Iron ball valves, Class 150.
4. Iron swing check valves with metal seats, Class 125 or Class 250, with threaded or flanged end connections.
5. Iron swing check valves with closure control lever and spring or weight, Class 125, with threaded or flanged end connections.
6. Iron, grooved-end swing check valves, 300 CWP.
7. Iron, center-guided check valves with compact wafer, Class 125, Class 150, Class 250 or Class 300.
8. Iron, center-guided check valves with globe, metal, resilient seat, Class 125, Class 150, Class 250 or Class 300, with threaded or flanged end connections.
9. Iron, dual-plate check valves with metal, resilient seat, Class 125, Class 150, Class 250 or Class 300, with threaded or flanged end connections.
10. Iron, single-plate check valves with resilient seat, Class 125 or Class 250, with threaded or flanged end connections.
11. Iron gate valves, NRS, OS&Y, Class 125 or Class 250 with flanged ends.
12. Iron, Single-Flange Butterfly Valves: 200 CWP, EPDM or NBR seat, aluminum-bronze, ductile-iron or stainless-steel disc.
13. Ductile-Iron, Grooved-End Butterfly Valves: 175 or 300 CWP.

END OF SECTION

SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal hanger-shield inserts.
5. Fastener systems.
6. Pipe stands.
7. Pipe-positioning systems.
8. Equipment supports.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Section 220516 "Expansion Fittings and Loops for Plumbing Piping" for pipe guides and anchors.
3. Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment"

1.3 ACTION SUBMITTALS

A. Submittals shall be formatted per Section 220000 “General Plumbing Requirements”. The manufacturer shall resubmit the specification section showing compliance with each respective paragraphs and specified items and features in that particular specification section. All **exceptions** shall be clearly identified by referencing respective paragraph and other requirements. Next to each specification item, indicate the following:

1. “No Exception Taken”.
2. “Exception”. All exceptions shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.

B. Product Data: For each type of product indicated including component cut-sheets and pre-approved details.

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Environmental Product Declaration: For each product.
3. Health Product Declaration: For each product.
4. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.

C. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:

1. Trapeze pipe hangers.
2. Metal framing systems.
3. Pipe stands.
4. Equipment supports.

D. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of trapeze hangers.
2. Include design calculations for designing trapeze hangers.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.5 QUALITY ASSURANCE

A. Structural-Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M.

B. Pipe Welding Qualifications: Qualify procedures and operators according to 2015 ASME Boiler and Pressure Vessel Code, Section IX.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design trapeze pipe hangers and equipment supports.

B. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.

2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

2.2 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized, hot-dip galvanized, or electro-galvanized.
3. Nonmetallic Coatings: Plastic coated or epoxy powder coated.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel stainless steel.

B. Stainless-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

C. Copper Pipe and Tube Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel stainless steel.

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-58, Type 59, shop- or field-fabricated pipe-support assembly, made from structural-carbon-steel shapes, with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.4 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. B-line, an Eaton business.
b. Flex-Strut Inc.
c. Unistrut; Part of Atkore International.

2. Description: Shop- or field-fabricated pipe-support assembly, made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
3. Standard: Comply with MFMA-4, factory-fabricated components for field assembly.
4. Channels: Continuous slotted carbon-steel stainless-steel, Type 304 stainless-steel, Type 316 extruded-aluminum Insert material channel with inturned lips.
5. Channel Width: Selected for applicable load criteria.
6. Channel Nuts: Formed or stamped nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
7. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel stainless steel.
8. Metallic Coating: No coating Plain Pregalvanized G90 Electroplated zinc Hot-dip galvanized Gold (yellow zinc dichromate) galvanized.
9. Paint Coating: Green epoxy, acrylic, or urethane.
10. Plastic Coating: PVC.
11. Combination Coating: .

B. Non-MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Anvil International.
    b. PHD Manufacturing, Inc.
    c. Sioux Chief Manufacturing Company, Inc.

2. Description: Shop- or field-fabricated pipe-support assembly, made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
3. Standard: Comply with MFMA-4, factory-fabricated components for field assembly.
4. Channels: Continuous slotted carbon-steel stainless-steel channel with inturned lips.
5. Channel Width: Select for applicable load criteria.
6. Channel Nuts: Formed or stamped nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
7. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel stainless steel.
8. Metallic Coating: No coating Plain Pregalvanized G90 Hot-dip galvanized
9. Paint Coating: Green epoxy, acrylic, or urethane.
10. Plastic Coating: PVC.

2.5 THERMAL HANGER-SHIELD INSERTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. National Pipe Hanger Corporation.
2. Pipe Shields Inc.
3. Piping Technology & Products, Inc.

B. Insulation-Insert Material for Cold Piping: ASTM C552, Type II cellular glass with 100-psig minimum compressive strength and vapor barrier.

C. Insulation-Insert Material for Hot Piping: Water-repellent-treated, ASTM C533, Type I calcium silicate with 100-psig ASTM C552, Type II cellular glass with 100-psig minimum compressive strength.

D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.6 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Hilti, Inc.
b. ITW Ramset/Red Head; Illinois Tool Works, Inc.
c. Simpson Strong-Tie Co., Inc.

B. Mechanical-Expansion Anchors: Insert-wedge-type anchors, for use in hardened portland cement concrete, with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. B-line, an Eaton business.
b. Hilti, Inc.
c. ITW Ramset/Red Head; Illinois Tool Works, Inc.

2. Indoor Applications: Zinc-coated or stainless steel.
3. Outdoor Applications: Stainless steel.

2.7 PIPE STANDS

A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

B. Compact Pipe Stand:

1. Description: Single base unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.
2. Base: Single, vulcanized rubber, molded polypropylene, or polycarbonate.
3. Hardware: Galvanized steel or polycarbonate.
4. Accessories: Protection pads.

C. Low-Profile, Single-Base, Single-Pipe Stand:

1. Description: Single base with vertical and horizontal members, and pipe support, for roof installation without membrane protection.
2. Base: Single, vulcanized rubber, molded polypropylene, or polycarbonate.
3. Vertical Members: Two galvanized stainless-steel, continuous-thread, 1/2-inch rods.
4. Horizontal Member: Adjustable horizontal, galvanized stainless-steel pipe support channels.
5. Pipe Supports: Roller Strut clamps Clevis hanger Swivel hanger.
6. Hardware: Galvanized Stainless steel.
7. Accessories: Protection pads.
8. Height: 12 inches above roof.

D. High-Profile, Single-Base, Single-Pipe Stand:

1. Description: Single base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.
2. Base: Single vulcanized rubber or molded polypropylene.

3. Vertical Members: Two galvanized stainless-steel, continuous-thread, 1/2-inch rods.
4. Horizontal Member: One adjustable-height, galvanized- or stainless-steel, pipe-support slotted channel or plate.
5. Pipe Supports: Roller Clevis hanger Swivel hanger.
6. Hardware: Galvanized Stainless steel.
7. Accessories: Protection pads, 1/2-inch, continuous-thread, galvanized-steel rod, 1/2-inch, continuous-thread, stainless-steel rod.
8. Height: 36 inches above roof.

E. High-Profile, Multiple-Pipe Stand:

1. Description: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.
2. Bases: Two or more; vulcanized rubber molded polypropylene.
3. Vertical Members: Two or more, galvanized stainless-steel channels.
4. Horizontal Members: One or more, adjustable-height, galvanized stainless-steel pipe support.
5. Pipe Supports: Roller Strut clamps Clevis hanger Swivel hanger.
6. Hardware: Galvanized Stainless steel.
7. Accessories: Protection pads, 1/2-inch, continuous-thread rod.
8. Height: 36 inches above roof.

F. Curb-Mounted-Type Pipe Stands: Shop- or field-fabricated pipe supports made from structural-steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.

2.8 PIPE-POSITIONING SYSTEMS

A. Description: IAPMO PS 42 positioning system composed of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.9 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-carbon-steel shapes.

2.10 MATERIALS

A. Aluminum: ASTM B221.

B. Carbon Steel: ASTM A1011/A1011M.

C. Structural Steel: ASTM A36/A36M carbon-steel plates, shapes, and bars; black and galvanized.

D. Stainless Steel: ASTM A240/A240M.

E. Grout: ASTM C1107/C1107M, factory-mixed and -packaged, dry, hydraulic-cement, non-shrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Non-staining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation, for penetrations through fire-rated walls, ceilings, and assemblies.

B. Strength of Support Assemblies: Where not indicated, select sizes of components, so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

3.2 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-58. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-58. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size, or install intermediate supports for smaller-diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A36/A36M carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Fiberglass Pipe-Hanger Installation: Comply with applicable portions of MSS SP-58. Install hangers and attachments as required to properly support piping from building structure.

D. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.

E. Thermal Hanger-Shield Installation: Install in pipe hanger or shield for insulated piping.

F. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete, after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete, after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

G. Pipe Stand Installation:

1. Pipe Stand Types, except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. See Section 077200 "Roof Accessories" for curbs.

H. Pipe-Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.

I. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

J. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

K. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

L. Install lateral bracing with pipe hangers and supports to prevent swaying.

M. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

N. Load Distribution: Install hangers and supports, so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

O. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

P. Insulated Piping:

1. Attach clamps and spacers to piping.

    a. Piping Operating Above Ambient Air Temperature: Clamp may project through insulation.
    b. Piping Operating Below Ambient Air Temperature: Use thermal hanger-shield insert with clamp sized to match OD of insert.
    c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39 protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

    a. Option: Thermal hanger-shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40 protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

    a. Option: Thermal hanger-shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

    a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
    b. NPS 4: 12 inches long and 0.06 inch thick.
    c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
    d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
    e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.

6. Thermal Hanger Shields: Install with insulation of same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections, so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.6 PAINTING

A. Touchup: Clean field welds and abraded, shop-painted areas. Paint exposed areas immediately after erecting hangers and supports. Use same materials as those used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded, shop-painted areas on miscellaneous metal are specified in Section 099113 "Exterior Painting." Section 099123 "Interior Painting." Section 099600 "High-Performance Coatings."

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas, and apply galvanizing-repair paint to comply with ASTM A780/A780M.

3.7 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-58 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finishes.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports metal trapeze pipe hangers and metal framing systems and attachments for general service applications.

F. Use stainless-steel pipe hangers and stainless-steel or corrosion-resistant attachments for hostile environment applications.

G. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.

H. Use padded hangers for piping that is subject to scratching.

I. Use thermal hanger-shield inserts for insulated piping and tubing.

J. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.

6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction occurs.
18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction occurs.
19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction occurs but vertical adjustment is unnecessary.
20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 if small horizontal movement caused by expansion and contraction occurs and vertical adjustment is unnecessary.
21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation, in addition to expansion and contraction, is required.

K. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

L. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment of up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11 split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

M. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable-Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

N. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.

2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal Hanger-Shield Inserts: For supporting insulated pipe.

O. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load, and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load, and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load, and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
8. Constant Supports: For critical piping stress and if necessary, to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:

    a. Horizontal (MSS Type 54): Mounted horizontally.
    b. Vertical (MSS Type 55): Mounted vertically.
    c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

P. Comply with MSS SP-58 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

Q. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

R. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

S. Use pipe-positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION

SECTION 220548 - VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Elastomeric isolation pads.
2. Elastomeric isolation mounts.
3. Restrained elastomeric isolation mounts.
4. Open-spring isolators.
5. Housed-spring isolators.
6. Restrained-spring isolators.
7. Housed-restrained-spring isolators.
8. Pipe-riser resilient supports.
9. Resilient pipe guides.
10. Elastomeric hangers.
11. Spring hangers.
12. Snubbers.
13. Restraint channel bracings.
14. Restraint cables.
15. Seismic-restraint accessories.
16. Mechanical anchor bolts.
17. Adhesive anchor bolts.

B. Related Requirements:

1. Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment" for devices for fire-suppression equipment and systems.
2. Section 230548 "Vibration and Seismic Controls for HVAC" for devices for HVAC equipment and systems.

1.3 DEFINITIONS

A. IBC: International Building Code.

B. ICC-ES: ICC-Evaluation Service.

C. OSHPD: Office of Statewide Health Planning & Development (for the State of California).

1.4 ACTION SUBMITTALS

A. Submittals shall be formatted per Section 220000 “General Plumbing Requirements”. The manufacturer shall resubmit the specification section showing compliance with each respective paragraphs and specified items and features in that particular specification section. All **exceptions** shall be clearly identified by referencing respective paragraph and other requirements. Next to each specification item, indicate the following:

1. “No Exception Taken”.
2. “Exception”. All exceptions shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.

B. Product Data: For each type of product.

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of vibration isolation device and seismic-restraint component required.

    a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an evaluation service member of ICC-ES OSHPD an agency acceptable to authorities having jurisdiction.
    b. Annotate to indicate application of each product submitted and compliance with requirements.

3. Interlocking Snubbers: Include ratings for horizontal, vertical, and combined loads.

C. Shop Drawings:

1. Detail fabrication and assembly of equipment bases. Detail fabrication including anchorages and attachments to structure and to supported equipment.

D. Delegated-Design Submittal: For each vibration isolation and seismic-restraint device.

1. Include design calculations and details for selecting vibration isolators and seismic restraints complying with performance requirements, design criteria, and analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
2. Design Calculations: Calculate static and dynamic loading due to equipment weight and operation, due to seismic forces required to select vibration isolators, and due to seismic restraints.
3. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, spring deflection changes, and seismic loads. Include certification that riser system was examined for excessive stress and that none exists.
4. Seismic-Restraint Details:

    a. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.

b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
c. Coordinate seismic-restraint and vibration isolation details with wind-restraint details required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.
d. Preapproval and Evaluation Documentation: By an evaluation service member of ICC-ES OSHPD an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Show coordination of vibration isolation device installation and seismic bracing for plumbing piping and equipment with other systems and equipment in the vicinity, including other supports and restraints, if any.

B. Qualification Data: For professional engineer and testing agency.

C. Welding certificates.

D. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7 and that is acceptable to authorities having jurisdiction.

B. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are unavailable, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic-Restraint Loading:

1. Site Class as Defined in the IBC: **F**.
2. Assigned Seismic Use Group or Building Category as Defined in the IBC: **III**.

    a. Component Importance Factor: **1.25.**
    b. Component Response Modification Factor: **5.0**.
    c. Component Amplification Factor: **5.0**.

3. Design Spectral Response Acceleration at Short Periods (0.2 Second): 1.8g
4. Design Spectral Response Acceleration at 1.0-Second Period: 2.71g.
5. Rated strengths, features, and applications shall be as defined in reports by an evaluation service member of ICC-ES OSHPD an agency acceptable to authorities having jurisdiction.

    a. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they are subjected.

2.2 ELASTOMERIC ISOLATION PADS

A. Elastomeric Isolation Pads:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Ace Mountings Co., Inc.
    b. California Dynamics Corporation.
    c. Isolation Technology, Inc.

2. Fabrication: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area.
3. Size: Factory or field cut to match requirements of supported equipment.
4. Pad Material: Oil and water resistant with elastomeric properties.
5. Surface Pattern: Smooth Ribbed Waffle pattern.
6. Infused nonwoven cotton or synthetic fibers.
7. Load-bearing metal plates adhered to pads.
8. Sandwich-Core Material: Resilient and elastomeric.

    a. Surface Pattern: Smooth Ribbed Waffle pattern.
    b. Infused nonwoven cotton or synthetic fibers.

2.3 ELASTOMERIC ISOLATION MOUNTS

A. Double-Deflection, Elastomeric Isolation Mounts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Ace Mountings Co., Inc.
    b. California Dynamics Corporation.
    c. Isolation Technology, Inc.

2. Mounting Plates:

    a. Top Plate: Encapsulated steel load transfer top plates, factory drilled and threaded with threaded studs or bolts.
    b. Baseplate: Encapsulated steel bottom plates with holes provided for anchoring to support structure.

3. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.4 RESTRAINED ELASTOMERIC ISOLATION MOUNTS

A. Restrained Elastomeric Isolation Mounts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Ace Mountings Co., Inc.
    b. California Dynamics Corporation.
    c. Isolation Technology, Inc.

2. Description: All-directional isolator with seismic restraints containing two separate and opposing elastomeric elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.

    a. Housing: Cast-ductile iron or welded steel.
    b. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.5 OPEN-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Ace Mountings Co., Inc.
    b. California Dynamics Corporation.
    c. Isolation Technology, Inc.

2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.

3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Baseplates: Factory-drilled steel plate for bolting to structure with an elastomeric isolator pad attached to the underside. Baseplates shall limit floor load to 500 psig.
7. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

2.6 HOUSED-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators in Two-Part Telescoping Housing:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Ace Mountings Co., Inc.
    b. California Dynamics Corporation.
    c. Isolation Technology, Inc.

2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Two-Part Telescoping Housing: A steel top and bottom frame separated by an elastomeric material and enclosing the spring isolators.

    a. Drilled base housing for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
    b. Top housing with attachment and leveling bolt threaded mounting holes and internal leveling device elastomeric pad.

2.7 RESTRAINED-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators with Vertical-Limit Stop Restraint:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Ace Mountings Co., Inc.
    b. California Dynamics Corporation.
    c. Isolation Technology, Inc.

2. Housing: Steel housing with vertical-limit stops to prevent spring extension due to weight being removed.

a. Base with holes for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
b. Top plate with threaded mounting holes elastomeric pad.
c. Internal leveling bolt that acts as blocking during installation.

3. Restraint: Limit stop as required for equipment and authorities having jurisdiction.
4. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
5. Minimum Additional Travel: 50 percent of the required deflection at rated load.
6. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
7. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.8 HOUSED-RESTRAINED-SPRING ISOLATORS

A. Freestanding, Steel, Open-Spring Isolators with Vertical-Limit Stop Restraint in Two-Part Telescoping Housing:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Ace Mountings Co., Inc.
b. California Dynamics Corporation.
c. Isolation Technology, Inc.

2. Two-Part Telescoping Housing: A steel top and bottom frame separated by an elastomeric material and enclosing the spring isolators. Housings are equipped with adjustable non-adjustable snubbers to limit vertical movement.

a. Drilled base housing for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
b. Threaded top housing with adjustment bolt and cap screw to fasten and level equipment.

3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.9 PIPE-RISER RESILIENT SUPPORT

A. Description: All-directional, acoustical pipe anchor consisting of two steel tubes separated by a minimum 1/2-inch-thick neoprene.

1. Vertical-Limit Stops: Steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions.

2. Maximum Load Per Support: 500 psig on isolation material providing equal isolation in all directions.

2.10 RESILIENT PIPE GUIDES

A. Description: Telescopic arrangement of two steel tubes or post and sleeve arrangement separated by a minimum 1/2-inch-thick neoprene.

1. Factory-Set Height Guide with Shear Pin: Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

2.11 ELASTOMERIC HANGERS

A. Elastomeric Mount in a Steel Frame with Upper and Lower Steel Hanger Rods:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Ace Mountings Co., Inc.
b. California Dynamics Corporation.
c. Isolation Technology, Inc.

2. Frame: Steel, fabricated with a connection for an upper threaded hanger rod and an opening on the underside to allow for a maximum of 30 degrees of angular lower hanger-rod misalignment without binding or reducing isolation efficiency.

3. Dampening Element: Molded, oil-resistant rubber, neoprene, or other elastomeric material with a projecting bushing for the underside opening preventing steel to steel contact.

2.12 SPRING HANGERS

A. Combination Coil-Spring and Elastomeric-Insert Hanger with Spring and Insert in Compression:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Ace Mountings Co., Inc.
b. California Dynamics Corporation.
c. Kinetics Noise Control, Inc.

2. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.

4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
7. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
8. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.
9. Self-centering hanger-rod cap to ensure concentricity between hanger rod and support spring coil.

2.13 SNUBBERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Kinetics Noise Control, Inc.
2. Mason Industries, Inc.
3. Novia; A Division of C&P.

B. Description: Factory fabricated using welded structural-steel shapes and plates, anchor bolts, and replaceable resilient isolation washers and bushings.

1. Anchor bolts for attaching to concrete shall be seismic-rated, drill-in, and stud-wedge or female-wedge type.
2. Resilient Isolation Washers and Bushings: Oil- and water-resistant neoprene.
3. Maximum 1/4-inch air gap, and minimum 1/4-inch-thick resilient cushion.

2.14 RESTRAINT CHANNEL BRACINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. B-line, an Eaton business.
2. Hilti, Inc.
3. Mason Industries, Inc.

B. Description: MFMA-4, shop- or field-fabricated bracing assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.15 RESTRAINT CABLES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CADDY; a brand of nVent.

2. Gripple Inc.
3. Kinetics Noise Control, Inc.

B. Restraint Cables: ASTM A603 galvanized ASTM A492 stainless-steel cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; with a minimum of two clamping bolts for cable engagement.

2.16 SEISMIC-RESTRAINT ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. B-line, an Eaton business.
2. CADDY; a brand of nVent.
3. TOLCO.

B. Hanger-Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections Reinforcing steel angle clamped to hanger rod.

C. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to rigid channel bracings and restraint cables.

D. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings and matched to type and size of anchor bolts and studs.

E. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings and matched to type and size of attachment devices used.

F. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.17 MECHANICAL ANCHOR BOLTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. B-line, an Eaton business.
2. Hilti, Inc.
3. Mason Industries, Inc.

B. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E488.

2.18 ADHESIVE ANCHOR BOLTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hilti, Inc.
2. Kinetics Noise Control, Inc.
3. Mason Industries, Inc.

B. Adhesive Anchor Bolts: Drilled-in and capsule anchor system containing PVC or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E488.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by an evaluation service member of ICC-ES OSHPD an agency acceptable to authorities having jurisdiction.

B. Hanger-Rod Stiffeners: Install hanger-rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength is adequate to carry present and future static and seismic loads within specified loading limits.

3.3 VIBRATION CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete."

B. Installation of vibration isolators must not cause any change of position of equipment, piping, or ductwork resulting in stresses or misalignment.

C. Comply with requirements in Section 077200 "Roof Accessories" for installation of roof curbs, equipment supports, and roof penetrations.

D. Equipment Restraints:

1. Install seismic snubbers on plumbing equipment mounted on vibration isolators. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure.
2. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
3. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES OSHPD an agency acceptable to authorities having jurisdiction that provides required submittals for component.

E. Piping Restraints:

1. Comply with requirements in MSS SP-127.
2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
3. Brace a change of direction longer than 12 feet.

F. Install cables so they do not bend across edges of adjacent equipment or building structure.

G. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES OSHPD an agency acceptable to authorities having jurisdiction that provides required submittals for component.

H. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.

I. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

J. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

K. Drilled-in Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.

3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque, using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment. Comply with requirements in Section 221116 "Domestic Water Piping" for piping flexible connections.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.
3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
5. Test to 90 percent of rated proof load of device.
6. Measure isolator restraint clearance.
7. Measure isolator deflection.
8. Verify snubber minimum clearances.

D. Remove and replace malfunctioning units and retest as specified above.

E. Prepare test and inspection reports.

3.6 ADJUSTING

A. Adjust isolators after piping system is at operating weight.

B. Adjust limit stops on restrained-spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

END OF SECTION

SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Stencils.
5. Valve tags.
6. Warning tags.

1.3 ACTION SUBMITTALS

A. Submittals shall be formatted per Section 220000 “General Plumbing Requirements”. The manufacturer shall resubmit the specification section showing compliance with each respective paragraphs and specified items and features in that particular specification section. All **exceptions** shall be clearly identified by referencing respective paragraph and other requirements. Next to each specification item, indicate the following:

1. “No Exception Taken”.
2. “Exception”. All exceptions shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.

B. Product Data: For each type of product indicated.

C. Samples: For color, letter style, and graphic representation required for each identification material and device.

D. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

E. Valve numbering scheme.

F. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

1.5 GENERAL

A. Manufacturers:

1. Craftmark Identification Systems
2. Seton Identification Products
3. Setmark

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Brady Corporation.
   b. Marking Services, Inc.
   c. Seton Identification Products.

2. Material and Thickness: Brass, 0.032-inch or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
3. Letter Color: White.
4. Background Color: Red.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Brady Corporation.
b. Marking Services, Inc.
c. Seton Identification Products.

2. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
3. Letter Color: White.
4. Background Color: Red.
5. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
6. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
7. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
8. Fasteners: Stainless-steel rivets or self-tapping screws.
9. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Brady Corporation.
2. Marking Services, Inc.
3. Seton Identification Products.

B. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick and having predrilled holes for attachment hardware.

C. Letter Color: Black.

D. Background Color: Yellow.

E. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

F. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

G. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

H. Fasteners: Stainless-steel rivets or self-tapping screws.

I. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

J. Label Content: Include caution and warning information plus emergency notification instructions.

2.3 PIPE LABELS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Actioncraft Products, Inc.; a division of Industrial Test Equipment Co., Inc.
2. Brady Corporation.
3. Seton Identification Products.

B. Do not use pipe labels or plastic tapes for bare pipes conveying fluids at temperatures of 125 deg F (52 deg C) or higher.

C. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

D. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

E. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

F. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping-system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: Size letters according to ASME A13.1 for piping.

2.4 STENCILS

A. Stencils for Piping:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Brimar Industries, Inc.
b. Marking Services, Inc.
c. Seton Identification Products.

2. Lettering Size: Size letters according to ASME A13.1 for piping.
3. Stencil Material: Brass.
4. Stencil Paint: Exterior, gloss, alkyd enamel or acrylic enamel in colors complying with recommendations in ASME A13.1 unless otherwise indicated. Paint may be in pressurized spray-can form.
5. Identification Paint: Exterior, alkyd enamel or acrylic enamel in colors according to ASME A13.1 unless otherwise indicated. Paint may be in pressurized spray-can form.

2.5 VALVE TAGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Actioncraft Products, Inc.; a division of Industrial Test Equipment Co., Inc.
2. Brady Corporation.
3. Brimar Industries, Inc.

B. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass wire-link chain or beaded chain or S-hook.

C. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

2.6 WARNING TAGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Brady Corporation.
2. Brimar Industries, Inc.
3. Carlton Industries, LP.

B. Description: Preprinted or partially preprinted accident-prevention tags of plasticized card stock with matte finish suitable for writing.

1. Size: Approximately 4 by 7 inches.

2. Fasteners: Brass grommet and wire.
3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
4. Color: Safety yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surface of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

3.3 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.4 PIPE LABEL INSTALLATION

A. Piping Color Coding: Painting of piping is specified in Section 099123 "Interior Painting."

B. Stenciled Pipe Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels, complying with ASME A13.1, with painted, color-coded bands or rectangles on each piping system.

1. Identification Paint: Use for contrasting background.
2. Stencil Paint: Use for pipe marking.

C. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.

3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

D. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.

E. Pipe Label Color Schedule:

1. Domestic Water Piping

a. Background: Safety green.
b. Letter Colors: White.

2. Sanitary Waste and Storm Drainage Piping:

a. Background Color: Safety green.
b. Letter Color: White.

3.5 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves, valves within factory-fabricated equipment units, shutoff valves, faucets, convenience and lawn-watering hose connections, and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size and Shape:

a. Cold Water: 2 inches, round.
b. Hot Water: 2 inches, round.

2. Valve-Tag Colors:

a. Cold Water: Natural.
b. Hot Water: Natural.

3. Letter Colors:

a. Cold Water: Black White.
b. Hot Water: Black.

3.6 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION

SECTION 220719 - PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes insulating the following plumbing piping services:

1. Domestic cold-water piping.
2. Domestic hot-water piping.
3. Domestic recirculating hot-water piping.
4. Domestic chilled-water piping for drinking fountains.
5. Supplies and drains for handicap-accessible lavatories and sinks.

1.3 ACTION SUBMITTALS

A. Submittals shall be formatted per Section 220000 “General Plumbing Requirements”. The manufacturer shall resubmit the specification section showing compliance with each respective paragraphs and specified items and features in that particular specification section. All **exceptions** shall be clearly identified by referencing respective paragraph and other requirements. Next to each specification item, indicate the following:

1. “No Exception Taken”.
2. “Exception”. All exceptions shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.

B. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied, if any).

C. Sustainable Design Submittals:

1. Product Data: For adhesives, mastics, and sealants, indicating VOC content.
2. Laboratory Test Reports: For adhesives, mastics, and sealants, indicating compliance with requirements for low-emitting materials.

D. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail insulation application at pipe expansion joints for each type of insulation.

3. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
4. Detail removable insulation at piping specialties, equipment connections, and access panels.
5. Detail application of field-applied jackets.
6. Detail application at linkages of control devices.

E. Samples: For each type of insulation and jacket indicated. Identify each Sample, describing product and intended use. Sample sizes are as follows:

1. Preformed Pipe Insulation Materials: 12 inches long by NPS 2.
2. Jacket Materials for Pipe: 12 inches long by NPS 2.
3. Sheet Jacket Materials: 12 inches square.
4. Manufacturer's Color Charts: For products where color is specified, show the full range of colors available for each type of finish material.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

C. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

C. Mockups: Before installing insulation, build mockups for each type of insulation and finish listed below to demonstrate quality of insulation application and finishes. Build mockups in the location indicated or, if not indicated, as directed by Architect. Use materials indicated for the completed Work.

1. Piping Mockups:

    a. One 10-foot section of NPS 2 straight pipe.
    b. One each of a 90-degree threaded, welded, and flanged elbow.
    c. One each of a threaded, welded, and flanged tee fitting.
    d. One NPS 2 or smaller valve, and one NPS 2-1/2 or larger valve.
    e. Four support hangers including hanger shield and insert.
    f. One threaded strainer and one flanged strainer with removable portion of insulation.
    g. One threaded reducer and one welded reducer.
    h. One pressure temperature tap.
    i. One mechanical coupling.

2. For each mockup, fabricate cutaway sections to allow observation of application details for insulation materials, adhesives, mastics, attachments, and jackets.
3. Notify Architect seven days in advance of dates and times when mockups will be constructed.
4. Obtain Architect's approval of mockups before starting insulation application.
5. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
7. Demolish and remove mockups when directed.

D. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.8 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C534, Type I for tubular materials.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Aeroflex USA, Inc.
    b. Armacell LLC.
    c. K-Flex USA.

G. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C553, Type II and ASTM C1290, Type I. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. CertainTeed Corporation.
    b. Johns Manville; a Berkshire Hathaway company.
    c. Owens Corning.

H. Mineral-Fiber, Preformed Pipe Insulation:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Johns Manville; a Berkshire Hathaway company.
    b. Manson Insulation Inc.
    c. Owens Corning.

2. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C547, Type I, Grade A, with factory-applied ASJ with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

I. Phenolic:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Resolco Inc.

2. Preformed pipe insulation of rigid, expanded, closed-cell structure. Comply with ASTM C1126, Type III, Grade 1.
3. Block insulation of rigid, expanded, closed-cell structure. Comply with ASTM C1126, Type II, Grade 1.
4. Factory fabricate shapes according to ASTM C450 and ASTM C585.
5. Factory-Applied Jacket: ASJ. Requirements are specified in "Factory-Applied Jackets" Article.

2.2 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C195.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Ramco Insulation, Inc.

B. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C196.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Ramco Insulation, Inc.

C. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C449.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Ramco Insulation, Inc.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Aeroflex USA, Inc.
b. Armacell LLC.
c. K-Flex USA.

C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Childers Brand; H. B. Fuller Construction Products.
b. Foster Brand; H. B. Fuller Construction Products.
c. Eagle Bridges - Marathon Industries.

D. Phenolic Adhesive: Solvent-based resin adhesive, with a service temperature range of minus 75 to plus 300 deg F.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Childers Brand; H. B. Fuller Construction Products.
b. Foster Brand; H. B. Fuller Construction Products.

E. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Childers Brand; H. B. Fuller Construction Products.
b. Foster Brand; H. B. Fuller Construction Products.
c. Mon-Eco Industries, Inc.

F. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Johns Manville; a Berkshire Hathaway company.
b. P.I.C. Plastics, Inc.

c. Dow Corning Corporation.

2.4 MASTICS AND COATINGS

A. Materials shall be compatible with insulation materials, jackets, and substrates.

1. Mastics: As recommended by insulation manufacturer and with a VOC content of 50 g/L or less.
2. Mastics shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Vapor-Retarder Mastic: Water based; suitable for indoor use on below-ambient services.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Childers Brand; H. B. Fuller Construction Products.
b. Foster Brand; H. B. Fuller Construction Products.
c. Knauf Insulation.

2. Water-Vapor Permeance: Comply with ASTM C755, Section 7.2.2, Table 2, for insulation type and service conditions.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D1644, 58 percent by volume and 70 percent by weight.
5. Color: White.

C. Vapor-Retarder Mastic: Solvent based; suitable for indoor use on below-ambient services.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Childers Brand; H. B. Fuller Construction Products.
b. Foster Brand; H. B. Fuller Construction Products.
c. Eagle Bridges - Marathon Industries.

2. Water-Vapor Permeance: Comply with ASTM C755, Section 7.2.2, Table 2, for insulation type and service conditions.
3. Service Temperature Range: 0 to 180 deg F.
4. Color: White.

D. Vapor-Retarder Mastic: Solvent based; suitable for outdoor use on below-ambient services.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Childers Brand; H. B. Fuller Construction Products.
b. Foster Brand; H. B. Fuller Construction Products.
c. Eagle Bridges - Marathon Industries.

2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mil dry film thickness.
3. Service Temperature Range: Minus 50 to plus 220 deg F.
4. Color: White.

E. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Childers Brand; H. B. Fuller Construction Products.
b. Foster Brand; H. B. Fuller Construction Products.
c. Knauf Insulation.
d. Vimasco Corporation.

2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Color: White.

2.5 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C, Class I, Grade A, and shall be compatible with insulation materials, jackets, and substrates.

1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Childers Brand; H. B. Fuller Construction Products.
b. Foster Brand; H. B. Fuller Construction Products.
c. Vimasco Corporation.

3. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over pipe insulation.
4. Service Temperature Range: 0 to plus 180 deg F.
5. Color: White.

2.6 SEALANTS

A. Joint Sealants for Phenolic Products:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Childers Brand; H. B. Fuller Construction Products.
    b. Foster Brand; H. B. Fuller Construction Products.
    c. Pittsburgh Corning Corporation.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Permanently flexible, elastomeric sealant.
4. Service Temperature Range: Minus 100 to plus 300 deg F.
5. Color: White or gray.
6. Sealant shall have a VOC content of 420 g/L or less.
7. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
8.

B. FSK and Metal Jacket Flashing Sealants:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Childers Brand; H. B. Fuller Construction Products.
    b. Foster Brand; H. B. Fuller Construction Products.
    c. Eagle Bridges - Marathon Industries.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.

C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Childers Brand; H. B. Fuller Construction Products.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.

2.7 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C1136, Type II.

2.8 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Glass-Fiber Fabric: Approximately 2 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in. for covering pipe and pipe fittings.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Childers Brand; H. B. Fuller Construction Products.

B. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in., in a Leno weave, for pipe.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Foster Brand; H. B. Fuller Construction Products.
b. Vimasco Corporation.

2.9 FIELD-APPLIED CLOTHS

A. Woven Glass-Fiber Fabric: Comply with MIL-C-20079H, Type I, plain weave, and presized a minimum of 8 oz./sq. yd..

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Alpha Associates, Inc.

2.10 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C921, Type I, unless otherwise indicated.

B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Johns Manville; a Berkshire Hathaway company.
b. P.I.C. Plastics, Inc.
c. Proto Corporation.

2. Adhesive: As recommended by jacket material manufacturer.
3. Color: White.
4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

    a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

C. Metal Jacket:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. ITW Insulation Systems; Illinois Tool Works, Inc.
    b. RPR Products, Inc.

2. Aluminum Jacket: Comply with ASTM B209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.

    a. Factory cut and rolled to size.
    b. Finish and thickness are indicated in field-applied jacket schedules.
    c. Moisture Barrier for Indoor Applications: 3-mil-thick, heat-bonded polyethylene and kraft paper.
    d. Moisture Barrier for Outdoor Applications: 3-mil-thick, heat-bonded polyethylene and kraft paper.
    e. Factory-Fabricated Fitting Covers:

        1) Same material, finish, and thickness as jacket.
        2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
        3) Tee covers.
        4) Flange and union covers.
        5) End caps.
        6) Beveled collars.
        7) Valve covers.
        8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

D. Underground Direct-Buried Jacket: 125-mil-thick vapor barrier and waterproofing membrane consisting of a rubberized bituminous resin reinforced with a woven-glass fiber or polyester scrim and laminated aluminum foil.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Pittsburgh Corning Corporation.
    b. Polyguard Products, Inc.

2.11 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C1136.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Avery Dennison Corporation, Specialty Tapes Division.
b. Ideal Tape Co., Inc., an American Biltrite Company.
c. Knauf Insulation.

2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C1136.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Avery Dennison Corporation, Specialty Tapes Division.
b. Ideal Tape Co., Inc., an American Biltrite Company.
c. Knauf Insulation.

2. Width: 3 inches.
3. Thickness: 6.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Ideal Tape Co., Inc., an American Biltrite Company.

2. Width: 2 inches.
3. Thickness: 6 mils.
4. Adhesion: 64 ounces force/inch in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch in width.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Avery Dennison Corporation, Specialty Tapes Division.
    b. Ideal Tape Co., Inc., an American Biltrite Company.
    c. Knauf Insulation.

2. Width: 2 inches.
3. Thickness: 3.7 mils.
4. Adhesion: 100 ounces force/inch in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch in width.

2.12 SECUREMENTS

A. Bands:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. ITW Insulation Systems; Illinois Tool Works, Inc.
    b. RPR Products, Inc.

2. Stainless Steel: ASTM A167 or ASTM A240/A240M, Type 304; 0.015 inch thick, 3/4 inch wide with wing seal or closed seal.
3. Aluminum: ASTM B209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with wing seal or closed seal.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.

C. Wire: 0.080-inch nickel-copper alloy 0.062-inch soft-annealed, stainless steel 0.062-inch soft-annealed, galvanized steel.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. C & F Wire.

2.13 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. McGuire Manufacturing. (With integral insulation).
    b. Or equal products.

2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

B. Protective Shielding Piping Enclosures: (Subject to architect's approval).

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Truebro.
b. Zurn Industries, LLC.

2. Description: Manufactured plastic enclosure for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with ADA requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:

1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

    1. Install insulation continuously through hangers and around anchor attachments.
    2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
    3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
    4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

    1. Draw jacket tight and smooth.
    2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
    3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches 4 inches o.c.

a. For below-ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.

3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily

removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.

6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.8 INSTALLATION OF PHENOLIC INSULATION

A. General Installation Requirements:

1. Secure single-layer insulation with stainless-steel bands at 12-inch intervals and tighten bands without deforming insulation materials.
2. Install 2-layer insulation with joints tightly butted and staggered at least 3 inches. Secure inner layer with 0.062-inch wire spaced at 12-inch intervals. Secure outer layer with stainless-steel bands at 12-inch intervals.

B. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets with vapor retarders on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

C. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of block insulation of same material and thickness as pipe insulation.

D. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed insulation sections of same material as straight segments of pipe insulation. Secure according to manufacturer's written instructions.

E. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed insulation sections of same material as straight segments of pipe insulation. Secure according to manufacturer's written instructions.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.9 FIELD-APPLIED JACKET INSTALLATION

A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.

1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
2. Embed glass cloth between two 0.062-inch-thick coats of lagging adhesive.
3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch-wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

C. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

D. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.10 FINISHES

A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.11 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

E. All adhesive shall be as recommended by cellular glass manufacturer and with a VOC content of 80 g/L or less.

F. Per ASHRAE 189.1, All adhesives and sealants shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

3.12 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.13 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Hot and Recirculated Hot Water:

1. NPS 3/4 and Smaller: Insulation shall be one of the following:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

2. NPS 1 and Larger: Insulation shall be one of the following:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

B. Floor Drains, Traps, and Sanitary Drain Piping within 10 Feet of Drain Receiving Condensate and Equipment Drain Water below 60 Deg F:

1. All Pipe Sizes: Insulation shall be the following:
   a. Flexible Elastomeric: 1 inch thick.
   b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

3.14 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. Piping, Concealed: None.

C. Piping, Exposed: PVC, Color-Coded by system, 30 mils thick for all indoor applications.

3.15 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. Piping, Concealed: None.

C. Piping, Exposed: Aluminum, Stucco Embossed, 0.024 inch thick.

END OF SECTION

SECTION 221116 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Copper tube and fittings.
2. CPVC piping.
3. PEX tube and fittings.
4. Piping joining materials.
5. Encasement for piping.
6. Transition fittings.
7. Dielectric fittings.

1.3 ACTION SUBMITTALS

A. Submittals shall be formatted per Section 220000 “General Plumbing Requirements”. The manufacturer shall resubmit the specification section showing compliance with each respective paragraphs and specified items and features in that particular specification section. All **exceptions** shall be clearly identified by referencing respective paragraph and other requirements. Next to each specification item, indicate the following:

1. “No Exception Taken”.
2. “Exception”. All exceptions shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.

B. Product Data: For transition fittings and dielectric fittings.

C. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating VOC content.
2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.

1.4 INFORMATIONAL SUBMITTALS

A. System purging and disinfecting activities report.

B. Field quality-control reports.

1.5 FIELD CONDITIONS

A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:

1. Notify Architect, Construction Manager and/or Owner no fewer than two days in advance of proposed interruption of water service.
2. Do not interrupt water service without Architect's, Construction Manager's and/or Owner's written permission.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

B. Potable-water piping and components shall comply with NSF 14, NSF 61, and NSF 372. Include marking "NSF-pw" on applicable piping.

2.2 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L and ASTM B 88, Type K water tube, drawn temper.

B. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.

C. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

D. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.

E. Copper Unions:

1. MSS SP-123.
2. Cast-copper-alloy, hexagonal-stock body.
3. Ball-and-socket, metal-to-metal seating surfaces.
4. Solder-joint or threaded ends.

F. Copper, Brass, or Bronze Pressure-Seal-Joint Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Apollo Flow Controls; Conbraco Industries, Inc.
b. Mueller Industries, Inc.
c. NIBCO INC.

2. Fittings: Cast-brass, cast-bronze or wrought-copper with EPDM O-ring seal in each end. Sizes NPS 2-1/2 and larger with stainless steel grip ring and EPDM O-ring seal.

3. Minimum 200-psig working-pressure rating at 250 deg F.

G. Appurtenances for Grooved-End Copper Tubing:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Anvil International.
b. Shurjoint-Apollo Piping Products USA Inc.
c. Victaulic Company.

2. Bronze Fittings for Grooved-End, Copper Tubing: ASTM B 75/B 75M copper tube or ASTM B 584 bronze castings.
3. Mechanical Couplings for Grooved-End Copper Tubing:

a. Copper-tube dimensions and design similar to AWWA C606.
b. Ferrous housing sections.
c. EPDM-rubber gaskets suitable for hot and cold water.
d. Bolts and nuts.
e. Minimum Pressure Rating: 300 psig.

2.3 CPVC PIPING

A. CPVC Pipe: ASTM F 441/F 441M, Schedule 40 and Schedule 80.

1. CPVC Socket Fittings: ASTM F 438 for Schedule 40 and ASTM F 439 for Schedule 80.
2. CPVC Threaded Fittings: ASTM F 437, Schedule 80.

B. CPVC Piping System: ASTM D 2846/D 2846M, SDR 11, pipe and socket fittings.

C. CPVC Tubing System: ASTM D 2846/D 2846M, SDR 11, tube and socket fittings.

2.4 PEX TUBE AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Apollo Flow Controls; Conbraco Industries, Inc.

2. Elkhart Products Corporation.
3. IPEX USA LLC.

B. Tube Material: PEX plastic according to ASTM F 876 and ASTM F 877.

C. Fittings: ASTM F 1807, metal insert and copper crimp rings ASTM F 1960, cold expansion fittings and reinforcing rings.

D. Fittings: ASSE 1061, push-fit fittings.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. SharkBite; a division of Reliance Worldwide Corporation.
b. Zurn Industries, LLC.

E. Manifold: Multiple-outlet, plastic or corrosion-resistant-metal assembly complying with ASTM F 876; with plastic or corrosion-resistant-metal valve for each outlet.

2.5 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials:

1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
2. Full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys.

D. Flux: ASTM B 813, water flushable.

E. Brazing Filler Metals: AWS A5.8M/A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

F. Solvent Cements for Joining CPVC Piping and Tubing: ASTM F 493.

1. Solvent cement shall have a VOC content of 490 g/L or less.
2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

G. Solvent Cements for Joining PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

1. Solvent cement shall have a VOC content of 510 g/L or less.
2. Adhesive primer shall have a VOC content of 550 g/L or less.

3. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
4. Adhesive primer shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

H. Plastic, Pipe-Flange Gaskets, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

2.6 ENCASEMENT FOR PIPING

A. Standard: ASTM A 674 or AWWA C105/A21.5.

B. Form: Sheet or tube.

C. Color: Black or natural.

2.7 TRANSITION FITTINGS

A. General Requirements:

1. Same size as pipes to be joined.
2. Pressure rating at least equal to pipes to be joined.
3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

C. Sleeve-Type Transition Coupling: AWWA C219.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Dresser, Inc.
b. Jay R. Smith Mfg. Co.
c. JCM Industries, Inc.

D. Plastic-to-Metal Transition Fittings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Charlotte Pipe and Foundry Company.
b. Harvel Plastics, Inc.

c. Spears Manufacturing Company.

2. Description:

a. CPVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions.
b. One end with threaded brass insert and one solvent-cement-socket or threaded end.

E. Plastic-to-Metal Transition Unions:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Colonial Engineering, Inc.
b. NIBCO INC.
c. Spears Manufacturing Company.

2. Description:

a. CPVC four-part union.
b. Brass or stainless-steel threaded end.
c. Solvent-cement-joint or threaded plastic end.
d. Rubber O-ring.
e. Union nut.

2.8 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Central Plastics Company.
b. WATTS.
c. Wilkins.

2. Standard: ASSE 1079.
3. Pressure Rating: 125 psig minimum at 180 deg F.
4. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Central Plastics Company.
    b. WATTS.
    c. Wilkins.

2. Standard: ASSE 1079.
3. Factory-fabricated, bolted, companion-flange assembly.
4. Pressure Rating: 125 psig minimum at 180 deg F.
5. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Advance Products & Systems, Inc.
    b. Calpico, Inc.
    c. Central Plastics Company.

2. Nonconducting materials for field assembly of companion flanges.
3. Pressure Rating: 150 psig.
4. Gasket: Neoprene or phenolic.
5. Bolt Sleeves: Phenolic or polyethylene.
6. Washers: Phenolic with steel backing washers.

E. Dielectric Nipples:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Elster Perfection Corporation.
    b. Grinnell G-Fire by Johnson Controls Company.
    c. Precision Plumbing Products.

2. Standard: IAPMO PS 66.
3. Electroplated steel nipple complying with ASTM F 1545.
4. Pressure Rating and Temperature: 300 psig at 225 deg F.
5. End Connections: Male threaded or grooved.
6. Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Comply with requirements in Section 312000 "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Install underground copper tube in PE encasement according to ASTM A 674 or AWWA C105/A21.5.

D. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for pressure gages in Section 220519 "Meters and Gages for Plumbing Piping" and with requirements for drain valves and strainers in Section 221119 "Domestic Water Piping Specialties."

E. Install shutoff valve immediately upstream of each dielectric fitting.

F. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements for pressure-reducing valves in Section 221119 "Domestic Water Piping Specialties."

G. Install domestic water piping level with 0.25 percent slope downward toward drain and plumb.

H. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

I. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

J. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

K. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

L. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

M. Install piping to permit valve servicing.

N. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.

O. Install piping free of sags and bends.

P. Install fittings for changes in direction and branch connections.

Q. Install PEX tubing with loop at each change of direction of more than 90 degrees. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

R. Install pressure gages on suction and discharge piping for each plumbing pump and packaged booster pump. Comply with requirements for pressure gages in Section 220519 "Meters and Gages for Plumbing Piping."

S. Install thermostats in hot-water circulation piping. Comply with requirements for thermostats in Section 221123 "Domestic Water Pumps."

T. Install thermometers on inlet and outlet piping from each water heater. Comply with requirements for thermometers in Section 220519 "Meters and Gages for Plumbing Piping."

U. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

V. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

W. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.

E. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

F. Pressure-Sealed Joints for Copper Tubing: Join copper tube and pressure-seal fittings with tools and procedure recommended by pressure-seal-fitting manufacturer. Leave insertion marks on pipe after assembly.

G. Joint Construction for Grooved-End Copper Tubing: Make joints according to AWWA C606. Roll groove ends of tubes. Lubricate and install gasket over ends of tubes or tube and fitting. Install coupling housing sections over gasket with keys seated in tubing grooves. Install and tighten housing bolts.

H. Joint Construction for Grooved-End Steel Piping: Make joints according to AWWA C606. Roll groove ends of pipe as specified. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections over gasket with keys seated in piping grooves. Install and tighten housing bolts.

I. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

1. Joint Construction for Solvent-Cemented Plastic Piping: Clean and dry joining surfaces. Join pipe and fittings according to the following:Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements. Apply primer.
2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.

J. Joints for PEX Tubing: Join according to ASTM F 1807 for metal insert and copper crimp ring fittings and ASTM F 1960 for cold expansion fittings and reinforcing rings.

K. Joints for PEX Tubing: Join according to ASSE 1061 for push-fit fittings.

L. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.4 TRANSITION FITTING INSTALLATION

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Underground Domestic Water Piping:

1. Fittings for NPS 1-1/2 and Smaller: Fitting-type coupling.
2. Fittings for NPS 2 and Larger: Sleeve-type coupling.

C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 and Smaller: Plastic-to-metal transition fittings or unions.

3.5 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric couplings nipples or unions.

C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges, flange kits or nipples.

3.6 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Comply with requirements for hangers, supports, and anchor devices in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

1. Vertical Piping: MSS Type 8 or 42, clamps.
2. Individual, Straight, Horizontal Piping Runs:

    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.

E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
4. NPS 2-1/2: 108 inches with 1/2-inch rod.
5. NPS 3 to NPS 4: 10 feet with 1/2-inch rod.

F. Install supports for vertical copper tubing every 10 feet.

G. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4 and Smaller: 84 inches with 3/8-inch rod.
2. NPS 1-1/2: 108 inches with 3/8-inch rod.
3. NPS 2: 10 feet with 3/8-inch rod.
4. NPS 2-1/2: 11 feet with 1/2-inch rod.
5. NPS 3 and NPS 3-1/2: 12 feet with 1/2-inch rod.
6. NPS 4: 12 feet with 5/8-inch rod.

H. Install supports for vertical steel piping every 15 feet.

I. Support piping and tubing not listed in this article according to MSS SP-58 and manufacturer's written instructions.

J. Install hangers for copper tubing and piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

K. Install vinyl-coated hangers for CPVC piping, with maximum horizontal spacing and minimum rod diameters, to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent. Install vinyl-coated hangers for PEX tubing, with maximum horizontal spacing and minimum rod diameters, to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

L. Support horizontal piping within 12 inches of each fitting.

M. Support vertical runs of copper tubing and piping to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

N. Support vertical runs of CPVC piping to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.Support vertical runs of PEX tubing to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
   1. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.

2. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
3. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.8 IDENTIFICATION

A. Identify system components. Comply with requirements for identification materials and installation in Section 220553 "Identification for Plumbing Piping and Equipment."

B. Label pressure piping with system operating pressure.

3.9 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Piping Inspections:

a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.

c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:

a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials.

Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.

e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
f. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.10 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.

    a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
    b. Adjust calibrated balancing valves to flows indicated.

5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.11 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:

    a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    b. Fill and isolate system according to either of the following:

        1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.

2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.

c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
d. Repeat procedures if biological examination shows contamination.
e. Submit water samples in sterile bottles to authorities having jurisdiction.

B. Clean non-potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging procedures prescribed by authorities having jurisdiction or; if methods are not prescribed, follow procedures described below:

a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
b. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

C. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.

D. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.12 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.

D. Under-building-slab, domestic water, building-service piping, NPS 3 and smaller, shall be the following:

1. Hard copper tube, ASTM B 88, Type K; wrought-copper, solder-joint fittings; and brazed joints.

E. Under-building-slab, domestic water, building-service piping, NPS 4 to NPS 8 and larger, shall be one of the following:

1. Hard copper tube, ASTM B 88, Type K; wrought-copper, solder-joint fittings; and brazed joints.

F. Under-building-slab, domestic water piping, NPS 2 and smaller, shall be one of the following:

1. Hard copper tube, ASTM B 88, Type K; wrought-copper, solder-joint fittings; and brazed joints.

G. Aboveground domestic water piping, NPS 2 and smaller, shall be one of the following:
1. Hard copper tube, ASTM B 88, Type L; cast- or wrought-copper, solder-joint fittings; and brazed or soldered joints.
2. Hard copper tube, ASTM B 88, Type L; copper pressure-seal-joint fittings; and pressure-sealed joints.
3. CPVC, Schedule 40or Schedule 80; socket fittings; and solvent-cemented joints.
4. CPVC, Schedule 80 pipe; CPVC, Schedule 80 threaded fittings; and threaded joints.
5. CPVC Tubing System: CPVC tube; CPVC socket fittings; and solvent-cemented joints. NPS 1-1/2 and NPS 2 CPVC pipe with CPVC socket fittings may be used instead of tubing.
6. PEX tube, NPS 2 and smaller.

a. Fittings for PEX tube:

1) ASTM F 1807, metal insert and copper crimp rings.
2) ASTM F 1960, cold expansion fittings and reinforcing rings.
3) ASSE 1061, push-fit fittings.

H. Aboveground domestic water piping, NPS 2-1/2 to NPS 4, shall be one of the following:

1. Hard copper tube, ASTM B 88, Type L; cast- or wrought-copper, solder-joint fittings; and brazed or soldered joints.
2. Hard copper tube, ASTM B 88, Type L; copper pressure-seal-joint fittings; and pressure-sealed joints.
3. Hard copper tube, ASTM B 88, Type L; grooved-joint, copper-tube appurtenances; and grooved joints.
4. CPVC, Schedule 40 or Schedule 80; socket fittings; and solvent-cemented joints.
5. CPVC, Schedule 80 pipe; CPVC, Schedule 80 threaded fittings; and threaded joints.

3.13 VALVE SCHEDULE

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use ball or gate valves for piping NPS 2 and smaller. Use butterfly, ball, or gate valves with flanged ends for piping NPS 2-1/2 and larger.
2. Throttling Duty: Use ball or globe valves for piping NPS 2 and smaller. Use butterfly or ball valves with flanged ends for piping NPS 2-1/2 and larger.
3. Hot-Water Circulation Piping, Balancing Duty: Calibrated or Memory-stop balancing valves.
4. Drain Duty: Hose-end drain valves.

B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

C. Iron grooved-end valves may be used with grooved-end piping.

END OF SECTION

SECTION 221119 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Vacuum breakers.
2. Backflow preventers.
3. Water pressure-reducing valves.
4. Automatic water shutoff valves.
5. Balancing valves.
6. Temperature-actuated, water mixing valves.
7. Strainers.
8. Outlet boxes.
9. Hose bibbs.
10. Drain valves.
11. Water-hammer arresters.
12. Trap-seal primer valves.
13. Trap-seal primer systems.
14. Flexible connectors.
15. Water meters.

B. Related Requirements:

1. Section 220519 "Meters and Gauges for Plumbing Piping" for thermometers, pressure gages, and flow meters in domestic water piping.
2. Section 221116 "Domestic Water Piping" for water meters.
3. Section 224713 "Drinking Fountains" for water filters for water coolers.

1.3 ACTION SUBMITTALS

A. Submittals shall be formatted per Section 220000 “General Plumbing Requirements”. The manufacturer shall resubmit the specification section showing compliance with each respective paragraphs and specified items and features in that particular specification section. All **exceptions** shall be clearly identified by referencing respective paragraph and other requirements. Next to each specification item, indicate the following:

1. “No Exception Taken”.

2. “Exception”. All exceptions shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.

B. Product Data: For each type of product.

C. Shop Drawings: For domestic water piping specialties.

1. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

A. Potable-water piping and components shall comply with NSF 61 and NSF 14. Mark "NSF-pw" on plastic piping components.

B. Comply with NSF 372 for low lead.

2.2 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.3 VACUUM BREAKERS

A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following

a. Apollo Flow Controls; Conbraco Industries, Inc.
b. FEBCO; A WATTS Brand.
c. WATTS.
d. Zurn Industries, LLC.

2. Standard: ASSE 1001.
3. Size: NPS 1/4 to NPS 3, as required to match connected piping.
4. Body: Bronze.
5. Inlet and Outlet Connections: Threaded.
6. Finish: Rough bronzeor Chrome plated.

B. Hose-Connection Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following

    a. Apollo Flow Controls; Conbraco Industries, Inc.
    b. WATTS.
    c. Zurn Industries, LLC.

2. Standard: ASSE 1011.
3. Body: Bronze, nonremovable, with manual drain.
4. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
5. Finish: Chrome or nickel plated.

C. Pressure Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following

    a. Apollo Flow Controls; Conbraco Industries, Inc.
    b. FEBCO; A WATTS Brand.
    c. WATTS.
    d. Zurn Industries, LLC.

2. Standard: ASSE 1020.
3. Operation: Continuous-pressure applications.
4. Pressure Loss: 5 psig maximum, through middle third of flow range.
5. Size: Refer to Plumbing design drawings.
6. Design Flow Rate: Refer to Plumbing design drawings.
7. Selected Unit Flow Range Limits: Refer to Plumbing design drawings.
8. Pressure Loss at Design Flow Rate:Refer to Plumbing design drawings .
9. Accessories: Refer to Plumbing design drawings.

    a. Valves: Ball type, on inlet and outlet.

D. Spill-Resistant Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following

    a. Apollo Flow Controls; Conbraco Industries, Inc.
    b. WATTS.

c. Zurn Industries, LLC.

2. Standard: ASSE 1056.
3. Operation: Continuous-pressure applications.
4. Size: NPS ¼, NPS 3/8, NPS 1/2,, NPS 3/4or NPS 1.
5. Accessories: Refer to Plumbing design drawings.

a. Valves: Ball type, on inlet and outlet.

2.4 BACKFLOW PREVENTERS

A. Intermediate Atmospheric-Vent Backflow Preventers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following

a. Apollo Flow Controls; Conbraco Industries, Inc.
b. FEBCO; A WATTS Brand.
c. WATTS.
d. Zurn Industries, LLC.

2. Standard: ASSE 1012.
3. Operation: Continuous-pressure applications.
4. Size: NPS 1/2or NPS 3/4.
5. Body: Bronze.
6. End Connections: Union, solder joint.
7. Finish: Chrome platedor Rough bronze.

B. Reduced-Pressure-Principle Backflow Preventers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following

a. Ames Fire & Waterworks; A WATTS Brand.
b. FEBCO; A WATTS Brand.
c. WATTS.
d. Zurn Industries, LLC.

2. Standard: ASSE 1013.
3. Operation: Continuous-pressure applications.
4. Pressure Loss: 12 psig maximum, through middle third of flow range.
5. Size: Refer to Plumbing design drawings.
6. Design Flow Rate: Refer to Plumbing design drawings.
7. Selected Unit Flow Range Limits: Refer to Plumbing design drawings .
8. Pressure Loss at Design Flow Rate: Refer to Plumbing design drawings .
9. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approvedor stainless steel for NPS 2-1/2 and larger.

10. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
11. Configuration: Designed for horizontal, straight-throughor vertical-inlet, horizontal-center-section, and vertical-outlet flow.
12. Accessories:

    a. Valves NPS 2 and Smaller: Ball type with threaded ends on inlet and outlet.
    b. Valves NPS 2-1/2 and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.
    c. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

C. Double-Check, Backflow-Prevention Assemblies:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Apollo Flow Controls; Conbraco Industries, Inc.
    b. FEBCO; A WATTS Brand.
    c. WATTS.
    d. Zurn Industries, LLC.

2. Standard: ASSE 1015.
3. Operation: Continuous-pressure applications unless otherwise indicated.
4. Pressure Loss: 5 psig maximum, through middle third of flow range.
5. Size: Refer to Plumbing design drawings.
6. Design Flow Rate: Refer to Plumbing design drawings.
7. Selected Unit Flow Range Limits: Refer to Plumbing design drawings.
8. Pressure Loss at Design Flow Rate: Refer to Plumbing design drawings.
9. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approvedor stainless steel for NPS 2-1/2 and larger.
10. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
11. Configuration: Designed for horizontal, straight-through flow.
12. Accessories:

    a. Valves NPS 2 and Smaller: Ball type with threaded ends on inlet and outlet.
    b. Valves NPS 2-1/2 and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.

D. Dual-Check-Valve Backflow Preventers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Apollo Flow Controls; Conbraco Industries, Inc.
    b. FEBCO; A WATTS Brand.
    c. WATTS.
    d. Zurn Industries, LLC.

2. Standard: ASSE 1024.
3. Operation: Continuous-pressure applications.
4. Size: NPS 1/2, NPS 3/4, NPS 1or NPS 1-1/4.
5. Body: Bronze with union inlet.

E. Double-Check, Detector-Assembly Backflow Preventers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Apollo Flow Controls; Conbraco Industries, Inc.
    b. FEBCO; A WATTS Brand.
    c. WATTS.
    d. Zurn Industries, LLC.

2. Standard: ASSE 1048 and is FM Global approved or UL listed.
3. Operation: Continuous-pressure applications.
4. Pressure Loss: 5 psig maximum, through middle third of flow range.
5. Size: Refer to Plumbing design drawings.
6. Design Flow Rate: Refer to Plumbing design drawings.
7. Selected Unit Flow Range Limits: Refer to Plumbing design drawings.
8. Pressure Loss at Design Flow Rate: Refer to Plumbing design drawings.
9. Body: Cast iron or steel with interior lining that complies with AWWA C550 or that is FDA approvedor Stainless steel.
10. End Connections: Flanged.
11. Configuration: Designed for horizontal, straight-throughor vertical-inlet, horizontal-center-section, and vertical-outlet flow.
12. Accessories:

    a. Valves: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.
    b. Bypass: With displacement-type water meter, shutoff valves, and reduced-pressure backflow preventer.

F. Hose-Connection Backflow Preventers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Apollo Flow Controls; Conbraco Industries, Inc.
    b. WATTS.
    c. Woodford Manufacturing Company.

2. Standard: ASSE 1052.
3. Operation: Up to 10-foot head of water back pressure.
4. Inlet Size: NPS 1/2 or NPS 3/4.
5. Outlet Size: Garden-hose thread complying with ASME B1.20.7.
6. Capacity: At least 3-gpm flow.

G. Backflow-Preventer Test Kits:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Apollo Flow Controls; Conbraco Industries, Inc.
   b. FEBCO; A WATTS Brand.
   c. WATTS.
   d. Zurn Industries, LLC.

2. Description: Factory calibrated, with gages, fittings, hoses, and carrying case with test-procedure instructions.

2.5 WATER PRESSURE-REDUCING VALVES

A. Water Regulators:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Apollo Flow Controls; Conbraco Industries, Inc.
   b. Cash Acme; a division of Reliance Worldwide Corporation.
   c. WATTS.
   d. Zurn Industries, LLC.

2. Standard: ASSE 1003.
3. Pressure Rating: Initial working pressure of 150 psig.
4. Size: Refer to Plumbing design drawings .
5. Design Flow Rate: Refer to Plumbing design drawings.
6. Design Inlet Pressure: Refer to Plumbing design drawings.
7. Design Outlet Pressure Setting: Refer to Plumbing design drawings.
8. Body: Bronze with chrome-plated finish for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved for NPS 2-1/2 and NPS 3.
9. Valves for Booster Heater Water Supply: Include integral bypass.
10. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and NPS 3.

B. Water-Control Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Apollo Flow Controls; Conbraco Industries, Inc.
   b. CLA-VAL Automatic Control Valves.
   c. WATTS.
   d. Zurn Industries, LLC.

2. Description: Pilot-operated, diaphragm-type, single-seated, main water-control valve.

3. Pressure Rating: Initial working pressure of 150 psig minimum with AWWA C550 or FDA-approved, interior epoxy coating. Include small pilot-control valve, restrictor device, specialty fittings, and sensor piping.

4. Main Valve Body: Cast- or ductile-iron body with AWWA C550 or FDA-approved, interior epoxy coating; or stainless-steel body.

    a. Size: Refer to Plumbing design drawings NPS.
    b. Pattern: Angleor Globe-valve design.
    c. Trim: Stainless steel.

5. Design Flow: Refer to Plumbing design drawings.
6. Design Inlet Pressure: Refer to Plumbing design drawings.
7. Design Outlet Pressure Setting: Refer to Plumbing design drawings.
8. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.

2.6 AUTOMATIC WATER SHUTOFF VALVES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. DynaQuip Controls.
2. FloLogic, Inc.
3. OnSite PRO Inc.
4. QMI Manufacturing Inc.

B. Standards: NSF 61 and NSF 372.

C. Shutoff Control Ball Valve:

1. Size: NPS 1/2, NPS 3/4, NPS 1, NPS 1-1/4, NPS 1-1/2or NPS 2.
2. Design Flow Rate: Refer to Plumbing design drawings.
3. Design Inlet Pressure: Refer to Plumbing design drawings.
4. Control Valve: Two-piece, full-port brass ball valve, MSS SP-110.

    a. End Connections: Threaded, female.
    b. Seats: PTFE.
    c. O-Rings: FKM.
    d. Stem: Low lead brass. Blowout proof.
    e. CWP Rating: 600 psig.

5. Manual override control turn-knob for emergency operation of the valve.

D. Shutoff Control Butterfly Valve:

1. Size: NPS 2-1/2, NPS 3or NPS 4.
2. Compliance: MSS SP-67.
3. Full-port, epoxy-coated, ductile-iron lug body.
4. Seat: EPDM, minus 30 deg F to plus 250 deg F.
5. Face-to-Face Flange: ASME B16.5 flanges.
6. Disc Design: Floating stainless-steel dual shaft.
7. Disc Material: Iron nylon 11or Stainless steel.
8. Locating Pin: Carbon steel.
9. Bushings: PTFE.
10. O-Rings: EPDM.
11. Ten position stop.
12. Manual override control turn-knob for emergency operation of the valve.

E. Clothes Washer Shutoff Control Valve: Two-way, four-port, low-zinc bronze alloy valve.

1. End Connections: Male hose connections, NPS 3/4.
2. Pressure Rating: 400 psi at 32 to 150 deg F.
3. Maximum Test Pressure: 1200 psig.
4. Stem Travel: 0.16 inch.
5. Maximum Temperature: 250 deg F.
6. Valve Stem: Burnished Type 303 stainless steel.
7. Valve Stem Packing: Double EPDM.
8. Valve Seat: Integral bronze.
9. Valve Disc and Plunger: EPDM.
10. Valve Spring: Stainless steel.
11. Hoses: Two, 9-inch steel braided.
12. Hose End Connections: One straight and one 90-degree elbow connection; both hoses.

F. Clothes Washer Shutoff Control Valve Actuator: Two position, drive closed, spring open.

1. Housing: High-temperature composite glass-filled nylon.
2. Connection to Valve: NPT female brass ring.
3. Electric Motor: Reversible, brushless, and synchronism, maintains constant control speed to keep the cycle time constant. Maximum stem output is force balance controlled with electronic shutoff when end travel is detected in both directions.
4. Maximum Working Force: 48 lbf.
5. Power Requirements:

    a. Input Voltage: 24 V ac.
    b. Frequency: 60or 50 Hz.
    c. Current: 0.045 A.
    d. Power: 1 VA.

6. Power Supply: 120-V ac to 24-V ac transformer with cord and plug.
7. Working Time: 90 seconds.
8. Duty Rating: 100 percent.
9. Travel: 0.16 inch.
10. Position Indicator: Standard.
11. Working Temperature: 40 to 120 deg F.

12. Conform to CE and ROHS requirements.

G. Water Main Shutoff Valve Actuator: Motor operated, with or without gears, electric and electronic. Capable of closing valve against inlet pressure. Direct mount, two way; fails open/open or closed/closed.

1. Actuator Torque: 133or 266 in-lbf.
2. Power Requirements:

    a. Input Voltage: 12or 24 V dc.
    b. Frequency: 60or 50 Hz.
    c. Current: 2 A.
    d. Power: 15or 24 VA.

3. Power Supply: 120-V ac to 12or 24-V dc transformer with cord and plug.
4. Working Time: 8or 10 seconds.
5. Torque Limiter: STD.
6. Duty Rating: 50or 75 percent.
7. Protection: IP65or IP67.
8. Rotation: 90or 180 degrees.
9. Manual Intervention: Allowed.
10. Position Indicator: Standard.
11. Working Temperature: Minus 4 deg F to plus 131 deg F.

H. Domestic Water Heater Shutoff Valve Actuator: Motor operated, with or without gears, electric and electronic. Capable of closing valve against inlet pressure. Direct mount, two way; fails open/open or close/close.

1. Power Requirements:

    a. Input Voltage: 24 V ac.
    b. Frequency: 60or 50 Hz.
    c. Current: 0.6 A.
    d. Power: 15 VA.

2. Power Supply: 120-V ac to 24-V ac transformer with cord and plug.
3. Working Time: 45 seconds.
4. Rotation: 90 degrees.
5. Manual Intervention: Allowed.
6. Position Indicator: LED for closed position.
7. Working Temperature: 0 to 100 deg F.
8. Audible Alarm: 83 dB.

I. Actuator Enclosure: Suitable for ambient conditions encountered by application.

1. NEMA 250, Type 2 for indoor and protected applications.
2. Material: Self-extinguishing class techno-polymer.
3. .

J. Wireless Leak Detection Receiver System:

1. Onboard Battery Backup: 48 hours of protection. Valve to close prior to backup failure.
2. LED Indicators: Wireless signal strength, communication loss, water fault, low temperature fault, and low battery.
3. Output Contacts: Interface with home security or building automation system, cellular text notification service, or auto dialer accessories.
4. FCC Approved Wireless Communication System: Between devices; sensors, repeaters, and receivers:

    a. Proprietary 900-MHz wireless communication platform ensures system operation without Wi-Fi dependence or other communication platforms, subject to power and random service outages.
    b. Automatic wireless communication testing and positive confirmation ensure system devices remain active and working correctly. Automatic fault notification for lost communication or missing device.

5. Power Supply: 120 V ac or 9-V dc battery.
6. Dual Function Wireless Sensors: 2. Valve closes if temperature falls below 45 deg F.

    a. Wireless Signal Range: 100 feet between sensors and receiver.
    b. Custom range finding feature.
    c. LED Indicators: Wireless signal strength, communication loss, water fault, low temperature, and low battery.

7. Self-monitoring enabled system; faults for lost communication between receiver and sensor(s).
8. Closed-Loop RF System: System remains active even when power and Wi-Fi signals are lost.

K. Wired Leak Detection System: Local water sensor.

1. Power Supply: Class II transformer with cord and plug, 120 V ac, UL listed.

    a. Power Cord Length: 12 feet.

2. Control Panel: LED power and LED valves indicator.
3. Alarms: Audible alarm, with external output.
4. Wired Sensors:

    a. Quantity Per Receiver: 1to 6.
    b. Cable Length: 8, 25, 50or 100 feet.

5. Sensor Elevation: Elevated 1/2 inches above condensate drain pan.

L. Accessories:

1. Water Flow Sensors: Pipe-mounted to detect water flow.
2. Rope Sensor: Absorbent water sensing rope constructed from twisted metal conductor wires insulated from one another and surrounded by polyethylene mesh

braid jacket. Connect up to 100 feet (10 sections) of sensor rope to a single receiver.

3. Electrical Plug Interrupter: Plugs into standard 120-V ac wall outlet.
4. Gas Flow Interrupter: ECO Connector with female spade connectors. Factory prewired, 8 feet.
5. Gas Interface Cable: Interface cable with male and female connectors.
6. Step-Down Transformer: 120, 208or 240 V ac to 24 V ac with mounting plate, 12-foot plenum wire to power, and 8-foot plenum wire to sensor.
7. Liquid Level Sensors: Monitor fluid levels in addition to detecting plumbing leaks.
8. Auto Dialer: Send and receive automatic alerts when a fault condition occurs. Standard output contacts trigger up to nine predetermined telephone number calls.

    a. Prerecord message for future playback.
    b. 10-second recordable message.
    c. Built-in tamper switch.
    d. DC adaptor with battery backup.
    e. Programmable as a silent (dialer only) or audible (siren and dialer) alarm.
    f. Easy "Stop Call Sequence" - push "#" on phone to acknowledge the alarm and stop the dialing sequence.

9. Cellular Text Notification System.

    a. Event SMS text notification to up to three cell phones.
    b. Battery backup, four (4) AA batteries.
    c. 12-foot interface cable to leak detection system.
    d. Customized messaging.
    e. Wireless network service provider.

10. Cable Adder: 10, 25, 50or 100 feet in length.
11. Wireless Signal Repeater: Boosts signal performance between wireless sensors and receiver.

    a. Push-button pairing and unpairing, into and out of the network.
    b. Visual indication of wireless signal strength, low battery, and lost communication.
    c. Standard wall outlet, 120 V ac, power.
    d. Battery backup: Two (2) AA batteries for battery backup to maintain system integrity during a power outage.

12. Wireless Water Switch: Allows manual override or wireless system functionality and closes the valve to shut off water flow.
13. Hard-Wired Water Switch: Allows manual override or wireless system functionality and closes the valve to shut off water flow.

2.7 BALANCING VALVES

A. Temperature-based Balancing Valves:
    1. Manufacturers: As specified in Fixture Schedule on P0.03 or approved equal. Approved equal is subject to compliance with requirements, available

manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
a. Apollo Flow Controls; Conbraco Industries, Inc.
b. Milwaukee Valve Company.
c. NIBCO INC.
d. Caleffi
2. Standard: MSS SP-110 for two-piece, copper-alloy ball valves.
3. Pressure Rating: 400-psig minimum CWP.
4. Size: same as connected piping, but smaller than NPS 2.
5. Body: Copper alloy.
6. Port: Standard or full port.
7. Ball: Chrome-plated brass.
8. Seats and Seals: Replaceable.
9. End Connections: Solder joint or threaded.
10. Handle: Vinyl-covered steel with memory-setting device.

B. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.

2.8 TEMPERATURE-ACTUATED, WATER MIXING VALVES

A. Water-Temperature Limiting Devices:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Apollo Flow Controls; Conbraco Industries, Inc.
b. Leonard Valve Company.
c. POWERS; A WATTS Brand.
d. Symmons Industries, Inc.

2. Standard: ASSE 1017.
3. Pressure Rating: 125 psig.
4. Type: Thermostatically controlled, water mixing valve.
5. Material: Bronze body with corrosion-resistant interior components.
6. Connections: Threaded union inlets and outlet.
7. Accessories: Check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
8. Tempered-Water Setting: Refer to Plumbing design drawings.
9. Tempered-Water Design Flow Rate: Refer to Plumbing design drawings.
10. Valve Finish: Chrome platedor Rough bronze.

B. Primary, Thermostatic, Water Mixing Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Lawler Manufacturing Company, Inc.

b. Leonard Valve Company.
c. POWERS; A WATTS Brand.
d. Symmons Industries, Inc.

2. Standard: ASSE 1017.
3. Pressure Rating: 125 psig minimum unless otherwise indicated.
4. Type: Exposed-mounted or Cabinet-type, thermostatically controlled, water mixing valve.
5. Material: Bronze body with corrosion-resistant interior components.
6. Connections: Threaded union inlets and outlet.
7. Accessories: Manual temperature control, check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
8. Tempered-Water Setting: Refer to Plumbing design drawings.
9. Tempered-Water Design Flow Rate: Refer to Plumbing design drawings.
10. Selected Valve Flow Rate at 45-psig Pressure Drop: Refer to Plumbing design drawings.
11. Pressure Drop at Design Flow Rate: Refer to Plumbing design drawings.
12. Valve Finish: Polished, chrome plated or Rough bronze.
13. Piping Finish: Chrome plated or Copper.
14. Cabinet: Factory fabricated, stainless steel, for recessed or surface mounting and with hinged, stainless-steel door.

C. Individual-Fixture, Water Tempering Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Apollo Flow Controls; Conbraco Industries, Inc.
b. Lawler Manufacturing Company, Inc.
c. Leonard Valve Company.
d. POWERS; A WATTS Brand.
e. WATTS.

2. Standard: ASSE 1016, thermostatically controlled, water tempering valve.
3. Pressure Rating: 125 psig minimum unless otherwise indicated.
4. Body: Bronze body with corrosion-resistant interior components.
5. Temperature Control: Adjustable.
6. Inlets and Outlet: Threaded.
7. Finish: Rough or chrome-plated bronze.
8. Tempered-Water Setting: Refer to Plumbing design drawings.
9. Tempered-Water Design Flow Rate: Refer to Plumbing design drawings.

D. Primary Water Tempering Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Heat-Timer Corporation.

b. Holby Valve Inc.
c. Uponor.

2. Standard: ASSE 1017, thermostatically controlled, water tempering valve, listed as tempering valve.
3. Pressure Rating: 125 psig minimum unless otherwise indicated.
4. Body: Bronze.
5. Temperature Control: Manual.
6. Inlets and Outlet: Threaded.
7. Selected Primary Water Tempering Valve Size: Refer to Plumbing design drawings.
8. Tempered-Water Setting: Refer to Plumbing design drawings.
9. Tempered-Water Design Flow Rate: Refer to Plumbing design drawings.
10. Pressure Drop at Design Flow Rate: Refer to Plumbing design drawings.
11. Tempered-Water Outlet Size: Refer to Plumbing design drawings.
12. Cold-Water Inlet Size: Refer to Plumbing design drawings.
13. Hot-Water Inlet Size: Refer to Plumbing design drawings.
14. Valve Finish: Rough bronze.

2.9 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig minimum unless otherwise indicated.
2. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved, epoxy coated and for NPS 2-1/2 and larger.
3. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
4. Screen: Stainless steel with round perforations unless otherwise indicated.
5. Perforation Size:

    a. Strainers NPS 2 and Smaller: 0.020, 0.033or 0.062 inch.
    b. Strainers NPS 2-1/2 to NPS 4: 0.045, 0.062or 0.125 inch.

6. Drain: Pipe plugand Factory-installed, hose-end drain valve.

2.10 OUTLET BOXES

A. Clothes Washer Outlet Boxes:
1. As specified in Fixture Schedule on P0.03 or approved equal. Approved equal is subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    a. Guy Gray Manufacturing Co., Inc.
    b. IPS Corporation.
    c. LSP Products Group, Inc.
    d. Oatey.
    e. Approved equal.

2. Mounting: Recessed.
3. Material and Finish: Enameled-steel, epoxy-painted-steelor Stainless-steel box and faceplate.
4. Faucet: Combination valved fitting or separate hot- and cold-water valved fittings complying with ASME A112.18.1. Include garden-hose thread complying with ASME B1.20.7 on outlets.
5. Supply Shutoff Fittings: NPS 1/2 gate, globe, or ball valves and NPS 1/2 copper, water tubing.
6. Drain: NPS 1-1/2or NPS 2 standpipe and P-trap for direct waste connection to drainage piping.
7. Inlet Hoses: Two 60-inch-long, rubber household clothes washer inlet hoses with female, garden-hose-thread couplings. Include rubber washers.
8. Drain Hose: One 48-inch-long, rubber household clothes washer drain hose with hooked end.

B. Icemaker Outlet Boxes:

1. Manufacturers: As specified in Fixture Schedule on P0.03 or approved equal. Approved equal is subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. IPS Corporation.
    b. LSP Products Group, Inc.
    c. Oatey.
    d. Plastic Oddities.

2. Mounting: Recessed.
3. Material and Finish: Enameled-steel, epoxy-painted-steel Stainless-steel box and faceplate.
4. Faucet: Valved fitting complying with ASME A112.18.1. Include NPS 1/2 or smaller copper tube outlet.
5. Supply Shutoff Fitting: NPS 1/2 gate, globe, or ball valve and NPS 1/2 copper, water tubing.

2.11 HOSE BIBBS

A. Hose Bibbs:

1. Manufacturers: As specified in Fixture Schedule on P0.03 or approved equal. Approved equal is subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Jay R. Smith Mfg. Co.
    b. MIFAB, Inc.
    c. WATTS.
    d. Woodford Manufacturing Company.
    e. Acorn Manufacturing

2. Standard: ASME A112.18.1 for sediment faucets.
3. Body Material: Bronze.
4. Seat: Bronze, replaceable.
5. Supply Connections: NPS 1/2 or NPS 3/4 threaded or solder-joint inlet.
6. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
7. Pressure Rating: 125 psig.
8. Vacuum Breaker: Integral or field-installation, nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
9. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
10. Finish for Service Areas: Rough bronze, Chrome or nickel plated.
11. Finish for Finished Rooms: Chrome or nickel plated.
12. Operation for Equipment Rooms: Wheel handle or operating key.
13. Operation for Service Areas: Wheel handleor Operating key.
14. Operation for Finished Rooms: Wheel handleor Operating key.
15. Include operating key with each operating-key hose bibb.
16. Include integral wall flange with each chrome- or nickel-plated hose bibb.

2.12 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 3/4.
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

B. Gate-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-80 for gate valves.
2. Pressure Rating: Class 125.
3. Size: NPS 3/4.
4. Body: ASTM B62 bronze.
5. Inlet: NPS 3/4 threaded or solder joint.
6. Outlet: Garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

C. Stop-and-Waste Drain Valves:

1. Standard: MSS SP-110 for ball valves or MSS SP-80 for gate valves.
2. Pressure Rating: 200-psig minimum CWP or Class 125.
3. Size: NPS 3/4.
4. Body: Copper alloy or ASTM B62 bronze.
5. Drain: NPS 1/8 side outlet with cap.

2.13 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters:

1. Manufacturers: As specified in Fixture Schedule on P0.03 or approved equal. Approved equal is subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. MIFAB, Inc.
    b. Precision Plumbing Products.
    c. Sioux Chief Manufacturing Company, Inc.
    d. WATTS.

2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Metal bellowsor Copper tube with piston.
4. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

B. Supply-Type, Trap-Seal Primer Device:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    a. Jay R. Smith Mfg. Co.
    b. MIFAB, Inc.
    c. Precision Plumbing Products.
    d. WATTS.
2. Standard: ASSE 1018.
3. Pressure Rating: 125 psig minimum.
4. Body: Bronze.
5. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
6. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

C. Flushvalve Vacuum Breaker-Type, Trap-Seal Primer:

Manufacturers: As specified in Fixture Schedule on P0.03 or approved equal. Approved equal is subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Sloan Valve

2. Standard: ASSE 1044.
3. Size: NPS 3/8 minimum.
4. Material: Chrome-plated, cast brass.

2.14 TRAP-SEAL PRIMER SYSTEMS

A. Trap-Seal Primer Systems:

Manufacturers: As specified in Fixture Schedule on P0.03 or approved equal. Approved equal is subject to compliance with requirements, available

manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
a. Precision Plumbing Products.
b. Zurn Industries, LLC.
2. Standard: ASSE 1044.
3. Piping: NPS 3/4, ASTM B 88, Type L; copper, water tubing.
4. Cabinet: Recessed or Surface-mounted steel box with stainless-steel cover.
5. Electric Controls: 24-hour timer, solenoid valve, and manual switch for 120-V ac power.
a. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
6. Vacuum Breaker: ASSE 1001.
7. Number Outlets: Refer to Plumbing design drawings.
8. Size Outlets: NPS 1/2 or NPS 5/8.

2.15 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. Flex-Hose Co., Inc.
2. Flex-Weld, Inc.
3. Metraflex Company (The).

B. Bronze-Hose Flexible Connectors: Corrugated-bronze tubing with bronze wire-braid covering and ends brazed to inner tubing.

1. Working-Pressure Rating: Minimum 200 psigor 250 psig.
2. End Connections NPS 2 and Smaller: Threaded copper pipe or plain-end copper tube.
3. End Connections NPS 2-1/2 and Larger: Flanged copper alloy.

C. Stainless-Steel-Hose Flexible Connectors: Corrugated-stainless-steel tubing with stainless-steel wire-braid covering and ends welded to inner tubing.

1. Working-Pressure Rating: Minimum 200 psigor 250 psig.
2. End Connections NPS 2 and Smaller: Threaded steel-pipe nipple.
3. End Connections NPS 2-1/2 and Larger: Flanged steel nipple.

2.16 WATER METERS

A. Displacement-Type Water Meters:

1. Manufacturers: As specified in Fixture Schedule on P0.03 or approved equal. Approved equal is subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. AALIANT.
b. ABB.
c. Mueller Co.
d. Sensus.

2. Standard: AWWA C700.
3. Pressure Rating: 150-psig working pressure.
4. Body Design: Nutating disc; totalization meter.
5. Registration: In gallons or cubic feet as required by utility company.
6. Case: Bronze.
7. End Connections: Threaded.

B. Remote Registration System: Encoder type complying with AWWA C707; modified with signal-transmitting assembly, low-voltage connecting wiring, and remote register assembly as required by utility company.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Backflow Preventers: Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.

1. Locate backflow preventers in same room as connected equipment or system.
2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe-to-floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are unacceptable for this application.
3. Do not install bypass piping around backflow preventers.

B. Water Regulators: Install with inlet and outlet shutoff valves and bypass with memory-stop balancing valve. Install pressure gages on inlet and outlet.

C. Water Control Valves: Install with inlet and outlet shutoff valves and bypass with globe valve. Install pressure gages on inlet and outlet.

D. Automatic Water Shutoff Valves: Test for signal strength before valve installation. Install automatic shutoff valve downstream from main domestic water shutoff valve and downstream from fire sprinkler system supply. Install valve controller is an accessible location with sensors in areas where water is likely to accumulate.

E. Balancing Valves: Install in locations where they can easily be adjusted.

F. Temperature-Actuated, Water Mixing Valves: Install with check stops or shutoff valves on inlets and with shutoff valve on outlet.

1. Install cabinet-type units recessed in or surface mounted on wall as specified.

G. Y-Pattern Strainers: For water, install on supply side of each control valve, water pressure-reducing valve, solenoid valve and/or pump.

H. Outlet Boxes: Install boxes recessed in wall or surface mounted on wall. Install 2-by-4-inch fire-retardant-treated-wood blocking, wall reinforcement between studs. Comply with requirements for fire-retardant-treated-wood blocking in Section 061000 "Rough Carpentry."

I. Water-Hammer Arresters: Install in water piping according to PDI-WH 201.

J. Supply-Type, Trap-Seal Primer Device: Install with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

K. Drainage-Type, Trap-Seal Primer Device: Install as lavatory trap with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting.

L. Trap-Seal Primer Systems: Install with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust system for proper flow.

3.2 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping specialties adjacent to equipment and machines, allow space for service and maintenance.

C. Comply with requirements for grounding equipment in Section 260526 "Grounding and Bonding for Electrical Systems."

3.3 IDENTIFICATION

A. Plastic Labels for Equipment: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:

1. Pressure vacuum breakers.
2. Intermediate atmospheric-vent backflow preventers.
3. Reduced-pressure-principle backflow preventers.
4. Double-check, backflow-prevention assemblies.
5. Carbonated-beverage-machine backflow preventers.
6. Dual-check-valve backflow preventers.
7. Reduced-pressure-detector, fire-protection, backflow-preventer assemblies.
8. Double-check, detector-assembly backflow preventers.
9. Water pressure-reducing valves.
10. Automatic water shutoff valves.
11. Calibrated balancing valves.
12. Primary, thermostatic, water mixing valves.

13. Manifold, thermostatic, water mixing-valve assemblies.
14. Photographic-process, thermostatic, water mixing-valve assemblies.
15. Primary water tempering valves.
16. Outlet boxes.
17. Supply-type, trap-seal primer valves.
18. Trap-seal primer systems.

B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Test each pressure vacuum breaker, reduced-pressure-principle backflow preventer, double-check, backflow-prevention assembly and/or double-check, detector-assembly backflow preventer according to authorities having jurisdiction and the device's reference standard.

B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.5 ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing valves.

B. Set field-adjustable flow set points of balancing valves.

C. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.

END OF SECTION

SECTION 221123 - INLINE, DOMESTIC-WATER PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. In-line, sealless centrifugal pumps.
2. Horizontally mounted, in-line, separately coupled centrifugal pumps.
3. Horizontally mounted, in-line, close-coupled centrifugal pumps.
4. Vertically mounted, in-line, close-coupled centrifugal pumps.

B. Related Requirements:
1. Section 331113 "Potable Water Supply Wells" for well pumps.

1.3 ACTION SUBMITTALS

A. Submittals shall be formatted per Section 220000 “General Plumbing Requirements”. The manufacturer shall resubmit the specification section showing compliance with each respective paragraphs and specified items and features in that particular specification section. All **exceptions** shall be clearly identified by referencing respective paragraph and other requirements. Next to each specification item, indicate the following:

1. “No Exception Taken”.
2. “Exception”. All exceptions shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.

B. Product Data: For each type of product. Include construction materials, rated capacities, certified performance curves with operating points plotted on curves, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Detail pumps and adjacent equipment. Show support locations, type of support, weight on each support, required clearances, and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Structural members to which pumps will be attached.

2. Size and location of initial access modules for acoustical tile.

B. Seismic Qualification Data: Certificates, for inline, domestic-water pumps, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For inline, domestic-water pumps to include in operation and maintenance manuals.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Retain shipping flange protective covers and protective coatings during storage.

B. Protect bearings and couplings against damage.

C. Comply with pump manufacturer's written instructions for handling.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. UL Compliance: UL 778 for motor-operated water pumps.

C. Drinking Water System Components - Health Effects and Drinking Water System Components - Lead Content Compliance: NSF 61 and NSF 372.

D. Retain "Seismic Performance" Paragraph below with "Seismic Qualification Data" Paragraph in "Informational Submittals" Article for projects requiring seismic design. Delete paragraph if performance requirements are indicated on Drawings. Model building codes and ASCE/SEI 7 establish criteria for buildings subject to earthquake motions. Coordinate requirements with structural engineer.

E. Seismic Performance: Inline, domestic-water pumps shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
2. Component Importance Factor: 1.0.

2.2 IN-LINE, SEALLESS CENTRIFUGAL PUMPS

A. Description: Factory-assembled and -tested, in-line, close-coupled, canned-motor, sealless, overhung-impeller centrifugal pumps.
1. Manufacturers: As specified in Fixture Schedule on P0.02 or approved equal. Approved equal is subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

2. Grundfos Pumps Corp.
3. WILO USA LLC - WILO Canada Inc.
4. Bell & Gossett

B. Capacities and Characteristics: Refer to Drawings.

C. Pump Construction:

1. Pump and Motor Assembly: Hermetically sealed, replaceable-cartridge type with motor and impeller on common shaft and designed for installation with pump and motor shaft horizontal.
2. Maximum Continuous Operating Temperature: 220 deg F.
3. Casing: Cast iron, with threaded or companion-flange connections.
4. Impeller: stainless steel.
5. Motor: Three speed or Variable.

2.3 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 220513 "Common Motor Requirements for Plumbing Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

2.4 CONTROLS

A. Thermostats: Electric; adjustable for control of hot-water circulation pump.

1. Type: Water-immersion temperature sensor, for installation in piping.
2. Range: 65 to 200 deg F.

3. Enclosure: NEMA 250, Type 4X.
4. Operation of Pump: On or off.
5. Transformer: Provide if required.
6. Power Requirement: 120 V ac.
7. Settings: Start pump at 110 deg F and stop pump at 120 deg F.

B. Timers: Electric, for control of hot-water circulation pump.

1. Type: Programmable, seven-day clock with manual override on-off switch.
2. Enclosure: NEMA 250, Type 1, suitable for wall mounting.
3. Operation of Pump: On or off.
4. Transformer: Provide if required.
5. Power Requirement: 120 V ac.
6. Programmable Sequence of Operation: Up to two on-off cycles each day for seven days.

C. Time-Delay Relays: Electric, for control of hot-water circulation pump between water heater and connected hot-water storage tank.

1. Type: Adjustable time-delay relay.
2. Range: Up to five minutes.
3. Setting: Five minutes.
4. Enclosure: NEMA 250, Type 4X.
5. Operation of Pump: On or off.
6. Transformer: Provide if required.
7. Power Requirement: 120 V ac.
8. Programmable Sequence of Operation: Limit pump operation to periods of burner operation, plus maximum five minutes after the burner stops.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for domestic-water-piping system to verify actual locations of piping connections before pump installation.

3.2 PUMP INSTALLATION

A. Comply with HI 1.4.

B. Mount pumps in orientation complying with manufacturer's written instructions.

C. Pump Mounting:

1. Install vertically mounted, in-line, close-coupled centrifugal pumps with cast-iron base mounted on concrete base using vibration isolation type and deflection as specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping

and Equipment." Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete."

2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
3. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.

D. Install continuous-thread hanger rods and vibration isolation of size required to support pump weight.

1. Comply with requirements for vibration isolation devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment." Fabricate brackets or supports as required.
2. Comply with requirements for hangers and supports specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

E. Install pressure switches in water-supply piping.

F. Install thermostats in hot-water return piping.

G. Install timers in heater room location.

H. Install time-delay relays in piping between water heaters and hot-water storage tanks.

3.3 PIPING CONNECTIONS

A. Comply with requirements for piping specified in Section 221116 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where installing piping adjacent to inline, domestic-water pumps, allow space for service and maintenance.

C. Connect domestic-water piping to pumps. Install suction and discharge piping equal to or greater than size of pump nozzles.

1. Install flexible connectors adjacent to pumps in suction and discharge piping of the following pumps:

a. Horizontally mounted, in-line, separately coupled centrifugal pumps.
b. Horizontally mounted, in-line, close-coupled centrifugal pumps.
c. Vertically mounted, in-line, close-coupled centrifugal pumps.
d. Comply with requirements for flexible connectors specified in Section 221116 "Domestic Water Piping."

D. Provide shutoff valve and strainer on suction side of each pump, and check, shutoff, and throttling valves on discharge side of each pump. Install valves and unions same size as connected piping. Comply with requirements for strainers specified in Section 221119 "Domestic Water Piping Specialties." Comply with requirements for valves specified in the following:

1. Section 220523 "General Duty Valves for Plumbing."
2. Provide pressure gauge at suction of each pump and pressure gauge at discharge of each pump. Install at integral pressure-gauge tappings where provided or install pressure-gauge connectors in suction and discharge piping around pumps. Comply with requirements for pressure gauges and snubbers specified in Section 220519 "Meters and Gages for Plumbing Piping."

3.4 CONTROL CONNECTIONS

A. Install control and electrical power wiring to field-mounted control devices.

B. Connect control wiring between temperature controllers and devices.

C. Interlock pump between water heater and hot-water storage tank with water heater burner and time-delay relay.

3.5 IDENTIFICATION

A. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment" for identification of pumps.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

D. Perform tests and inspections with the assistance of a factory-authorized service representative.

E. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

F. Inline, domestic-water pump will be considered defective if it does not pass tests and inspections.

G. Prepare test and inspection reports.

3.7 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup check according to manufacturer's written instructions.
2. Check piping connections for tightness.
3. Clean strainers on suction piping.
4. Set pressure switches, thermostats, timers, and time-delay relays for automatic starting and stopping operation of pumps.
5. Perform the following startup checks for each pump before starting:

    a. Verify bearing lubrication.
    b. Verify that pump is free to rotate by hand and that pump for handling hot liquid is free to rotate with pump hot and cold. If pump is bound or drags, do not operate until cause of trouble is determined and corrected.
    c. Verify that pump is rotating in the correct direction.

6. Prime pump by opening suction valves and closing drains, and prepare pump for operation.
7. Start motor.
8. Open discharge valve slowly.
9. Adjust temperature settings on thermostats.
10. Adjust timer settings.

3.8 ADJUSTING

A. Adjust inline, domestic-water pumps to function smoothly, and lubricate as recommended by manufacturer.

B. Adjust initial temperature set points.

C. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

END OF SECTION

SECTION 221316 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Hubless, cast-iron soil pipe and fittings.
2. PVC pipe and fittings.
3. Specialty pipe fittings.
4. Encasement for underground metal piping.

1.3 ACTION SUBMITTALS

A. Submittals shall be formatted per Section 220000 “General Plumbing Requirements”. The manufacturer shall resubmit the specification section showing compliance with each respective paragraphs and specified items and features in that particular specification section. All **exceptions** shall be clearly identified by referencing respective paragraph and other requirements. Next to each specification item, indicate the following:

1. “No Exception Taken”.
2. “Exception”. All exceptions shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.

B. Product Data: For each type of product.

C. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating VOC content.
2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.

D. Shop Drawings: For hubless, single-stack drainage system include plans, elevations, sections, and details.

1.4 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For waste and vent piping, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether certification is based on actual test of assembled components or on calculation.
2. Detailed description of piping anchorage devices on which the certification is based and their installation requirements.

B. Field quality-control reports.

1.5 FIELD CONDITIONS

A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Architect, Construction Manager and Owner no fewer than two days in advance of proposed interruption of sanitary waste service.
2. Do not proceed with interruption of sanitary waste service without Architect's, Construction Manager's and Owner's written permission.

1.6 WARRANTY

A. Listed manufacturers to provide labelling and warranty of their respective products.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 10-foot head of water.
2. Waste, Force-Main Piping: 50 psig, 100 psig or 150 psig.

B. Seismic Performance: Soil, waste, and vent piping and support and installation shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

2.2 PIPING MATERIALS

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AB & I Foundry; a part of the McWane family of companies.
2. Charlotte Pipe and Foundry Company.
3. Tyler Pipe; a part of McWane family of companies.

B. Pipe and Fittings: ASTM A888 or CISPI 301.

C. CISPI, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. ANACO-Husky.
b. Charlotte Pipe and Foundry Company.
c. Tyler Pipe; a subsidiary of McWane Inc.

2. Standards: ASTM C1277 and CISPI 310.
3. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C564, rubber sleeve with integral, center pipe stop.

D. Heavy-Duty, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. ANACO-Husky.
b. Charlotte Pipe and Foundry Company.
c. Tyler Pipe; a subsidiary of McWane Inc.

2. Standards: ASTM C1277 and ASTM C1540.
3. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C564, rubber sleeve with integral, center pipe stop.

2.4 PVC PIPE AND FITTINGS

A. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

B. Solid-Wall PVC Pipe: ASTM D2665, drain, waste, and vent.

C. Cellular-Core PVC Pipe: ASTM F891, Schedule 40.

D. PVC Socket Fittings: ASTM D2665, made to ASTM D3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.

E. Adhesive Primer: ASTM F656.

1. Adhesive primer shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

F. Solvent Cement: ASTM D2564.

1. Solvent cement shall have a VOC content of 510 g/L or less.

2.5 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
2. Shielded, Nonpressure Transition Couplings:

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1) Cascade Waterworks Mfg. Co.
2) Mission Rubber Company, LLC; a division of MCP Industries.

b. Standard: ASTM C1460.
c. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
d. End Connections: Same size as and compatible with pipes to be joined.

2.6 ENCASEMENT FOR UNDERGROUND METAL PIPING

A. Standard: ASTM A674 or AWWA C105/A 21.5.

B. Material: Linear low-density polyethylene film of 0.008-inch or high-density, cross-laminated polyethylene film of 0.004-inchminimum thickness.

C. Form: Sheet or tube.

D. Color: Natural.

PART 3 - EXECUTION

3.1 EARTH MOVING

A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.

1. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.
2. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Provided seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

K. All cleanouts shall be installed where readily accessible. The contractor shall coordinate all cleanout locations with equipment, cabinets, etc. and architect prior to any installation.

L. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends.

1. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical.

2. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe.

    a. Straight tees, elbows, and crosses may be used on vent lines.

3. Do not change direction of flow more than 90 degrees.
4. Use proper size of standard increasers and reducers if pipes of different sizes are connected.

    a. Reducing size of waste piping in direction of flow is prohibited.

M. Lay buried building waste piping beginning at low point of each system.

1. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.
2. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
3. Maintain swab in piping and pull past each joint as completed.

N. Install soil and waste and vent piping at the following minimum slopes unless otherwise indicated:

1. Building Sanitary Waste: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 or 2percent downward in direction of flow for piping NPS 4 and larger.
2. Horizontal Sanitary Waste Piping: 2 percent downward in direction of flow.
3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

O. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Install encasement on underground piping according to ASTM A674 or AWWA C105/A 21.5.

P. Install aboveground PVC piping according to ASTM D2665.

Q. Install underground PVC piping according to ASTM D2321.

R. Install engineered soil and waste and vent piping systems as follows:

1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
2. Hubless, Single-Stack Drainage System: Comply with ASME B16.45 and hubless, single-stack aerator fitting manufacturer's written installation instructions.
3. Reduced-Size Venting: Comply with standards of authorities having jurisdiction.

S. Install underground, ductile-iron, force-main piping according to AWWA C600.

1. Install buried piping inside building between wall and floor penetrations and connection to sanitary sewer piping outside building with restrained joints.

2. Anchor pipe to wall or floor. Install thrust-block supports at vertical and horizontal offsets.
3. Install encasement on piping according to ASTM A674 or AWWA C105/A 21.5.

T. Plumbing Specialties:

1. Install backwater valves in sanitary waster gravity-flow piping.

a. Comply with requirements for backwater valves specified in Section 221319 "Sanitary Waste Piping Specialties."

2. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary waste gravity-flow piping.
a. Comply with requirements for cleanouts specified in Section 221319 "Sanitary Waste Piping Specialties."

3. Install drains in sanitary waste gravity-flow piping.

a. Comply with requirements for drains specified in Section 221319 "Sanitary Waste Piping Specialties."

U. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

V. Install sleeves for piping penetrations of walls, ceilings, and floors.

1. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

W. Install sleeve seals for piping penetrations of concrete walls and slabs.

1. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

X. Install escutcheons for piping penetrations of walls, ceilings, and floors.

1. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

A. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead-and-oakum calked joints.

C. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1.

1. Cut threads full and clean using sharp dies.
2. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

    a. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
    b. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
    c. Do not use pipe sections that have cracked or open welds.

E. Join stainless-steel pipe and fittings with gaskets according to ASME A112.3.1.

F. Grooved Joints: Cut groove ends of pipe according to AWWA C606. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections, over gasket, with keys seated in piping grooves. Install and tighten housing bolts.

G. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.

H. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements.
2. PVC Piping: Join according to ASTM D2855 and ASTM D2665 appendixes.

3.4 SPECIALTY PIPE FITTING INSTALLATION

A. Transition Couplings:

1. Install transition couplings at joints of piping with small differences in ODs.
2. In Waste Drainage Piping: Unshielded or Shielded, nonpressure transition couplings.

B. Dielectric Fittings:

1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
2. Dielectric Fittings for NPS 2 and Smaller: Use dielectric nipples or unions.
3. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges, flange kits or nipples.
4. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.5 VALVE INSTALLATION

A. Comply with requirements in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," Section 220523.14 "Check Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping" for general-duty valve installation requirements.

B. Shutoff Valves:

1. Install shutoff valve on each sewage pump discharge.
2. Install full-port ball valve for piping NPS 2 and smaller.
3. Install gate valve for piping NPS 2-1/2 and larger.

C. Check Valves: Install swing check valve, between pump and shutoff valve, on each sewage pump discharge.

D. Backwater Valves: Install backwater valves in piping subject to backflow.

1. Horizontal Piping: Horizontal backwater valves. Use normally closed type unless otherwise indicated.
2. Floor Drains: Drain outlet backwater valves unless drain has integral backwater valve.
3. Install backwater valves in accessible locations.
4. Comply with requirements for backwater valve specified in Section 221319 "Sanitary Waste Piping Specialties."

3.6 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment." and Section 220548.13 "Vibration Controls for Plumbing Piping and Equipment."

1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
2. Install stainless-steel or fiberglass pipe hangers for horizontal piping in corrosive environments.
3. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
4. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
5. Vertical Piping: MSS Type 8 or Type 42, clamps.
6. Install individual, straight, horizontal piping runs:

    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.

7. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.

8. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Support horizontal piping and tubing within 12 inches of each fitting, valve, and coupling.

D. Support vertical piping and tubing at base and at each floor.

E. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.

F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
2. NPS 3: 60 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
4. NPS 6 and NPS 8: 60 inches with 3/4-inch rod.
5. NPS 10 and NPS 12: 60 inches with 7/8-inch rod.
6. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.

G. Install supports for vertical cast-iron soil piping every 15 feet.

H. Install supports for vertical steel piping every 15 feet.

I. Install hangers for stainless-steel piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 2: 84 inches with 3/8-inch rod.
2. NPS 3: 96 inches with 1/2-inch rod.
3. NPS 4: 108 inches with 1/2-inch rod.
4. NPS 6: 10 feet with 5/8-inch rod.

J. Install supports for vertical stainless-steel piping every 10 feet.

K. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch rod.
2. NPS 3: 48 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
4. NPS 6 and NPS 8: 48 inches with 3/4-inch rod.
5. NPS 10 and NPS 12: 48 inches with 7/8-inch rod.

L. Install supports for vertical PVC piping every 48 inches.

M. Support piping and tubing not listed above according to MSS SP-58 and manufacturer's written instructions.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect waste and vent piping to the following:

1. Plumbing Fixtures: Connect waste piping in sizes indicated, but not smaller than required by plumbing code.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect waste and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
5. Install horizontal backwater valves with cleanout cover flush with floor or in pit with pit cover flush with floor.
6. Comply with requirements for backwater valves cleanouts and drains specified in Section 221319 "Sanitary Waste Piping Specialties."
7. Equipment: Connect waste piping as indicated.

    a. Provide shutoff valve if indicated and union for each connection.
    b. Use flanges instead of unions for connections NPS 2-1/2 and larger.

D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

E. Make connections according to the following unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.8 IDENTIFICATION

A. Identify exposed sanitary waste and vent piping.

B. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.9 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.

2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary waste and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired.

    a. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.

2. Leave uncovered and unconcealed new, altered, extended, or replaced waste and vent piping until it has been tested and approved.

    a. Expose work that was covered or concealed before it was tested.

3. Roughing-in Plumbing Test Procedure: Test waste and vent piping except outside leaders on completion of roughing-in.

    a. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water.
    b. From 15 minutes before inspection starts to completion of inspection, water level must not drop.
    c. Inspect joints for leaks.

4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight.

    a. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg.
    b. Use U-tube or manometer inserted in trap of water closet to measure this pressure.
    c. Air pressure must remain constant without introducing additional air throughout period of inspection.
    d. Inspect plumbing fixture connections for gas and water leaks.

5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.10 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect sanitary waste and vent piping during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Cover all floor drains and floor sinks during constructions to prevent debris from entering pipe and protect grates from damages.

D. Place plugs in ends of uncompleted piping at end of day and when work stops.

E. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

F. Repair damage to adjacent materials caused by waste and vent piping installation.

3.11 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

B. Aboveground, soil and waste piping NPS 4 and smaller shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings and hubless, single-stack aerator fittings; CISPI or heavy-duty hubless-piping couplings; and coupled joints.
3. Galvanized-steel pipe, drainage fittings, and threaded joints.
4. Solid-wall or Cellular-core PVC pipe, PVC socket fittings, and solvent-cemented joints.
5. Dissimilar Pipe-Material Couplings: Unshielded or Shielded, nonpressure transition couplings.

C. Aboveground, soil and waste piping NPS 5 and larger shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings and hubless, single-stack aerator fittings; CISPI or heavy-duty hubless-piping couplings; and coupled joints.
3. Galvanized-steel pipe, drainage fittings, and threaded joints.
4. Solid-wall or Cellular-core PVC pipe, PVC socket fittings, and solvent-cemented joints.
5. Dissimilar Pipe-Material Couplings: Unshielded or Shielded, nonpressure transition couplings.

D. Aboveground, vent piping NPS 4 and smaller shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI or heavy-duty hubless-piping couplings; and coupled joints.
3. Galvanized-steel pipe, drainage fittings, and threaded joints.
4. Solid-wall or Cellular-core PVC pipe, PVC socket fittings, and solvent-cemented joints.
5. Dissimilar Pipe-Material Couplings: Unshielded or Shielded, nonpressure transition couplings.

E. Aboveground, vent piping NPS 5 and larger shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI or heavy-duty hubless-piping couplings; and coupled joints.
3. Galvanized-steel pipe, drainage fittings, and threaded joints.
4. Solid-wall or Cellular-core PVC pipe, PVC socket fittings, and solvent-cemented joints.
5. Dissimilar Pipe-Material Couplings: Unshielded or Shielded, nonpressure transition couplings.

F. Underground, soil, waste, and vent piping NPS 4 and smaller shall be any of the following:

1. Extra Heavy or Service class, cast-iron soil piping; gaskets; and gasketed or calking materials; and calked joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI, heavy-duty cast-iron hubless-piping couplings; and coupled joints.
3. Solid wall or Cellular-core PVC pipe, PVC socket fittings, and solvent-cemented joints.
4. Dissimilar Pipe-Material Couplings: Unshielded or Shielded, nonpressure transition couplings.

G. Underground, soil and waste piping NPS 5 and larger shall be any of the following:

1. Extra Heavy or Service class, cast-iron soil piping; gaskets; and gasketed or calking materials; and calked joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI or heavy-duty cast-iron hubless-piping couplings; coupled joints.
3. Solid-wall or Cellular-core PVC pipe; PVC socket fittings; and solvent-cemented joints.
4. Dissimilar Pipe-Material Couplings: Unshielded or Shielded, nonpressure transition couplings.

END OF SECTION

SECTION 221319 - SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Backwater valves.
2. Cleanouts.
3. Roof flashing assemblies.
4. Through-penetration firestop assemblies.
5. Miscellaneous sanitary drainage piping specialties.
6. Floor drains.
7. Floor sinks.
8. Trench drains.

B. Related Requirements:

1. Section 221423 "Storm Drainage Piping Specialties" for trench drains for storm water, channel drainage systems for storm water, roof drains, and catch basins.

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene.

B. FOG: Fats, oils, and greases.

C. PVC: Polyvinyl chloride.

D. FRP: Fiberglass-reinforced plastic.

E. HDPE: High-density polyethylene.

F. PE: Polyethylene.

G. PP: Polypropylene.

1.4 ACTION SUBMITTALS

A. Submittals shall be formatted per Section 220000 “General Plumbing Requirements”. The manufacturer shall resubmit the specification section showing compliance with each respective paragraphs and specified items and features in that particular specification section. All **exceptions** shall be clearly identified by referencing respective paragraph and other requirements. Next to each specification item, indicate the following:

1. “No Exception Taken”.
2. “Exception”. All exceptions shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.

B. Product Data: For each type of product. Include rated capacities, operating characteristics, and accessories for the following:

1. FOG disposal systems.

C. Shop Drawings:

1. Show fabrication and installation details for frost-resistant vent terminals.
2. Wiring Diagrams: Power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Data: For FOG disposal systems, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For sanitary waste piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTIONS

A. Sanitary waste piping specialties shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14 for plastic sanitary waste piping specialty components.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing, and marked for intended location and application.

2.2 BACKWATER VALVES

A. Horizontal, Cast-Iron Backwater Valves:

1. Manufacturers: Subject to compliance with requirements, available manufactures offering products that may be incorporated into the work include but are not limited to the following:

    a. Jay R. Smith Mfg. Co.
    b. MIFAB, Inc.
    c. Zurn Industries, LLC.

2. Standard: ASME A112.14.1.
3. Size: Same as connected piping.
4. Body: Cast iron.
5. Cover: Cast iron with bolted or threaded access check valve.
6. End Connections: Hub and spigot or hubless.
7. Type Check Valve: Removable, bronze, swing check, factory assembled or field modified to hang closed or open for airflow unless subject to backflow condition.
8. Extension: ASTM A74, Service class; full-size, cast-iron, soil-pipe extension to field-installed cleanout at floor; replaces backwater valve cover.

B. Drain-Outlet Backwater Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Jay R. Smith Mfg. Co.
    b. WATTS.
    c. Zurn Industries, LLC.

2. Size: Same as floor drain outlet.
3. Body: Cast iron or bronze made for vertical installation in bottom outlet of floor drain.
4. Check Valve: Removable ball float.
5. Inlet: Threaded.
6. Outlet: Threaded or spigot.

2.3 CLEANOUTS

A. Cast-Iron Exposed Cleanouts: :

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Jay R. Smith Mfg. Co.
b. MIFAB, Inc.
c. Zurn Industries, LLC.

2. Standard: ASME A112.36.2M.
3. Size: Same as connected drainage piping
4. Body Material: Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk or raised-head, brass plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

B. Stainless-Steel Exposed Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. BLÜCHER; A Watts brand.
b. Josam Company.
c. Watts.

2. Standard: ASME A112.3.1.
3. Size: Same as connected drainage piping
4. Body Material: Stainless-steel tee with side cleanout as required to match connected piping.
5. Closure: Stainless-steel plug with seal.

C. Cast-Iron Exposed Floor Cleanouts:

1. <Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Jay R. Smith Mfg. Co.
b. Josam Company.
c. Zurn Industries, LLC.

2. Standard: ASME A112.36.2M for heavy-duty, adjustable housing or threaded, adjustable housing cleanout.
3. Size: Same as connected branch.
4. Type: Heavy-duty, adjustable housing or threaded, adjustable housing.
5. Body or Ferrule: Cast iron.
6. Clamping Device: As Required.
7. Outlet Connection: Inside calk, Spigot, or Threaded.
8. Closure: Brass plug with straight threads and gasket or Brass plug with tapered threads.
9. Adjustable Housing Material: Cast iron with threads or setscrews.
10. Frame and Cover Material and Finish: Nickel-bronze, copper alloy Polished bronze, or Rough bronze.
11. Frame and Cover Shape: Round, or Square when specifically requested by owner.
12. Top Loading Classification: Heavy duty at exterior locations. Light or Medium Duty within building.

13. Riser: ASTM A74, Extra-Heavy or Service class, cast-iron drainage pipe fitting and riser to cleanout.

D. Stainless-Steel Exposed Floor Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. BLÜCHER; A Watts brand.
    b. Josam Company.
    c. Kusel Equipment Co.

2. Standard: ASME A112.3.1.
3. Size: Same as connected branch.
4. Housing: Stainless steel.
5. Closure: Stainless steel with seal.
6. Riser: ASTM A74, Extra-Heavy or Service class, stainless-steel drainage pipe fitting and riser to cleanout.
7. Body or Ferrule: Stainless steel.
8. Clamping Device: as Required.
9. Outlet Connection: Inside calk, Spigot, or Threaded.
10. Closure: Brass plug with straight threads and gasket, or Brass plug with tapered threads.
11. Adjustable Housing Material: Cast iron with threads or setscrews.
12. Frame and Cover Material and Finish: Nickel-bronze, copper alloy, or Stainless steel.
13. Frame and Cover Shape: Round or Square when specifically requested by owner.
14. Top Loading Classification: Heavy duty at exterior locations. Light or Medium Duty within building.

E. Cast-Iron Wall Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Jay R. Smith Mfg. Co.
    b. MIFAB, Inc.
    c. Zurn Industries, LLC.

2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: Hub-and-spigot, cast-iron soil pipe T-branch, or Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure Plug:

    a. Brass Cast iron.
    b. Countersunk or raised head.
    c. Drilled and threaded for cover attachment screw.
    d. Size: Same as or not more than one size smaller than cleanout size.

6. Wall Access: Round, flat, chrome-plated brass or stainless-steel cover plate with screw.
7. Wall Access: Round, nickel-bronze, copper-alloy, or stainless-steel wall-installation frame and cover.

2.4 ROOF FLASHING ASSEMBLIES

A. Roof Flashing Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Acorn Engineering Company.
    b. Thaler Metal Industries Ltd.
    c. Zurn Industries, LLC.

2. Description: Manufactured assembly made of 4.0-lb/sq. ft., 0.0625-inch- thick, lead flashing collar and skirt extending at least 8 inches from pipe, with galvanized-steel boot reinforcement and counterflashing fitting.

    a. Open-Top Vent Cap: Without cap.
    b. Low-Silhouette Vent Cap: With vandal-proof vent cap.
    c. Extended Vent Cap: With field-installed, vandal-proof vent cap.

2.5 THROUGH-PENETRATION FIRESTOP ASSEMBLIES

A. Through-Penetration Firestop Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. ProVent Systems.

2. Standard: UL 1479 assembly of sleeve-and-stack fitting with firestopping plug.
3. Size: Same as connected soil, waste, or vent stack.
4. Sleeve: Molded-PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.
5. Stack Fitting: ASTM A48/A48M, gray-iron, hubless-pattern wye branch with neoprene O-ring at base and gray-iron plug in thermal-release harness. Include PVC protective cap for plug.
6. Special Coating: Corrosion resistant on interior of fittings.

2.6 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Open Drains:

1. Description: Shop or field fabricate from ASTM A74, Service class, hub-and-spigot, cast-iron soil-pipe fittings. Include P-trap, hub-and-spigot riser section; and where required, increaser fitting joined with ASTM C564 rubber gaskets.
2. Size: Same as connected waste piping.

B. Deep-Seal Traps:

1. Description: Cast-iron or bronze casting, with inlet and outlet matching connected piping and cleanout trap-seal primer valve connection.
2. Size: Same as connected waste piping.

    a. NPS 2: 4-inch-minimum water seal.
    b. NPS 2-1/2 and Larger: 5-inch-minimum water seal.

C. Floor-Drain, Trap-Seal Primer Fittings:

1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
2. Size: Same as floor drain outlet with NPS 1/2 side inlet.

D. Air-Gap Fittings:

1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
2. Body: Bronze or cast iron.
3. Inlet: Opening in top of body.
4. Outlet: Larger than inlet.
5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

E. Sleeve Flashing Device:

1. Description: Manufactured, cast-iron fitting, with clamping device that forms sleeve for pipe floor penetrations of floor membrane. Include galvanized-steel pipe extension in top of fitting that will extend 1 inch to 2 inches above finished floor and galvanized-steel pipe extension in bottom of fitting that will extend through floor slab.
2. Size: As required for close fit to riser or stack piping.

F. Stack Flashing Fittings:

1. Description: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.
2. Size: Same as connected stack vent or vent stack.

G. Vent Caps:

1. Description: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and setscrews to secure to vent pipe.
2. Size: Same as connected stack vent or vent stack.

H. Expansion Joints:

1. Standard: ASME A112.6.4.
2. Body: Cast iron with bronze sleeve, packing, and gland.
3. End Connections: Matching connected piping.
4. Size: Same as connected soil, waste, or vent piping.

2.7 FLOOR DRAINS

A. Cast-Iron Floor Drains:

1. Manufacturers: As specified in Fixture Schedule on P0.03 or approved equal. Approved equal is subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Jay R. Smith Mfg. Co.
    b. MIFAB, Inc.
    c. WATTS.

2. Standard: ASME A112.6.3 with backwater valve where required.
3. Pattern: Area or Floor drain.
4. Body Material: Gray iron.
5. Seepage Flange: As Required.
6. Anchor Flange: As Required.
7. Clamping Device: As Required.
8. Outlet: Bottom.
9. Backwater Valve: Drain-outlet type or Integral, ASME A112.14.1, swing-check type.
10. Coating on Interior and Exposed Exterior Surfaces: Acid-resistant enamel.
11. Sediment Bucket: As Required.
12. Top or Strainer Material: Nickel bronze or Stainless steel.
13. Top of Body and Strainer Finish: Nickel bronze or Stainless steel.
14. Top Shape: Round. Square when specifically requested by owner.
15. Dimensions of Top or Strainer: Refer to Plumbing Fixture Schedule on Construction Plans for body, sump, and grate requirements.
16. Top Loading Classification: Heavy duty at exterior locations. Light or Medium Duty within building.
17. Funnel: Not required.
18. Inlet Fitting: Gray iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
19. Trap Material: Bronze, Cast iron or Copper.
20. Trap Pattern: Deep-seal P-trap or Standard P-trap.
21. Trap Features: Trap-seal primer valve drain connection.

B. Stainless-Steel Floor Drains, ASME A112.3.1:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Zurn Industries, LLC.

2. Outlet: Bottom or Side.
3. Top or Strainer Material: Stainless steel.
4. Top Shape: Round. Square when specifically requested by owner.
5. Dimensions of Top or Strainer: Refer to Plumbing Fixture Schedule on Construction Plans for body, sump, and grate requirements.
6. Seepage Flange: As Required.
7. Anchor Flange: As Required.
8. Clamping Device: As Required.
9. Trap-Primer Connection: Required.
10. Trap Material: Stainless steel.
11. Trap Pattern: Deep-seal P-trap or Standard P-trap.

2.8 FLOOR SINKS

A. Cast-Iron Floor Sinks:

1. Manufacturers: As specified in Fixture Schedule on P0.03 or approved equal. Approved equal is subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Jay R. Smith Mfg. Co.
    b. MIFAB, Inc.
    c. Watts; a Watts Water Technologies company.

2. Standard: ASME A112.6.7.
3. Pattern: Floor drain.
4. Body Material: Cast iron.
5. Anchor Flange: As Required, with seepage holes.
6. Clamping Device: As Required.
7. Outlet: Bottom, no-hub connection.
8. Coating on Interior Surfaces: Acid-resistant enamel.
9. Sediment Bucket: Not required.
10. Internal Strainer: Dome or Flat.
11. Internal Strainer Material: Aluminum.
12. Top Grate Material: Cast iron, loose.
13. Top of Body and Grate Finish: Nickel bronze, Acid-resistant enamel.
14. Top Shape: Square.
15. Dimensions of Top Grate: Refer to Plumbing Fixture Schedule on Construction plans.
16. Top Loading Classification: No traffic.
17. Funnel: Not required.

2.9 TRENCH DRAINS

A. Trench Drains:

1. Manufacturers: As specified in Fixture Schedule on P0.03 or approved equal. Approved equal is subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Jay R. Smith Mfg. Co.
    b. MIFAB, Inc.
    c. WATTS.

2. Standard: ASME A112.6.3 for trench drains.
3. Material: Ductile or gray iron.
4. Flange: Anchor or Seepage, or As Required.
5. Clamping Device: As Required.
6. Outlet: Bottom, End or Side.
7. Grate Material: Ductile iron or Stainless steel.
8. Grate Finish: Painted or coated as required.
9. Dimensions of Frame and Grate: Refer to Plumbing Fixture Schedule on Construction plans for dimensions, body, sump, and grate requirements.
10. Top Loading Classification: Heavy duty at exterior locations. Light or Medium Duty within building.
11. Trap Material: Cast iron or Stainless steel.
12. Trap Pattern: Standard P-trap.

2.10 MOTORS

A. General requirements for motors are specified in Section 220513 "Common Motor Requirements for Plumbing Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, motor shall be large enough, so driven load will not require motor to operate in service factor range above 1.0.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Equipment Mounting:

1. Comply with requirements for vibration-isolation and seismic-control devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Install backwater valves in building drain piping.

1. For interior installation, provide cleanout deck plate flush with floor and centered over backwater valve cover, and of adequate size to remove valve cover for servicing.

C. Install cleanouts in building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 135 degrees.
3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate at base of each vertical soil and waste stack.
5. At each horizontal drainage pipe upper terminal.
6. Above each Urinal.

D. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

E. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

F. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof. Comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."

G. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof. Comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."

H. Install through-penetration firestop assemblies in plastic conductors and stacks at floor penetrations.

1. Comply with requirements in Section 078413 "Penetration Firestopping."

I. Install deep-seal traps on floor drains and other waste outlets, if indicated.

J. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.

1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
2. Size: Same as floor drain inlet.

K. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

L. Install sleeve and sleeve seals with each riser and stack passing through floors with waterproof membrane.

M. Install vent caps on each vent pipe passing through roof.

N. In freeze prone areas install frost-resistant vent terminals on each vent pipe passing through roof. Maintain 1-inch clearance between vent pipe and roof substrate.

O. Install expansion joints on vertical stacks and conductors. Position expansion joints for easy access and maintenance.

P. In freeze prone areas install frost-proof vent caps on each vent pipe passing through roof. Maintain 1-inch clearance between vent pipe and roof substrate.

Q. Install wood-blocking reinforcement for wall-mounting-type specialties.

R. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

S. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Install floor-drain flashing collar or flange, so no leakage occurs between drain and adjoining flooring.

a. Maintain integrity of waterproof membranes where penetrated.

2. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

T. Install trench drains at low points of surface areas to be drained.

1. Set grates of drains flush with finished surface, unless otherwise indicated.

U. Comply with ASME A112.3.1 for installation of stainless-steel channel drainage systems.

1. Install on support devices, so that top will be flush with adjacent surface.

V. Install FRP channel drainage system components on support devices, so that top will be flush with adjacent surface.

W. Install plastic channel drainage system components on support devices, so that top will be flush with adjacent surface.

3.2 CONNECTIONS

A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

E. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.

F. Comply with requirements in Section 221319 "Sanitary Waste Piping Specialties" for backwater valves, air admittance devices and miscellaneous sanitary drainage piping specialties.

3.3 FLASHING INSTALLATION

A. Comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."

B. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required.

C. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.

D. Set flashing on floors and roofs in solid coating of bituminous cement.

E. Secure flashing into sleeve and specialty clamping ring or device.

F. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Section 076200 "Sheet Metal Flashing and Trim."

G. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

3.4 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the equipment.

B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit.

1. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections, and prepare test reports.

B. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.6 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain FOG disposal systems. Refer to Section 017900 "Demonstration and Training."

END OF SECTION

SECTION 221413 - STORM DRAINAGE PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Hub-and-spigot, cast-iron soil pipe and fittings.
2. Hubless, cast-iron soil pipe and fittings.
3. Copper tube and fittings.
4. PVC pipe and fittings.
5. Specialty pipe and fittings.
6. Encasement for underground metal piping.

B. Related Requirements:

1. Section 221429 "Sump Pumps" for storm drainage pumps.
2. Section 334400 "Stormwater Utility Equipment" for storm drainage piping outside the building.

1.3 ACTION SUBMITTALS

A. Submittals shall be formatted per Section 220000 “General Plumbing Requirements”. The manufacturer shall resubmit the specification section showing compliance with each respective paragraphs and specified items and features in that particular specification section. All **exceptions** shall be clearly identified by referencing respective paragraph and other requirements. Next to each specification item, indicate the following:

1. “No Exception Taken”.
2. “Exception”. All exceptions shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.

B. Product Data: For each type of product.

C. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating VOC content.
2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.

D. Shop Drawings: For controlled-flow siphonic roof drainage system. Include calculations, plans, and details.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Detail storm drainage piping. Show support locations, type of support, weight on each support, required clearances, and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Structural members to which drainage piping will be attached or suspended from.

B. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

1.6 FIELD CONDITIONS

A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Architect Owner no fewer than two days in advance of proposed interruption of storm drainage service.
2. Do not proceed with interruption of storm drainage service without Architect's Owner's written permission.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Storm Drainage Piping: 10-foot head of water.
2. Storm Drainage, Force-Main Piping: 150 psig.

2.2 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AB & I Foundry; a part of the McWane family of companies.

2. Charlotte Pipe and Foundry Company.
3. NewAge Casting.
4. Tyler Pipe; a part of McWane family of companies.

B. Pipe and Fittings:

1. Marked with CISPI collective trademark and NSF certification mark.
2. Class: ASTM A74, Service and Extra Heavy class(es).

C. Gaskets: ASTM C564, rubber.

D. Caulking Materials: ASTM B29, pure lead and oakum or hemp fiber.

2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AB & I Foundry; a part of the McWane family of companies.
2. Charlotte Pipe and Foundry Company.
3. NewAge Casting.
4. Tyler Pipe; a part of McWane family of companies.

B. Pipe and Fittings:

1. Marked with CISPI collective trademark and NSF certification mark.
2. Standard: ASTM A888 or CISPI 301.

C. CISPI, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ANACO-Husky.
b. Charlotte Pipe and Foundry Company.
c. Dallas Specialty & Mfg. Co.
d. Fernco Inc.
e. Ideal Clamp Products, Inc.
f. Matco-Norca.
g. MIFAB, Inc.
h. Mission Rubber Company, LLC; a division of MCP Industries.
i. NewAge Casting.
j. Tyler Pipe; a subsidiary of McWane Inc.

2. Couplings shall bear CISPI collective trademark and NSF certification mark.
3. Standards: ASTM C1277 and CISPI 310.
4. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C564, rubber sleeve with integral, center pipe stop.

D. Heavy-Duty, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. ANACO-Husky.
    b. Charlotte Pipe and Foundry Company.
    c. Clamp-All Corp.
    d. Dallas Specialty & Mfg. Co.
    e. Ideal Clamp Products, Inc.
    f. MIFAB, Inc.
    g. Mission Rubber Company, LLC; a division of MCP Industries.
    h. NewAge Casting.
    i. Tyler Pipe; a subsidiary of McWane Inc.

2. Standard: ASTM C1540..
3. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C564, rubber sleeve with integral, center pipe stop.

E. Cast-Iron, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Charlotte Pipe and Foundry Company.
    b. MG Piping Products Company.

2. Standard: ASTM C1277..
3. Description: Two-piece ASTM A48/A48M, cast-iron housing; stainless-steel bolts and nuts; and ASTM C564, rubber sleeve with integral, center pipe stop.

2.4 COPPER TUBE AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cambridge-Lee Industries, LLC.
2. Cerro Flow Products, LLC.
3. Mueller Industries, Inc.
4. Wieland Copper Products, LLC.

B. Copper Type DWV Tube: ASTM B306, drainage tube, drawn temper.

C. Copper Drainage Fittings: ASME B16.23, cast-copper fittings or ASME B16.29, wrought-copper, solder-joint fittings.

D. Hard Copper Tube: ASTM B88, Type L, water tube, drawn temper.

E. Soft Copper Tube: ASTM B88, Type L, water tube, annealed temper.

F. Copper Pressure Fittings:

1. Copper Fittings: ASME B16.18, cast-copper-alloy fittings or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
2. Copper Unions: MSS SP-123, copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

G. Copper Flanges: ASME B16.24, Class 150, cast copper with solder-joint end.

1. Flange Gasket Materials: ASME B16.21, full-face, flat, nonmetallic, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

H. Solder: ASTM B32, lead free with ASTM B813, water-flushable flux.

2.5 PVC PIPE AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Charlotte Pipe and Foundry Company.
2. GF Piping Systems.
3. JM Eagle.
4. Mueller Industries, Inc.
5. National Pipe and Plastic, Inc.
6. North America Pipe Corporation.
7. Rocky Mountain Colby Pipe Company.
8. Silver-line Plastics.

B. NSF Marking: Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-drain" for plastic storm drain and "NSF-sewer" for plastic storm sewer piping.

C. Solid-Wall PVC Pipe: ASTM D2665; drain, waste, and vent.

D. Cellular-Core PVC Pipe: ASTM F891, Schedule 40.

E. PVC Socket Fittings: ASTM D2665, made to ASTM D3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.

F. Adhesive Primer: ASTM F656.

1. <Double click to insert sustainable design text for adhesive primer.>
2. Adhesive primer shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

G. Solvent Cement: ASTM D2564.

1. Solvent cement shall have a VOC content of 510 g/L or less.

2.6 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in ODs or of different materials. Include end connections same size as and compatible with pipes to be joined.
2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified-piping-system fitting.
3. Unshielded, Nonpressure Transition Couplings:

    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        1) Dallas Specialty & Mfg. Co.
        2) Fernco Inc.
        3) Mission Rubber Company, LLC; a division of MCP Industries.
        4) Plastic Oddities.

    b. Standard: ASTM C1173.
    c. Description: Elastomeric sleeve, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
    d. Sleeve Materials:

        1) For Cast-Iron Soil Pipes: ASTM C564, rubber.
        2) For Plastic Pipes: ASTM F477, elastomeric seal or ASTM D5926, PVC.
        3) For Dissimilar Pipes: ASTM D5926, PVC or other material compatible with pipe materials being joined.

4. Shielded, Nonpressure Transition Couplings:

    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        1) Cascade Waterworks Mfg. Co.
        2) Mission Rubber Company, LLC; a division of MCP Industries.

    b. Standard: ASTM C1460.
    c. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
    d. End Connections: Same size as and compatible with pipes to be joined.

5. Pressure Transition Couplings:

    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        1) Cascade Waterworks Mfg. Co.

2) EBAA Iron, Inc.
3) Ford Meter Box Company, Inc. (The).
4) JCM Industries, Inc.
5) Romac Industries, Inc.

b. Standard: AWWA C219.
c. Description: Metal, sleeve-type couplings same size as pipes to be joined, and with pressure rating at least equal to and ends compatible with pipes to be joined.
d. Gasket Material: Natural or synthetic rubber.
e. Metal Component Finish: Corrosion-resistant coating or material.

B. Dielectric Fittings:

1. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
2. Dielectric Unions:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) A.Y. McDonald Mfg. Co.
2) Capitol Manufacturing Company.
3) Central Plastics Company.
4) HART Industrial Unions, LLC.
5) Jomar Valve.
6) Matco-Norca.
7) WATTS.
8) Zurn Industries, LLC.

b. Description:

1) Standard: ASSE 1079.
2) Pressure Rating: 150 psig minimum at 180 deg F.
3) End Connections: Solder-joint copper alloy and threaded ferrous.

3. Dielectric Flanges:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Central Plastics Company.
2) Matco-Norca.
3) WATTS.
4) Zurn Industries, LLC.

b. Description:

1) Standard: ASSE 1079.
2) Factory-fabricated, bolted, companion-flange assembly.

3) Pressure Rating: 150 psig minimum at 180 deg F.
4) End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

4. Dielectric-Flange Insulating Kits:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Advance Products & Systems, Inc.
2) Calpico, Inc.
3) Central Plastics Company.
4) GPT; an EnPro Industries company.

b. Description:

1) Nonconducting materials for field assembly of companion flanges.
2) Pressure Rating: 150 psig.
3) Gasket: Neoprene or phenolic.
4) Bolt Sleeves: Phenolic or polyethylene.
5) Washers: Phenolic with steel-backing washers.

5. Dielectric Nipples:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Grinnell G-Fire by Johnson Controls Company.
2) Matco-Norca.
3) Precision Plumbing Products.
4) Victaulic Company.

b. Description: Electroplated steel nipple.
c. Standard: IAPMO PS 66.
d. Pressure Rating: 300 psig at 225 deg F.
e. End Connections: Male threaded or grooved.
f. Lining: Inert and noncorrosive, propylene.

2.7 ENCASEMENT FOR UNDERGROUND METAL PIPING

A. Standard: ASTM A674 or AWWA C105/A 21.5.

B. Material: High-density, crosslaminated polyethylene film of 0.004-inch or linear low-density polyethylene film of 0.008-inch minimum thickness.

C. Form: tube.

D. Color: Black or natural.

PART 3 - EXECUTION

3.1 EARTH MOVING

A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.

1. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.
2. Install piping as indicated unless deviations from layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Cover all roof and overflow drains during constructions to prevent debris from entering pipe and protect grates from damages.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

L. Make changes in direction for piping using appropriate branches, bends, and long-sweep bends.

1. Do not change direction of flow more than 90 degrees.
2. Use proper size of standard increasers and reducers if pipes of different sizes are connected.

a. Reducing size of drainage piping in direction of flow is prohibited.

M. Lay buried building piping beginning at low point of each system.

1. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.
2. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
3. Maintain swab in piping and pull past each joint as completed.

N. Install piping at the following minimum slopes unless otherwise indicated:

1. Building Storm Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 2 percent downward in direction of flow for piping NPS 4 and larger.
2. Horizontal Storm Drainage Piping: 2 percent downward in direction of flow.

O. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Install encasement on underground piping according to ASTM A674 or AWWA C105/A 21.5.

P. Install steel piping according to applicable plumbing code.

Q. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."

R. Install aboveground PVC piping according to ASTM D2665.

S. Install underground PVC piping according to ASTM D2321.

T. Install engineered controlled-flow siphonic drain specialties and storm drainage piping in locations indicated.

U. Install underground, copper, force-main tubing according to CDA's "Copper Tube Handbook."

1. Install encasement on piping according to ASTM A674 or AWWA C105/A 21.5.

V. Install force mains at elevations indicated.

W. Plumbing Specialties:

1. Install backwater valves in storm drainage gravity-flow piping.

a. Comply with requirements for backwater valves specified in Section 221423 "Storm Drainage Piping Specialties."

2. Install cleanouts at grade and extend to where building storm drains connect to building storm sewers in storm drainage gravity-flow piping.

a. Install cleanout fitting with closure plug inside the building in storm drainage force-main piping.
b. Comply with requirements for cleanouts specified in Section 221423 "Storm Drainage Piping Specialties."

3. Install drains in storm drainage gravity-flow piping.

a. Comply with requirements for drains specified in Section 221423 "Storm Drainage Piping Specialties."

X. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

Y. Install sleeves for piping penetrations of walls, ceilings, and floors.

1. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

Z. Install sleeve seals for piping penetrations of concrete walls and slabs.

1. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

AA. Install escutcheons for piping penetrations of walls, ceilings, and floors.

1. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

A. Hub-and-Spigot, Cast-Iron Soil Piping Gasketed Joints: Join according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Hub-and-Spigot, Cast-Iron Soil Piping Caulked Joints: Join according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead-and-oakum caulked joints.

C. Hubless, Cast-Iron Soil Piping Coupled Joints:

1. Join according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1.

1. Cut threads full and clean using sharp dies.
2. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

a. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.

b. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
c. Do not use pipe sections that have cracked or open welds.

E. Join copper tube and fittings with soldered joints according to ASTM B828 procedure. Use ASTM B813, water-flushable, lead-free flux and ASTM B32, lead-free-alloy solder.

F. Grooved Joints: Cut groove ends of pipe according to AWWA C606. Lubricate and install gasket over ends of pipes or pipe and fittings. Install coupling housing sections, over gasket, with keys seated in piping grooves. Install and tighten housing bolts.

G. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.

H. Plastic, Nonpressure-Piping, Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements.
2. PVC Piping: Join according to ASTM D2855 and ASTM D2665 appendices.

I. Joint Restraints and Sway Bracing:

1. Provide joint restraints and sway bracing for storm drainage piping joints to comply with the following conditions:

a. Provide axial restraint for pipe and fittings 5 inches and larger, upstream and downstream of all changes in direction, branches, and changes in diameter greater than two pipe sizes.
b. Provide rigid sway bracing for pipe and fittings 4 inches and larger, upstream and downstream of all changes in direction 45 degrees and greater.
c. Provide rigid sway bracing for pipe and fittings 5 inches and larger, upstream and downstream of all changes in direction and branch openings.

3.4 SPECIALTY PIPE FITTING INSTALLATION

A. Transition Couplings:

1. Install transition couplings at joints of piping with small differences in ODs.
2. In Drainage Piping: Shielded, nonpressure transition couplings.
3. In Aboveground Force-Main Piping: Fitting-type transition couplings.
4. In Underground Force-Main Piping:

a. NPS 1-1/2 and Smaller: Fitting-type transition couplings.
b. NPS 2 and Larger: Pressure transition couplings.

B. Dielectric Fittings:

1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
2. Dielectric Fittings for NPS 2 and Smaller: Use dielectric nipples.
3. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.
4. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.5 VALVE INSTALLATION

A. General valve installation requirements for general-duty valve installations are specified in the following Sections:

1. Section 220523.12 "Ball Valves for Plumbing Piping."
2. Section 220523.13 "Butterfly Valves for Plumbing Piping."
3. Section 220523.14 "Check Valves for Plumbing Piping."
4. Section 220523.15 "Gate Valves for Plumbing Piping."

B. Shutoff Valves:

1. Install shutoff valve on each sump pump discharge.
2. Install full port ball valve for piping NS 2 and smaller.
3. Install gate valve for piping NPS 2-1/2 and larger.

C. Check Valves: Install swing-check valve, between pump and shutoff valve, on each sump pump discharge.

D. Backwater Valves: Install backwater valves in piping subject to backflow.

1. Horizontal Piping: Horizontal backwater valves. Use normally closed type unless otherwise indicated.
2. Install backwater valves in accessible locations.
3. Comply with requirements for backwater valves specified in Section 221423 "Storm Drainage Piping Specialties."

3.6 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
2. Install stainless-steel fiberglass pipe hangers for horizontal piping in corrosive environments.
3. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
4. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.

5. Vertical Piping: MSS Type 8 or Type 42, clamps.
6. Install individual, straight, horizontal piping runs:

    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.

7. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
8. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Support horizontal piping and tubing within 12 inches of each fitting and coupling.

D. Support vertical piping and tubing at base and at each floor.

E. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.

F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
2. NPS 3: 60 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
4. NPS 6 and NPS 8: 60 inches with 3/4-inch rod.
5. NPS 10 and NPS 12: 60 inches with 7/8-inch rod.
6. Spacing for 10-foot pipe lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.

G. Install supports for vertical cast-iron soil piping every 15 feet.

H. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4: 84 inches with 3/8-inch rod.
2. NPS 1-1/2: 108 inches with 3/8-inch rod.
3. NPS 2: 10 feet with 3/8-inch rod.
4. NPS 2-1/2: 11 feet with 1/2-inch rod.
5. NPS 3: 12 feet with 1/2-inch rod.
6. NPS 4 and NPS 5: 12 feet with 5/8-inch rod.
7. NPS 6 and NPS 8: 12 feet with 3/4-inch rod.
8. NPS 10 and NPS 12: 12 feet with 7/8-inch rod.

I. Install supports for vertical steel piping every 15 feet.

J. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4: 72 inches with 3/8-inch rod.
2. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
3. NPS 2-1/2: 108 inches with 1/2-inch rod.

4. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
5. NPS 6: 10 feet with 5/8-inch rod.
6. NPS 8: 10 feet with 3/4-inch rod.

K. Install supports for vertical copper tubing every 10 feet.

L. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch rod.
2. NPS 3: 48 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
4. NPS 6 and NPS 8: 48 inches with 3/4-inch rod.
5. NPS 10 and NPS 12: 48 inches with 7/8-inch rod.

M. Install supports for vertical PVC piping every 48 inches.

N. Support piping and tubing not listed above according to MSS SP-58 and manufacturer's written instructions.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.

C. Connect storm drainage piping to roof drains and storm drainage specialties.

1. Install test tees (wall cleanouts) in conductors near floor, and floor cleanouts with cover flush with floor.
2. Install horizontal backwater valves in pit with pit cover flush with floor.
3. Comply with requirements for backwater valves cleanouts and drains specified in Section 221423 "Storm Drainage Piping Specialties."

D. Connect force-main piping to the following:

1. Storm Sewer: To exterior force main.
2. Sump Pumps: To sump pump discharge.

E. Where installing piping adjacent to equipment, allow space for service and maintenance.

F. Make connections according to the following unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.8 IDENTIFICATION

A. Identify exposed storm drainage piping.

B. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.9 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Test storm drainage piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired.

    a. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.

2. Leave uncovered and unconcealed new, altered, extended, or replaced storm drainage piping until it has been tested and approved.

    a. Expose work that was covered or concealed before it was tested.

3. Test Procedure:

    a. Test storm drainage piping on completion of roughing-in.
    b. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts until completion of inspection, water level must not drop. Inspect joints for leaks.

4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
5. Prepare reports for tests and required corrective action.

C. Test force-main piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Leave uncovered and unconcealed new, altered, extended, or replaced force-main piping until it has been tested and approved.

a. Expose work that was covered or concealed before it was tested.

2. Cap and subject piping to static-water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials.

a. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.

3. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
4. Prepare reports for tests and required corrective action.

D. Piping will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.10 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.11 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

B. Aboveground storm drainage piping NPS 6 and smaller shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI, heavy-duty, hubless-piping couplings; and coupled joints.
3. Copper Type DWV tube, copper drainage fittings, and soldered joints.
4. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
5. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

C. Aboveground, storm drainage piping NPS 8 and larger shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI, heavy-duty, hubless-piping couplings; and coupled joints.
3. Copper Type DWV tube, copper drainage fittings, and soldered joints.
4. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
5. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

D. Underground storm drainage piping NPS 6 and smaller shall be any of the following:

1. Extra Heavy Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI, heavy-duty, cast-iron, hubless-piping couplings; and coupled joints.
3. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
4. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

E. Underground, storm drainage piping NPS 8 and larger shall be any of the following:

1. Extra Heavy Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI, heavy-duty, cast-iron, hubless-piping couplings; and coupled joints.
3. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
4. Cellular-core, sewer and drain series, PVC pipe; PVC socket fittings; and solvent-cemented joints.
5. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

F. Aboveground storm drainage force mains NPS 1-1/2 and NPS 2 shall be any of the following:

1. Hard copper tube, Type L copper pressure fittings, and soldered joints.

G. Aboveground storm drainage force mains NPS 2-1/2 to NPS 6 shall be any of the following:

1. Hard copper tube, Type L copper pressure fittings, and soldered joints.
2. Fitting-type transition couplings if dissimilar pipe materials.

H. Underground storm drainage force mains NPS 4 and smaller shall be any of the following:

1. Hard copper tube; Type L wrought-copper pressure fittings; and soldered joints.
2. Fitting-type transition coupling for piping smaller than NPS 1-1/2 and pressure transition coupling for NPS 1-1/2 and larger if dissimilar pipe materials.

I. Underground storm drainage force mains NPS 5 and larger shall be any of the following:

1. Hard copper tube; Type L wrought-copper pressure fittings; and soldered joints.
2. Pressure transition couplings if dissimilar pipe materials.

END OF SECTION

SECTION 221423 - STORM DRAINAGE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal roof drains.
2. Miscellaneous storm drainage piping specialties.
3. Cleanouts.
4. Backwater valves.
5. Trench drains.
6. Area Drains.

B. Related Requirements:

1. Section 076200 "Sheet Metal Flashing and Trim" for penetrations of roofs.
2. Section 078413 "Penetration Firestopping" for firestopping roof penetrations.

1.3 ACTION SUBMITTALS

A. Submittals shall be formatted per Section 220000 “General Plumbing Requirements”. The manufacturer shall resubmit the specification section showing compliance with each respective paragraphs and specified items and features in that particular specification section. All exceptions shall be clearly identified by referencing respective paragraph and other requirements. Next to each specification item, indicate the following:

1. “No Exception Taken”.
2. “Exception”. All exceptions shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.

B. Product Data: For each type of product.

1.4 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 METAL ROOF DRAINS

A. Cast-Iron, Large-Sump, General-Purpose Roof Drains:

1. Manufacturers: As specified in Fixture Schedule on P0.03 or approved equal. Approved equal is subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Jay R. Smith Mfg. Co.
    b. MIFAB, Inc.
    c. Zurn Industries, LLC.

2. Standard: ASME A112.6.4.
3. Body Material: Cast iron.
4. Dimension of Body: Nominal 14-to 16-inch diameter.
5. Combination Flashing Ring and Gravel Stop: Required.
6. Flow-Control Weirs: Required.
7. Outlet: Bottom or Side.
8. Outlet Type: No hubor Threaded.
9. Extension Collars: Required.
10. Underdeck Clamp: Required.
11. Sump Receiver Plate: Required.
12. Dome Material: Aluminum Cast iron PE.
13. Perforated Gravel Guard: Stainless steel.
14. Vandal-Proof Dome: Required.
15. Water Dam: Not required.

B. Cast-Iron, Medium-Sump, General-Purpose Roof Drains:

1. Manufacturers: As specified in Fixture Schedule on P0.03 or approved equal. Approved equal is subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Jay R. Smith Mfg. Co.
    b. MIFAB, Inc.
    c. Zurn Industries, LLC.

2. Standard: ASME A112.6.4.
3. Body Material: Cast iron.
4. Dimension of Body: 8- to 12-inch diameter.
5. Combination Flashing Ring and Gravel Stop: Required.
6. Flow-Control Weirs: Required.
7. Outlet: Bottom or Side.
8. Outlet Type: No hubor Threaded.
9. Extension Collars: Required.

10. Underdeck Clamp: Required.
11. Sump Receiver Plate: Required.
12. Dome Material: Aluminum Cast iron PE.
13. Wire Mesh: Not required.
14. Perforated Gravel Guard: Stainless steel.
15. Vandal-Proof Dome: Required.
16. Water Dam: Not required.

C. Cast-Iron, Small-Sump, General-Purpose Roof Drains:

1. Manufacturers: As specified in Fixture Schedule on P0.03 or approved equal. Approved equal is subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Jay R. Smith Mfg. Co.
    b. MIFAB, Inc.
    c. Zurn Industries, LLC.

2. Standard: ASME A112.6.4.
3. Body Material: Cast iron.
4. Dimension of Body: Nominal 8-inch diameter.
5. Combination Flashing Ring and Gravel Stop: Required.
6. Outlet: Bottom or Side.
7. Outlet Type: No hub Threaded.
8. Extension Collars: Required.
9. Underdeck Clamp: Required.
10. Sump Receiver Plate: Required.
11. Dome Material: Cast iron.
12. Wire Mesh: Not required.
13. Vandal-Proof Dome: Required.

D. Metal, Parapet Roof Drains:

1. Manufacturers: As specified in Fixture Schedule on P0.03 or approved equal. Approved equal is subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Jay R. Smith Mfg. Co.
    b. MIFAB, Inc.
    c. Zurn Industries, LLC.

2. Standard: ASME A112.6.4.
3. Body Material: Cast iron.
4. Outlet: Back Angle.
5. Outlet Type: Threaded.
6. Grate Material: Bronze Cast iron Nickel-bronze alloy.

7. Wire Mesh: Not required.
8. Vandal-Proof Grate: Required.

E. Metal, Large-Sump, Promenade Roof Drains:

1. Manufacturers: As specified in Fixture Schedule on P0.03 or approved equal. Approved equal is subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Jay R. Smith Mfg. Co.
   b. MIFAB, Inc.
   c. Zurn Industries, LLC.

2. Standard: ASME A112.6.4.
3. Body Material: Cast iron.
4. Dimension of Body: Nominal 12- to 14-inch diameter.
5. Dimension of Frame and Grate: Nominal 12 to 14 inches square.
6. Outlet: Bottom Side.
7. Outlet Type: No hub Threaded.
8. Grate Material: Bronze Cast iron Nickel-bronze alloy.
9. Vandal-Proof Grate: Required.
10. Extension Collars: Required.
11. Underdeck Clamp: Required.
12. Sump Receiver Plate: Required.

F. Metal, Medium-Sump, Promenade Roof Drains:

1. Manufacturers: As specified in Fixture Schedule on P0.03 or approved equal. Approved equal is subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Jay R. Smith Mfg. Co.
   b. MIFAB, Inc.
   c. Zurn Industries, LLC.

2. Standard: ASME A112.6.4.
3. Body Material: Cast iron.
4. Dimension of Body: 11- to 12-inch diameter.
5. Dimension of Frame and Grate: Nominal 12 inches square.
6. Outlet: Bottom Side.
7. Outlet Type: No hub Threaded.
8. Grate Material: Bronze Cast iron Nickel-bronze alloy.
9. Vandal-Proof Grate: Required.
10. Extension Collars: Required.
11. Underdeck Clamp: Required.
12. Sump Receiver Plate: Required.

G. Metal, Small-Sump, Promenade Roof Drains:

1. Manufacturers: As specified in Fixture Schedule on P0.03 or approved equal. Approved equal is subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Jay R. Smith Mfg. Co.
    b. Josam Company.
    c. Zurn Industries, LLC.

2. Standard: ASME A112.6.4.
3. Body Material: Cast iron.
4. Dimension of Body: Nominal 8-inch diameter.
5. Dimension of Frame and Grate: Nominal 8 inches square.
6. Outlet: Bottom.
7. Outlet Type: No hub Threaded
8. Grate Material: Bronze Cast iron Nickel-bronze alloy.
9. Vandal-Proof Grate: Required.
10. Extension Collars: Required.
11. Underdeck Clamp: Required.
12. Sump Receiver Plate: Required.

H. Metal, Medium-Sump, Deck Roof Drains:

1. Manufacturers: As specified in Fixture Schedule on P0.03 or approved equal. Approved equal is subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Jay R. Smith Mfg. Co.
    b. MIFAB, Inc.
    c. Zurn Industries, LLC.

2. Standard: ASME A112.6.4.
3. Body Material: Cast iron.
4. Flange: Anchor.
5. Clamping Device: Required.
6. Integral Backwater Valve: Not required.
7. Outlet: Bottom or Side.
8. Outlet Type: No hub Threaded.
9. Grate Material: Cast or ductile iron.
10. Grate Finish: [Not required] <Insert finish>.
11. Overall Dimension of Frame and Grate: Nominal 12 to 14 inches [round] [square].
12. Top-Loading Classification: Heavy Duty.
13. Vandal-Proof Frame and Grate: Required.

I. Metal, Small-Sump, Deck Roof Drains:

1. Manufacturers: As specified in Fixture Schedule on P0.03 or approved equal. Approved equal is subject to compliance with requirements, available

manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Jay R. Smith Mfg. Co.
b. MIFAB, Inc.
c. Zurn Industries, LLC.

2. Standard: ASME A112.6.4.
3. Body Material: Metal.
4. Flange: Anchor.
5. Clamping Device: Required.
6. Integral Backwater Valve: Not required.
7. Outlet: Bottom Side.
8. Outlet Type: No hub Threaded.
9. Grate Material: Cast or ductile iron.
10. Grate Finish: [Not required] <Insert finish>.
11. Overall Dimension of Frame and Grate: Nominal 8 inches <Insert dimension> [round] [square].
12. Vandal-Proof Frame and Grate: Required.

2.2 MISCELLANEOUS STORM DRAINAGE PIPING SPECIALTIES

A. Downspout Adaptors:

1. Description: Manufactured, gray-iron casting, for attaching to horizontal-outlet, parapet roof drain and to exterior, sheet metal downspout.
2. Size: Inlet size to match parapet drain outlet.

B. Downspout Boots:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. J.R. Hoe & Sons Inc.
b. Neenah Foundry Company.

2. Description: Manufactured, ASTM A48/A48M, gray-iron casting, with strap or ears for attaching to building; NPS 4 outlet; and shop-applied bituminous coating.
3. Size: Inlet size to match downspout and NPS 4 outlet.

C. Conductor Nozzles:

1. Description: Bronze body with threaded inlet and bronze wall flange with mounting holes.
2. Size: Same as connected conductor.

2.3 CLEANOUTS

A. Cast-Iron Exposed Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Jay R. Smith Mfg. Co.
    b. MIFAB, Inc.
    c. Zurn Industries, LLC.

2. Standard: ASME A112.36.2M.
3. Size: Same as connected branch.
4. Body Material: Hub-and-spigot, cast-iron soil pipe T-branch No-hub, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk or raised-head, brass plug.
6. Closure Plug Size: Same as, or not more than, one size smaller than cleanout size.

B. Cast-Iron Exposed Floor Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Jay R. Smith Mfg. Co.
    b. WATTS.
    c. Zurn Industries, LLC.

2. Standard: ASME A112.36.2M.
3. Size: Same as connected branch.
4. Type: Heavy-duty, adjustable housing Threaded, adjustable housing.
5. Body or Ferrule: Cast iron.
6. Clamping Device: Not required.
7. Outlet Connection: No hub Hub with gasket Threaded.
8. Closure: Brass plug with straight threads and gasket Brass plug with tapered threads Cast-iron plug Plastic plug.
9. Adjustable Housing Material: Cast iron Plastic with threads.
10. Frame and Cover Material and Finish: Nickel-bronze, copper alloy Painted cast iron Polished bronze Rough bronze.
11. Frame and Cover Shape: Round.
12. Top Loading Classification: Heavy Duty.
13. Riser: ASTM A74, Extra-Heavy Service class, cast-iron drainage pipe fitting and riser to cleanout.

C. Plastic Floor Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Canplas LLC.
    b. IPS Corporation.
    c. NDS Inc.

2. Size: Same as connected branch.
3. Body Material: PVC.

4. Closure Plug: PVC.
5. Riser: Drainage pipe fitting and riser to cleanout of same material as drainage piping.

D. Cast-Iron Wall Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Jay R. Smith Mfg. Co.
    b. MIFAB, Inc.
    c. Zurn Industries, LLC.

2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: No-hub, cast-iron soil pipe test tee as required to match connected piping.
5. Closure Plug:

    a. Brass Cast iron.
    b. Countersunk or raised head.
    c. Drilled and threaded for cover attachment screw.
    d. Size: Same as, or not more than, one size smaller than cleanout size.

6. Wall Access: Round, flat, chrome-plated brass or stainless-steel cover plate with screw.
7. Wall Access: Round, nickel-bronze, copper-alloy, or stainless-steel wall-installation frame and cover.

E. Test Tees:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Jay R. Smith Mfg. Co.
    b. MIFAB, Inc.
    c. Tyler Pipe; a subsidiary of McWane Inc.

2. Standard: ASME A112.36.2M and ASTM A74, ASTM A888, or CISPI 301.
3. Size: Same as connected drainage piping.
4. Body Material: Hub-and-spigot, cast-iron soil-pipe T-branch or no-hub, cast-iron soil-pipe test tee as required to match connected piping.
5. Closure Plug: Countersunk or raised head, brass.
6. Closure Plug Size: Same as, or not more than, one size smaller than cleanout size.

2.4 BACKWATER VALVES

A. Cast-Iron, Horizontal Backwater Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Jay R. Smith Mfg. Co.
b. MIFAB, Inc.
c. Zurn Industries, LLC.

2. Standard: ASME A112.14.1.
3. Size: Same as connected piping.
4. Body Material: Cast iron.
5. Cover: Cast iron with bolted or threaded access check valve.
6. End Connections: no hub.
7. Check Valve: Removable, bronze, swing check, factory assembled or field modified to hang closed.
8. Extension: ASTM A74, Service class; full-size, cast-iron soil-pipe extension to field-installed cleanout at floor; replaces backwater valve cover.

B. Cast-Iron, Drain-Outlet Backwater Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Jay R. Smith Mfg. Co.
b. Josam Company.
c. Zurn Industries, LLC.

2. Standard: ASME A112.14.1.
3. Size: Same as floor drain outlet.
4. Body Material: Cast iron or bronze.
5. Check Valve: Removable ball float.
6. Inlet: Threaded.
7. Outlet: Threaded or spigot.

C. Plastic, Horizontal Backwater Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Canplas LLC.
b. IPS Corporation.
c. NDS Inc.

2. Standard: ASME A112.14.1.
3. Size: Same as connected piping.
4. Body Material: PVC.
5. Cover: Same material as body with threaded access to check valve.
6. Check Valve: Removable swing check.
7. End Connections: Socket type.

2.5 TRENCH DRAINS

A. Trench Drains:

1. Manufacturers: As specified in Fixture Schedule on P0.03 or approved equal. Approved equal is subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Jay R. Smith Mfg. Co.
    b. MIFAB, Inc.
    c. Zurn Industries, LLC.

2. Standard: ASME A112.6.3.
3. Body Material: Cast iron.
4. Flange: Anchor.
5. Clamping Device: Required.
6. Outlet: Bottom End Side.
7. Outlet Type: Threaded or No Hub.
8. Grate Material: Ductile iron cast iron or stainless steel.
9. Grate Finish: Painted .

2.6 AREA DRAINS

A. Cast-Iron Floor Drains:
    1. Manufacturers: As specified in Fixture Schedule on P0.03 or approved equal. Approved equal is subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
        a. Jay R. Smith Mfg. Co.
        b. MIFAB, Inc.
        c. Wade; a subsidiary of McWane Inc.
        d. WATTS.
    2. Standard: ASME A112.6.3.
    3. Pattern: Floor drain.
    4. Body Material: Cast Iron.
    5. Seepage Flange: As Required.
    6. Anchor Flange: As Required.
    7. Clamping Device: As Required.
    8. Outlet: Bottom, End or Side.
    9. Grate Top or Strainer Material: Nickel bronze or Stainless steel.
    10. Grate Top Shape: Round. Square when specifically requested by owner.
    11. Dimensions of Top or Strainer: Refer to Plumbing Fixture Schedule on Construction Plans for body, sump, and grate requirements.
    12. Top Loading Classification: Heavy duty at exterior locations. Light or Medium Duty within building.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions.

1. Install flashing collar or flange of roof drain to prevent leakage between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
2. Install expansion joints, if indicated, in roof drain outlets.
3. Position roof drains for easy access and maintenance.

B. Install downspout adapters on outlet of back-outlet parapet roof drains and connect to sheet metal downspouts.

C. Install downspout boots at grade with top 12 inches above grade. Secure to building wall.

D. Install conductor nozzles at exposed bottom of conductors where they spill onto grade.

E. Install cleanouts in building drain piping according to the following instructions unless otherwise indicated:

1. Use cleanouts the same size as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate cleanouts at each change in direction of piping greater than 135 degrees.
3. Locate cleanouts at base of each vertical storm piping conductor.

F. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

G. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

H. Install horizontal backwater valves in floor with cover flush with floor.

I. Install drain-outlet backwater valves in outlet of drains.

J. Install test tees in vertical conductors and near floor.

K. Install wall cleanouts in vertical conductors. Install access door in wall if indicated.

L. Install trench drains at low points of surface areas to be drained. Set grates of drains flush with finished surface unless otherwise indicated.

M. Install through-penetration firestop assemblies for penetrations of fire- and smoke-rated assemblies.

1. Comply with requirements in Section 078413 "Penetration Firestopping."

3.2 CONNECTIONS

A. Comply with requirements for piping specified in Section 221413 "Facility Storm Drainage Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece of metal unless large pans, sumps, or other drainage shapes are required.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

3.4 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

SECTION 221429 - SUMP PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Submersible sump pumps.
2. Wet-pit-volute sump pumps.
3. Sump-pump basins and basin covers.
4. Packaged drainage-pump units.

1.3 ACTION SUBMITTALS

A. Submittals shall be formatted per Section 220000 “General Plumbing Requirements”. The manufacturer shall resubmit the specification section showing compliance with each respective paragraphs and specified items and features in that particular specification section. All **exceptions** shall be clearly identified by referencing respective paragraph and other requirements. Next to each specification item, indicate the following:

1. “No Exception Taken”.
2. “Exception”. All exceptions shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.

B. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

C. Shop Drawings:

1. Include plans, elevations, sections, and mounting attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
4. Include diagrams for power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For pumps and controls, to include in operation and maintenance manuals.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Retain shipping flange protective covers and protective coatings during storage.

B. Protect bearings and couplings against damage.

C. Comply with manufacturer's written instructions for handling.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. UL Compliance: Comply with UL 778 for motor-operated water pumps.

2.2 SUBMERSIBLE SUMP PUMPS

A. Submersible, Fixed-Position, Single-Seal Sump Pumps:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Liberty Pumps.
   b. Weil Pump Company, Inc.
   c. Zoeller Company.

2. Description: Factory-assembled and -tested sump-pump unit.
3. Pump Type: Submersible, end-suction, single-stage, close-coupled, overhung-impeller, centrifugal sump pump as defined in HI 1.1-1.2 and HI 1.3.
4. Pump Casing: Cast iron, with strainer inlet, legs that elevate pump to permit flow into impeller, and vertical discharge for piping connection.
5. Impeller: Statically and dynamically balanced, ASTM A532/A532M, abrasion-resistant cast iron, semiopen design for clear wastewater handling, and keyed and secured to shaft.
6. Pump and Motor Shaft: Stainless steel, with factory-sealed, grease-lubricated ball bearings.
7. Seal: Mechanical.
8. Motor: Hermetically sealed, capacitor-start type; with built-in overload protection; lifting eye or lug; and three-conductor, waterproof power cable of length required and with grounding plug and cable-sealing assembly for connection at pump.

9. Controls:

    a. Enclosure: NEMA 250, **Type 4X**.
    b. Switch Type: Pedestal-mounted float switch with float rods and rod buttons.
    c. Automatic Alternator: Start pumps on successive cycles and start multiple pumps if one cannot handle load.
    d. Float Guides: Pipe or other restraint for floats and rods in basins of depth greater than 60 inches.
    e. High-Water Alarm: Cover-mounted, compression-probe alarm, with electric bell; 120 V ac, with transformer and contacts for remote alarm bell.

10. Controls:

    a. Enclosure: NEMA 250, **Type 4X**
    b. Switches: Selected type switches shall be housed in NEMA 250, Type 6 enclosures with mounting rod and electric cables.
    c. Automatic Alternator: Start pumps on successive cycles and start multiple pumps if one cannot handle load.
    d. High-Water Alarm: Rod-mounted, NEMA 250, Type 6 enclosure with mechanical-float, mercury-float, or pressure switch matching control and electric bell; 120 V ac, with transformer and contacts for remote alarm bell.

11. Control-Interface Features:

    a. Remote Alarm Contacts: For remote alarm interface.
    b. Building Automation System Interface: Auxiliary contacts in pump controls for interface to building automation system and capable of providing the following:

        1) On-off status of pump.
        2) Alarm status.

B. Submersible, Fixed-Position, Double-Seal Sump Pumps:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. EBARA Fluid Handling.
    b. Flygt; a brand of Xylem Inc.
    c. PACO Pumps; Grundfos Pumps Corporation, USA.

2. Description: Factory-assembled and -tested sump-pump unit.
3. Pump Type: Submersible, end-suction, single-stage, close-coupled, overhung-impeller, centrifugal sump pump as defined in HI 1.1-1.2 and HI 1.3.
4. Pump Casing: Cast iron, with strainer inlet, legs that elevate pump to permit flow into impeller, and vertical discharge for piping connection.
5. Impeller: Statically and dynamically balanced, ASTM A532/A532M, abrasion-resistant cast iron and ASTM B584, cast bronze, semiopen design for clear wastewater handling, and keyed and secured to shaft.
6. Pump and Motor Shaft: Stainless steel, with factory-sealed, grease-lubricated ball bearings.

7. Seals: Mechanical.
8. Moisture-Sensing Probe: Internal moisture sensor and moisture alarm.
9. Motor: Hermetically sealed, capacitor-start type; with built-in overload protection; lifting eye or lug; and three-conductor, waterproof power cable of length required and with grounding plug and cable-sealing assembly for connection at pump.
10. Controls:

    a. Enclosure: NEMA 250, **Type 4X**
    b. Switch Type: Pedestal-mounted float switch with float rods and rod buttons.
    c. Automatic Alternator: Start pumps on successive cycles and start multiple pumps if one cannot handle load.
    d. Float Guides: Pipe or other restraint for floats and rods in basins of depth greater than 60 inches.
    e. High-Water Alarm: Cover-mounted, compression-probe alarm, with electric bell; 120 V ac, with transformer and contacts for remote alarm bell.

11. Controls:

    a. Enclosure: NEMA 250, **Type 4X**
    b. Switch Type: Mechanical-float Pressure type, in NEMA 250, Type 6 enclosures with mounting rod and electric cables.
    c. Automatic Alternator: Start pumps on successive cycles and start multiple pumps if one cannot handle load.
    d. High-Water Alarm: Rod-mounted, NEMA 250, Type 6 enclosure with mechanical-float, mercury-float, or pressure switch matching control and electric bell; 120 V ac, with transformer and contacts for remote alarm bell.

12. Control-Interface Features:

    a. Remote Alarm Contacts: For remote alarm interface.
    b. Building Automation System Interface: Auxiliary contacts in pump controls for interface to building automation system and capable of providing the following:

        1) On-off status of pump.
        2) Alarm status.

2.3 WET-PIT-VOLUTE SUMP PUMPS

A. Description: Factory-assembled and -tested sump-pump unit.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. PACO Pumps; Grundfos Pumps Corporation, USA.
2. Peerless Pump Company.
3. Weil Pump Company, Inc.

C. Pump Type: Wet-pit-volute, single-stage, separately coupled, overhung-impeller, centrifugal sump pump as defined in HI 1.1-1.2 and HI 1.3.

D. Pump Casing: Cast iron, with strainer inlet and threaded connection for NPS 2 and smaller and flanged connection for NPS 2-1/2 and larger discharge piping.

E. Impeller: Statically and dynamically balanced, ASTM A532/A532M, abrasion-resistant cast iron and ASTM B584, cast bronze, semiopen design for clear wastewater handling, and keyed and secured to shaft.

F. Sleeve Bearings: Bronze. Include oil-lubricated, intermediate sleeve bearings at 48-inch-maximum intervals if basin depth is more than 48 inches, and grease-lubricated, ball-type thrust bearings.

G. Pump and Motor Shaft Coupling: Flexible, capable of absorbing torsional vibration and shaft misalignment.

H. Pump Discharge Piping: Factory or field fabricated, galvanized, ASTM A53/A53M, Schedule 40, steel pipe with ASME B16.1, Class 125, cast-iron flanges and flanged fittings or ASME B16.4, Class 125, gray-iron threaded fittings.

I. Support Plate: Cast iron or coated steel; strong enough to support pumps, motors, and controls. See "Sump-Pump Basins and Basin Covers" Article for requirements.

J. Shaft Seal: Stuffing box, with graphite-impregnated braided-yarn rings and bronze packing gland.

K. Motor: Single speed; grease-lubricated ball bearings and mounting on vertical, cast-iron pedestal.

L. Controls:

1. Enclosure: NEMA 250, **Type 4X**
2. Switch Type: Pedestal-mounted float switch with float rods and rod buttons.
3. Automatic Alternator: Start pumps on successive cycles and start multiple pumps if one cannot handle load.
4. Float Guides: Pipe or other restraint for floats and rods in basins of depth greater than 60 inches.
5. High-Water Alarm: Cover-mounted, compression-probe alarm, with electric bell; 120 V ac, with transformer and contacts for remote alarm bell.

M. Controls:

1. Enclosure: NEMA 250, **Type 4X**
2. Switches: Selected type switches shall be in NEMA 250, Type 6 enclosures with mounting rod and electric cables.
3. Automatic Alternator: Start pumps on successive cycles and start multiple pumps if one cannot handle load.
4. High-Water Alarm: Rod-mounted, NEMA 250, Type 6 enclosure with mechanical-float, mercury-float, or pressure switch matching control and electric bell; 120 V ac, with transformer and contacts for remote alarm bell.

N. Control-Interface Features:

1. Remote Alarm Contacts: For remote alarm interface.
2. Building Automation System Interface: Auxiliary contacts in pump controls for interface to building automation system and capable of providing the following:

    a. On-off status of pump.
    b. Alarm status.

2.4 SUMP-PUMP CAPACITIES AND CHARACTERISTICS

A. Unit Capacity: Minimum 5 GPM.

B. Number of Pumps: **One**

C. Each Pump:

1. Capacity: 5 gpm.
2. Total Dynamic Head: 25 feet.
3. Speed: 1500 RPM
4. Discharge Size: 1-1/2 minimum NPS.
5. Electrical Characteristics:

    a. Motor Horsepower: 1/3 hp.
    b. Volts: **120** V ac.
    c. Phases: **Single**
    d. Hertz: 60.

2.5 SUMP-PUMP BASINS AND BASIN COVERS

A. Basins: Factory-fabricated, watertight, cylindrical, basin sump with top flange and sidewall openings for pipe connections.

1. Material: **Cast iron**.
2. Reinforcement: Mounting plates for pumps, fittings, and accessories.
3. Anchor Flange: Same material as or compatible with basin sump, cast in or attached to sump, in location and of size required to anchor basin in concrete slab.

B. Basin Covers: Fabricate metal cover with openings having gaskets, seals, and bushings; for access to pumps, pump shafts, control rods, discharge piping, vent connections, and power cables.

1. Reinforcement: Steel or cast iron, capable of supporting foot traffic for basins installed in foot-traffic areas.

C. Capacities and Characteristics:

1. Capacity: minimum 5 gal..
2. Diameter: minimum1-1/2 inches.
3. Cover Material: **Cast iron or steel with bituminous coating**

2.6 PACKAGED DRAINAGE-PUMP UNITS

A. Packaged Pedestal Drainage-Pump Units:

1. Description: Factory-assembled and -tested, automatic-operation, freestanding, sump-pump unit.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Liberty Pumps.
    b. Little Giant Pump Co.
    c. Zoeller Company.

3. Pump Type: Wet-pit-volute, single-stage, separately coupled, overhung-impeller centrifugal pump as defined in HI 1.1-1.2 and HI 1.3.
4. Pump Casing: Corrosion-resistant material, with strainer inlet, design that permits flow into impeller, and vertical discharge for piping connection.
5. Impeller: Aluminum, brass, or plastic.
6. Motor: With built-in overload protection and mounted vertically on sump pump column.
7. Power Cord: Three-conductor, waterproof cable of length required, but not less than 72 inches, with grounding plug and cable-sealing assembly for connection at pump.
8. Control: Float switch.

B. Packaged Submersible Drainage-Pump Units:

1. Description: Factory-assembled and -tested, automatic-operation, basin-mounted, sump-pump unit.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Liberty Pumps.
    b. Little Giant Pump Co.
    c. Zoeller Company.

3. Pump Type: Submersible, end-suction, single-stage, close-coupled, overhung-impeller centrifugal pump as defined in HI 1.1-1.2 and HI 1.3.
4. Casing: **Metal**
5. Impeller: **Brass**
6. Pump Seal: Mechanical.
7. Motor: Hermetically sealed, capacitor-start type, with built-in overload protection.
8. Power Cord: Three-conductor, waterproof cable of length required, but not less than 72 inches, with grounding plug and cable-sealing assembly for connection at pump.
9. Pump Discharge Piping: Factory or field fabricated, **galvanized, ASTM A53/A53M, Schedule 40, steel pipe with ASME B16.4, Class 125, gray-iron threaded fittings**
10. Control: Motor-mounted float switch.
11. Basin: Plastic.

C. Capacities and Characteristics:

1. Capacity: Minimum 5 gpm.
2. Total Dynamic Head: Minimum 30 feet.
3. Discharge Pipe Size: 1-1/2 NPS.
4. Electrical Characteristics:

a. Motor Horsepower: 1/3 hp.
b. Volts: **120** V.
c. Phases: **Single**.
d. Hertz: 60.

2.7 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 220513 "Common Motor Requirements for Plumbing Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

B. Motors for submersible pumps shall be hermetically sealed.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavation and filling are specified in Section 312000 "Earth Moving."

3.2 EXAMINATION

A. Examine roughing-in for plumbing piping to verify actual locations of storm drainage piping connections before sump pump installation.

3.3 INSTALLATION

A. Pump Installation Standards: Comply with HI 1.4 for installation of sump pumps.

3.4 CONNECTIONS

A. Comply with Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where installing piping adjacent to equipment, allow space for service and maintenance.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test, inspect, and adjust components, assemblies, and equipment installations, including connections.

B. Perform the following tests and inspections:

1. Perform each visual and mechanical inspection.
2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Pumps and controls will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.6 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

3.7 ADJUSTING

A. Adjust pumps to function smoothly, and lubricate as recommended by manufacturer.

B. Adjust control set points.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain controls and pumps.

END OF SECTION

SECTION 221619 - DISINFECTION OF POTABLE WATER SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes the furnishing of all labor and materials for disinfection of the potable water system. Potable water systems are those systems which carry domestic water from the supply main without isolation of the branch by a backflow prevention device. Install all plumbing fittings and valves necessary to perform the disinfection.

B. This section also includes the furnishing of all labor and materials to sample water in system following completion of procedure and provide bacteriological analysis of the water.

1.2 QUALIFICATIONS

A. Disinfection: Disinfection shall be done by a commercial disinfection company approved by the Client. Submit to the Client's Representative the name of the proposed company for approval.

B. Bacteriological Analysis: Water testing shall be done by a laboratory approved by the State Department of Health Services. Submit for approval the name of the proposed laboratory as well as the proposed number and location of samples.

C. Provide a certificate of completion per Part B attached standard chlorination report which denotes the lines disinfected, the concentration applied and the amount and type of disinfection agent used, and that disinfection is in accordance with AWWA C-601 and State Health Department requirements.

1.3 ACTION SUBMITTALS

A. Submittals shall be formatted per Section 220000 “General Plumbing Requirements”. The manufacturer shall resubmit the specification section showing compliance with each respective paragraphs and specified items and features in that particular specification section. All **exceptions** shall be clearly identified by referencing respective paragraph and other requirements. Next to each specification item, indicate the following:
   1. “No Exception Taken”.
   2. “Exception”. All exceptions shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.

B. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Use an approved chlorine agent, applied in liquid form into the system being disinfected. Chlorine gas or a hypochlorite solution may be used to make up the disinfecting liquid.

PART 3 - EXECUTION

3.1 PRELIMINARY PREPARATION OF THE SYSTEM

A. Provide within 3 feet of the supply main, an injection port for introducing the chlorine solution and a gate valve upstream from the injection port.

B. There shall be no dead-end sections in the system exceeding 18 inches in length. All branches within the system shall lead to an outlet for bleeding and flushing.

C. After final pressure tests, open each fixture or outlet to maximum flow and run until the discharge water is free from particulates.

3.2 CHLORINATION PROCEDURE

A. Notify the University's Representative at least five working days prior to the start date of chlorination per Part A attached chlorination report.

B. Install all fixtures to be served by the potable water system before start of chlorination.

C. Prior to injection, place signs on each fixture being treated, reading "Heavily Chlorinated Water - Do Not Use."

D. Introduce the chlorine into the supply stream at a rate to provide a uniform concentration of chlorine in the entire system. Maintain at least 50 ppm chlorine level at each fixture after a hold period of 24 hours.

E. Draw the injected chlorine in the system through each outlet and fixture until the specified concentration level is reached. Then close all valves including the service cock and supply valve. Keep the system closed during the 24 hour hold period.

F. The Client will require a test for the residual concentration in the system at the end of 24 hours. Release no water from the system until these required samples are taken. A minimum concentration of 50 ppm of chlorine is required at all chosen sampling points.

G. After approval to proceed, flush the system at a relatively high velocity to remove the injected chlorine to a concentration in the system of no more than 0.5 ppm above that in the normal supply.

H. After approval to proceed, secure the entire system for at least three days prior to taking samples for bacteriological analysis.

3.3 SAMPLING AND NOTIFICATION

A. At the completion of the three-day hold period, take bacteriological water samples with observation by the Client's Representative.

B. Sample bottles must be provided by the approved laboratory. After the samples have been collected, the Client's Representative may allow temporary use of the water system pending results of the bacteriological analysis of the samples. The system cannot be used unless such allowance in writing is given.

C. Upon completion of sampling, submit the certificate of completion to the Client's Representative for approval.

3.4 ANALYSIS

A. Perform qualitative and quantitative bacterial analysis on the water samples and submit a laboratory report. The report must include the presence of any E. Coli bacteria in a 100 ml sample (this must be negative to be acceptable) and a total plate count of bacteria per cc of the sample (this must be less than 100, or equal to the supply).

3.5 FINAL ACCEPTANCE

A. Upon satisfactory completion of all procedures and receipt of acceptable bacteriological results, written approval of the system will be provided by the Client's Representative per Part C attached standard chlorination report. Failure to fully comply with the above procedures will result in a requirement to repeat the procedure until acceptable results are achieved, at no additional cost to the Client.

END OF SECTION

SECTION 223300 - ELECTRIC, DOMESTIC-WATER HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Air Source Heat Pump Heaters
2. Water Limitations
3. Storage Tank
4. Swing Tank
5. Flow-control, electric, tankless, domestic-water heaters.
6. Thermostat-control, electric, tankless, domestic-water heaters.
7. Domestic-water heater accessories.

1.3 ACTION SUBMITTALS

A. Submittals shall be formatted per Section 220000 “General Plumbing Requirements”. The manufacturer shall resubmit the specification section showing compliance with each respective paragraphs and specified items and features in that particular specification section. All **exceptions** shall be clearly identified by referencing respective paragraph and other requirements. Next to each specification item, indicate the following:

1. “No Exception Taken”.
2. “Exception”. All exceptions shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.

B. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

C. Sustainable Design Submittals:

1. Product Data: For energy efficiency.

D. Shop Drawings:

1. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Equipment room drawing or BIM model, drawn to scale, on which the items described in this Section are shown and coordinated with all building trades.

1.5 Retain "Seismic Qualification Data" Paragraph below if required by seismic criteria applicable to Project. Coordinate with Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment." See ASCE/SEI 7 for certification requirements for equipment and components.

A. Seismic Qualification Data: Certificates, for commercial domestic-water heaters, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Product Certificates: For each type of commercial and tankless, electric, domestic-water heater.

C. Domestic-Water Heater Labeling: Certified and labeled by testing agency acceptable to authorities having jurisdiction.

D. Source quality-control reports.

E. Field quality-control reports.

F. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For electric, domestic-water heaters to include emergency, operation, and maintenance manuals.

1.7 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of electric, domestic-water heaters that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

    a. Structural failures including storage tank and supports.
    b. Faulty operation of controls.
    c. Deterioration of metals, metal finishes, and other materials beyond normal use.

2. Warranty Periods: From date of Substantial Completion.

    a. Air Source Heat Pump Heaters:

        1) Unit: Five years.
        2) Controls and Other Components: Five years.

    b. Storage Tank:

        1) Unit: Five years.
        2) Controls and Other Components: Five years.

    c. Swing Tank:

        1) Tank: Five years.
        2) Controls and Other Components: Three years.

    d. Expansion Tanks: Five years.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and use.

B. Seismic Performance: Commercial, electric, domestic-water heaters shall withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
2. Component Importance Factor: **1.5**.

C. ASHRAE/IES Compliance: Applicable requirements in ASHRAE/IES 90.1.

D. ASME Compliance: Where ASME-code construction is indicated, fabricate and label commercial, domestic-water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

E. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61 and NSF 372.

2.2 Air Source Heat Pump Heaters

A. Manufacturers: As specified in Equipment Schedule on P0.02 or approved equal.
   1. Colmac Industries.

B. The heat pump water heater shall be packaged air source equipment, factory assembled, charged, and tested. The heat pump shall be suitable for heating potable water and have the capability of producing no less than 160°F (71°C) water up to 185°F(85°C) under predetermined source conditions, with heating capacity and C.O.P. as indicated on the application specific documents.

C. Heat Pump water circuit shall be NSF 61 low lead certified by a third-party national testing laboratory for potable water applications.

D. Heat pump unit shall consist of compressor, condenser, evaporator coil, direct drive EC fan (either Axial or Plenum), hot water circulating pump, piping, and controls, factory assembled, charged, and tested. The heat pump shall contain the following components and features:

E. Components:
   1. Cabinet and Frame
      a. Cabinet shall be 304L stainless steel (316L optional), designed for outdoor operation. Cabinet Supports, channels and beams shall also be constructed of 304L stainless steel. Compartments shall have large access doors for servicing. Refrigerant components shall be in a separate compartment from fan for service during operation. Unit shall have stainless steel drip pan for condensate. Unit shall be designed with slide out refrigeration tray to allow refrigeration component servicing while unit is configured in a side-by-side array and connected to intake and discharge ducting.
   2. Electrical
      a. Control box shall be Nema 4x or equivalent. Panel wiring shall be UL508 Compliant. Control box shall possess a main disconnect switch to shut off power to all components, and an additional switch to shut off control power.
   3. Fan
      a. Direct-drive EC axial fan with high-performance axial impeller, mounted on an EC motor with integrated control electronics. The fan arrangement shall be draw-through design. Integrated diffuser, corrosion-resistant galvanized sheet steel, coated with black plastic RAL 9005, optimized inlet ring, aerodynamically optimized guard grill in accordance with DIN EN ISO 13857, made of steel, coated with black plastic RAL 9005. Profiled blade geometry with winglets at the blade tips; impeller made of highly corrosion resistant composite material. Motor impeller statically and dynamically balanced on two planes to balancing grade G 6.3 in accordance with DIN ISO 1940.
   4. Evaporator Coil:
      a. Shall be aluminum microchannel construction. (For corrosion resistant coating see OPTIONS section).
   5. Condenser:
      a. 316L Stainless steel, copper brazed plate, vented double wall type. Single wall condenser construction shall not be allowed. UL Listed, NSF 372 compliant, and suitable for up to 450°F (232°C) high temperature operation

with potable water. Unit shall be operational pressure rated to no less than 435 PSI (30 Bar), with built in temperature ports for performance monitoring.

6. Refrigerant: Refrigerant shall be R-134a.
7. Refrigerant Accessories:
   a. Filter-Driers: Sweat connection type.
   b. Sight Glass: Moisture indicating type.
   c. Suction accumulator.
8. Expansion Valve:
   a. Electronic expansion valve shall be specifically designed for heat pump use with field adjustable superheat feature and employed with a dedicated programmable, PID equipped microprocessor controller.
9. Compressor:
   a. Hermetic scroll type by Copeland Corp., suitable for high temperature operation with R-134a refrigerant. Compressor shall be furnished with rotolock backseating service valves (except 25HP) for suction and discharge connections. Compressor shall have optional variable frequency options to maximize electrical efficiency and capacity for seasonal applications. Compressor shall have belly band heater to maintain proper oil temperature to avoid wear upon compressor startup. Heat pump shall have double vibration isolation between the compressor and unit frame. Compressor shall possess a mechanical safety to avoid damage when exposed to extraordinary temperatures.
10. Water Circulating Pump:
    a. Shall be in-line stainless steel body NSF-61Certified, centrifugal type, able to deliver rated flow against the external head shown on the drawings.
11. Air Filter:
    a. Factory installed air filter shall have 1-inch thick, rigid polyester filter media that is MERV 4 rated. Filter shall be re-usable and washable with soap and water.
12. Controls:
    a. The heat pump unit shall have industrial PLC controls with the following features:
13. Call for Heat Logic:
    a. Unit shall utilize its own logic to analyze up to four factory-provided temperature sensors and run via user-specifiedtemperature setpoints. Unit shall have the ability to trigger on via BMS communications (see communications and UI) or a closed contact set.
14. Constant Leaving Water Temperature Control:
    a. Unit shall possess the ability to maintain constant outlet water temperatures via PID control logic, regardless of the inlet water temperature. Setpoint temperature shall be field adjustable.
15. Refrigeration Cycle Controls:
    a. Unit Protections:
       1) Built-in controls shall prevent the following conditions from exceeding boundaries that cause harm or unnecessary wear to physical components: high incoming potable water temperature, compressor short-cycling, high discharge pressure, low suction pressure, and phase failure compressor protection. Alarm notifications shall alert user of extraordinary conditions via touch screen.
16. Intelligent Defrost:

a. Unit shall have the ability to selectively defrost when conditions and refrigeration cycle performance dictate that frost has accumulated on the evaporator coil.

17. Communications and UI:
    a. BMS Communication:
        1) Unit shall respond and report to external systems through BACnet MSTP, BACnet IP (ethernet), modbus MSTP, or modbus IP (ethernet).
18. Data Trending:
    a. Unit shall trend recent water temperature and refrigeration cycle data for ease of troubleshooting and system performance. Unit shall possess the ability to report these values to an external system via BMS communications listed above or download to a provided micro-usb drive with no external hardware required.
19. Touch Screen:
    a. Unit shall have a touch screen with multi-tiered password protected access. The touch screen shall allow live system monitoring and password protected setpoint modifications. Screen shall possess the capability to automatically upload updates via included micro-usb drive without the requirement of any additional hardware.
20. Arrays of Multiple Units:
    a. Units shall have the ability to integrate into modular arrays and possess the ability to assume master or slave status within that array. Units shall communicate with each other via ethernet without any external hardware required. Master unit shall have the ability to report any unit's status within the array to controlling BMS platforms.
21. Lead/Lag:
    a. Units shall possess the ability to communicate in arrays via ethernet. No external control systems shall be required for this communication to take place. Units shall possess lead/lag capabilities to prevent excess inrush current resulting from multiple units starting simultaneously.
22. Staging:
    a. Units shall have the ability to run specified unit quantities via user-defined stages, based off up to four tank temperature sensor locations.
23. Run-hour balancing:
    a. While interconnected, master unit shall prioritize specific units to run to balance the run hours of all connected units.

2.3 WATER LIMITATIONS

A. The heat pump has a maximum standard domestic water working pressure of 150 psig. Maximum working pressures of 370PSI are available in custom configurations. Flow rates through each Standard heat pump module are limited to 55GPM (varies by unit) of domestic water. Accommodations for potable flow rates over 55 GPM are considered as custom configurations. Modular heat pump arrays can be configured to accommodate higher potable flows.

B. Additional Options
    1. OPTION 1:

a. Electrocoat Evaporator Coating. Evaporator coated with flexible epoxy polymer e-coat uniformly applied to all surface areas with no material bridging between fins. Coating process shall ensure complete encapsulation and uniform dry film thickness from 0.6-1.2 mils on all surface areas including fin edges. Coating shall pass 5,000 hours salt spray resistance per ASTM B117-90.

2. OPTION 2:
   a. EC Plenum Fan. The fan arrangement shall be draw-through design. Direct-drive single inlet centrifugal fan with backwards-curvedhigh-performance centrifugal impellers with radial diffusers, mounted on an EC external rotor motor with integrated control electronics. Impeller made of aluminum, with 5 backwards-curved,continuously welded, hollow-profile blades; impeller sizes 250 and 280 made of plastic; flow-optimized inlet ring made of galvanized sheet steel with pressure test nipple. Motor impeller statically and dynamically balanced on two planes to balancing grade G 6.3 (motor size 200 to balancing grade G 4.0) in accordance with DIN ISO 1940. Integrated electronics, soft start, integrated current limitation, extended voltage input 1~200-277 V, 50/60 respectively 3~380-480 V, 50/60 Hz. Plenum housing shall be designed to allow front or back, left, right, or top discharge ducting connections.
3. OPTION 3:
   a. Cool Weather Package. Unit shall utilize hot refrigerant gas to defrost evaporator coil with intelligent defrost (listed above) while continuing to run and maintain setpoint outlet water temperature.
4. OPTION 4:
   a. Freezing Weather Package. Unit shall possess all capabilities of the cool weather package (Option 3). In addition, all wetted surfaces shall be factory wrapped and plc controlled to provide freeze protection if the PLC is energized during freezing conditions. Cabinet shall be insulated to prevent condensation from forming on exterior surfaces. Heater shall be installed in the drain pan to prevent condensate from freezing in the unit.

2.4 Storage Tank:

A. Manufacturers: As specified in Equipment Schedule on P0.02 or approved equal.
   1. PVI

B. ASME-code steel with 150- psig working-pressure rating. Include nozzle and head for heat-exchanger tube coil.

C. Configuration: Horizontal Vertical.

D. Manhole: 11 by 15 inches in end head of horizontal sidewall of vertical storage-tank shell.

E. Tappings: Factory fabricated of materials compatible with tank. Attach tappings to tank before testing and labeling.

F. NPS 2 and Smaller: Threaded ends.

G. NPS 2-1/2 and Larger: Flanged ends.

H. Non-ferrous connections

I. The storage tank shall be an unlined pressure vessel constructed from phase-balanced austenitic and ferritic duplex steel with a chemical structure containing a minimum of 21% chromium to prevent corrosion and mill certified per ASTM A 923Methods A to ensure that the product is free of detrimental chemical precipitation that affects corrosion resistance. The material selected shall be tested and certified to pass stress chloride cracking test protocols as defined in ISO 3651-2and ASTM G123 - 00(2005) “Standard Test Method for Evaluating Stress-Corrosion Cracking of Stainless Alloys with Different Nickel Content in Boiling Acidified Sodium Chloride Solution.”

J. Insulation: Complying with ASHRAE/IES 90.1, unless otherwise indicated, and suitable for operating temperature. Surround entire storage tank and nozzle, except connections and controls.

K. Anode Rods: Not required.

L. Capacity and Characteristics: See equipment schedules on the drawings.

2.5 Electric Swing Tank

A. Manufacturers: As specified in Equipment Schedule on P0.02 or approved equal.
   1. PVI

B. Standard: UL 174.

C. Storage-Tank Construction: Steel, vertical arrangement.
   1. Tappings: ASME B1.20.1 pipe thread.
   2. Pressure Rating: 150 psig.
   3. Interior Finish: Comply with NSF 61 Annex G barrier materials for potable-water tank linings, including extending lining material into tappings.

D. Factory-Installed Storage-Tank Appurtenances:
   1. Anode Rod: Replaceable magnesium.
   2. Dip Tube: Required unless cold-water inlet is near bottom of tank.
   3. Drain Valve: ASSE 1005.
   4. Insulation: Comply with ASHRAE/IESNA 90.1.
   5. Jacket: Steel with enameled finish.
   6. Heat-Trap Fittings: Inlet type in cold-water inlet and outlet type in hot-water outlet.
   7. Heating Elements: Two; electric, screw-in immersion type; wired for simultaneous operation unless otherwise indicated. Limited to 12 kW total.
   8. Temperature Control: Adjustable thermostat.
   9. Safety Control: High-temperature-limit cutoff device or system.
   10. Relief Valve: ASME rated and stamped for combination temperature-and-pressure relief valves. Include relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select relief valve with sensing element that extends into storage tank.

E. Special Requirements: NSF 5 construction with legs for off-floor installation.

F. Capacity and Characteristics:
   1. Capacity: 100 gallon minimum.
   2. Temperature Setting: 140 deg F.
   3. Electrical Characteristics:
      a. Volts: 120.
      b. Phases: One.
      c. Hertz: 60.

2.6 DOMESTIC-WATER HEATER ACCESSORIES

A. Domestic-Water Expansion Tanks:

   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      a. AMTROL, Inc.
      b. Honeywell.
      c. TACO Comfort Solutions, Inc.

   2. Source Limitations: Obtain domestic-water expansion tanks from single source from single manufacturer.

   3. Description: Steel pressure-rated tank constructed with welded joints and factory-installed, butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.
   4. Construction:

      a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1 pipe thread.
      b. Interior Finish: Comply with NSF 61 and NSF 372 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
      c. Air-Charging Valve: Factory installed.

   5. Capacity and Characteristics:

      a. Working-Pressure Rating: **150 psig**
      b. Capacity Acceptable: **4 gal** minimum.

B. Drain Pans: Corrosion-resistant metal with raised edge. Include dimensions not less than base of domestic-water heater, and include drain outlet not less than NPS 3/4 with ASME B1.20.1 pipe threads.

C. Piping-Type Heat Traps: Field-fabricated piping arrangement in accordance with ASHRAE/IES 90.1 ASHRAE 90.2.

D. Heat-Trap Fittings: ASHRAE/IES 90.1 ASHRAE 90.2.

E. Manifold Kits: Domestic-water-heater manufacturer's factory-fabricated inlet and outlet piping for field installation, for multiple domestic-water heater installation. Include ball-,

butterfly-, or gate-type shutoff valves to isolate each domestic-water heater and **calibrated** or **memory-stop** balancing valves to provide balanced flow through each domestic-water heater.

1. Comply with requirements for ball-, butterfly-, or gate-type shutoff valves specified in Section 220523 "General Duty Valves for Plumbing Piping."
2. Comply with requirements for balancing valves specified in Section 221119 "Domestic Water Piping Specialties."

F. Pressure-Reducing Valves: ASSE 1003 for water. Set at 25-psig-maximum outlet pressure unless otherwise indicated.

G. Combination Temperature-and-Pressure Relief Valves: ASME rated and stamped. Include relieving capacity at least as great as heat input, and include pressure setting less than working-pressure rating of domestic-water heater. Select relief valves with sensing element that extends into storage tank.

H. Pressure Relief Valves: ASME rated and stamped. Include pressure setting less than working-pressure rating of domestic-water heater.

I. Vacuum Relief Valves: ANSI Z21.22/CSA 4.4.

J. Shock Absorbers: ASSE 1010 or PDI-WH 201, Size A water hammer arrester.

K. Domestic-Water Heater Stands: Manufacturer's factory-fabricated steel stand for floor mounting, capable of supporting domestic-water heater and water. Include dimension that will support bottom of domestic-water heater a minimum of 18 inches above the floor.

L. Domestic-Water Heater Mounting Brackets: Manufacturer's factory-fabricated steel bracket for wall mounting, capable of supporting domestic-water heater and water.

2.7 SOURCE QUALITY CONTROL

A. Factory Tests: Test and inspect domestic-water heaters specified to be ASME-code construction, in accordance with ASME Boiler and Pressure Vessel Code.

B. Hydrostatically test commercial domestic-water heaters to minimum of one and one-half times pressure rating before shipment.

C. Electric, domestic-water heaters will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 DOMESTIC-WATER HEATER INSTALLATION

A. Commercial, Electric, Domestic-Water Heater Mounting: Install commercial, electric, domestic-water heaters on concrete base. Comply with requirements for concrete bases specified in Section 033000 "Cast-in-Place Concrete."

1. Exception: Omit concrete bases for commercial, electric, domestic-water heaters if installation on stand, bracket, suspended platform, or directly on floor is indicated.
2. Maintain manufacturer's recommended clearances.
3. Arrange units so controls and devices that require servicing are accessible.
4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
6. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
7. Install anchor bolts to elevations required for proper attachment to supported equipment.
8. Anchor domestic-water heaters to substrate.
9. Maintain manufacturer's recommended clearances.
10. Arrange units so controls and devices that require servicing are accessible.
11. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
12. Install anchor bolts to elevations required for proper attachment to supported equipment.
13. Anchor domestic-water heaters to substrate.

B. Install electric, domestic-water heaters level and plumb, in accordance with layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

1. Install shutoff valves on domestic-water-supply piping to domestic-water heaters and on domestic-hot-water outlet piping. Comply with requirements for shutoff valves specified in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping."

C. Install commercial, electric, domestic-water heaters with seismic-restraint devices. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

D. Install combination temperature-and-pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend domestic-water heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor sink.

E. Install combination temperature-and-pressure relief valves in water piping for electric, domestic-water heaters without storage. Extend domestic-water heater relief-valve

outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

F. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for electric, domestic-water heaters that do not have tank drains. Comply with requirements for hose-end drain valves specified in Section 221119 "Domestic Water Piping Specialties."

G. Install thermometers on outlet piping of electric, domestic-water heaters. Comply with requirements for thermometers specified in Section 220519 "Meters and Gages for Plumbing Piping."

H. Install thermometers on outlet piping of solar, electric, domestic-water heaters. Comply with requirements for thermometers specified in Section 220519 "Meters and Gages for Plumbing Piping."

I. Assemble and install inlet and outlet piping manifold kits for multiple electric, domestic-water heaters. Fabricate, modify, or arrange manifolds for balanced water flow through each electric, domestic-water heater. Include shutoff valve and thermometer in each domestic-water heater inlet and outlet, and throttling valve in each electric, domestic-water heater outlet. Comply with requirements for valves specified in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping," and comply with requirements for thermometers specified in Section 220519 "Meters and Gages for Plumbing Piping."

J. Install pressure-reducing valve with integral bypass relief valve in electric, domestic-water booster-heater inlet piping and water hammer arrester in booster-heater outlet piping. Set pressure-reducing valve for outlet pressure of 25 psig. Comply with requirements for pressure-reducing valves and water hammer arresters specified in Section 221119 "Domestic Water Piping Specialties."

K. Install piping-type heat traps on inlet and outlet piping of electric, domestic-water heater storage tanks without integral or fitting-type heat traps.

L. Fill electric, domestic-water heaters with water.

M. Charge domestic-water expansion tanks with air to required system pressure.

N. Install dielectric fittings in all locations where piping of dissimilar metals is to be joined. The wetted surface of the dielectric fitting contacted by potable water shall contain less than 0.25 percent of lead by weight.

3.2 PIPING CONNECTIONS

A. Comply with requirements for piping specified in Section 221116 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where installing piping adjacent to electric, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

3.3 IDENTIFICATION

A. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

D. Perform tests and inspections with the assistance of a factory-authorized service representative.

E. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

F. Electric, domestic-water heaters will be considered defective if they do not pass tests and inspections.

G. Prepare test and inspection reports.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain commercial and tankless, electric, domestic-water heaters. Training shall be a minimum of one hour(s).

END OF SECTION

SECTION 224000 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Water closets.
2. Water closet Flushometer valves.
3. Water Closets Tank Type
4. Toilet seats.
5. Urinals.
6. Urinal Flushometer valves.
7. Lavatories.
8. Lavatory Faucets.
9. Service sinks.
10. Sinks
11. Kitchen Sinks.
12. Showers
13. Bathtubs
14. Lavatory and Sink Supply Fittings.
15. Lavatory and Sink Waste Fittings.
16. Grout.
17. Supports.

B. Related Requirements:
1. Section 224713 "Drinking Fountains" for drinking fountain units.

1.3 DEFINITIONS

A. Effective Flush Volume: Average of two reduced flushes and one full flush per fixture.

B. Remote Water Closet: Located more than 30 feet from other drain line connections or fixture and where less than 1.5 drainage fixture units are upstream of the drain line connection.

1.4 ACTION SUBMITTALS

A. Submittals shall be formatted per Section 220000 “General Plumbing Requirements”. The manufacturer shall resubmit the specification section showing compliance with each

respective paragraphs and specified items and features in that particular specification section. All **exceptions** shall be clearly identified by referencing respective paragraph and other requirements. Next to each specification item, indicate the following:

1. "No Exception Taken".
2. "Exception". All exceptions shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.

B. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for water closets.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

C. Shop Drawings: Include diagrams for power, signal, and control wiring.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flushometer valves and electronic sensors to include in operation and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that are packaged with protective covering for storage and identified with labels describing contents.

1. Water Closet Flushometer-Valve Repair Kits: Equal to 10 percent of amount of each type installed, but no fewer than six of each type.
2. Urinal Flushometer-Valve Repair Kits: Equal to 10 percent of amount of each type installed, but no fewer than **six** of each type.

PART 2 - PRODUCTS

2.1 WALL-MOUNTED WATER CLOSETS

A. Water Closets: Wall mounted, top spud.
1. Manufacturer: As specified in Fixture Schedule on P0.03 or approved equal.
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings.
3. Bowl:
   a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
   b. Material: Vitreous china.
   c. Type: Siphon jet.
   d. Style: Flushometer valve.
   e. Height: Standard/ADA.
   f. Rim Contour: Elongated.

g. Water Consumption: 1.28 gal. per flush.
h. Spud Size and Location: NPS 1-1/2; top.

4. Flushometer Valve: See below.
5. Toilet Seat: See below.
6. Support: See below.
7. Water-Closet Mounting Height: Standard or Accessible or per Architectural drawings.

2.2 WATER CLOSET FLUSHOMETER VALVES

A. Electronic Flushometer Valves:
1. Manufacturer: As specified in Fixture Schedule on P0.03 or approved equal.
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following;
   a. American Standard
   b. Sloan Valve
   c. Zurn Industries.
3. Standard: ASSE 1037.
4. Type: Diaphragm.
5. Minimum Pressure Rating: 125 psig.
6. Features: Include integral check stop, backflow-prevention device and True Mechanical override switch.
7. Material: Brass body with corrosion-resistant components.
8. Exposed Flushometer-Valve Finish: Chrome plated.
9. Panel Finish: Chrome plated or stainless steel.
10. Style: Exposed.
11. Actuator: Solenoid complying with UL 1951, and listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
12. Trip Mechanism: Battery-powered electronic sensor complying with UL 1951, and listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
13. Consumption: 1.28 gal. per flush.
14. Minimum Inlet: NPS 1.
15. Minimum Outlet: NPS 1-1/4.

2.3 WATER CLOSETS TANK TYPE

A. Water Closets: Floor Mounted, Tank Type.
1. Manufacturer: As specified in Fixture Schedule on P0.03 or approved equal.
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings.
3. Bowl:
   a. Standards: ASME A112.19.2/CSA B45.1.
   b. Material: Vitreous china.
   c. Type: Floor Mount.
   d. Style: Aqua Piston.
   e. Height: Standard/ADA.

f. Rim Contour: Elongated.
g. Water Consumption: 1.28 gal. per flush.
h. Spud Size and Location: NPS 1-1/2; top.

4. Toilet Seat: See below.
5. Water-Closet Height: Standard or Accessible or per Architectural drawings.

2.4 TOILET SEATS

A. Toilet Seats:
1. Manufacturer: As specified in Fixture Schedule on P0.03 or approved equal.
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following;
a. Bemis Manufacturing
b. Church Seats
c. Olsonite.
3. Standard: IAPMO/ANSI Z124.5.
4. Material: Plastic.
5. Type: Commercial, Heavy duty.
6. Shape: Elongated rim, open front.
7. Hinge: Self-sustaining, check-raising.
8. Hinge Material: Noncorroding metal, stainless steel.
9. Seat Cover: Not required.
10. Color: White.

2.5 WALL-HUNG URINALS

A. Urinals: Wall hung, back outlet.
1. Manufacturer: As specified in Fixture Schedule on P0.03 or approved equal.
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings.
3. Fixture:
a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
b. Type: Washdown.
c. Material: Vitreous china.
d. Strainer or Trapway: Manufacturer's standard strainer.
e. Water Consumption: Water saving.
f. Spud Size and Location: NPS 3/4; top.
g. Outlet Size and Location: NPS 2; back.
h. Color: White.
4. Flushometer Valve: Sloan Royal model 186-0.125 with side-mounted sensor Sloan model EBV89A.
5. Waste Fitting:
a. Standard: ASME A112.18.2/CSA B125.2 for coupling.
b. Size: NPS 2.
6. Support: Type I Urinal Carrier with fixture support plates and coupling with seal and fixture bolts and hardware matching fixture. Include rectangular, steel uprights.
7. Urinal Mounting Height: Standard or Accessible or per Architectural drawings.

2.6 VITREOUS-CHINA, COUNTER-MOUNTED LAVATORIES

A. Lavatory: Rectangular, Round or Oval, self-rimming, vitreous china, counter or undercounter mounted.
   1. Manufacturers: As specified in Fixture Schedule on P0.03 or approved equal. Approved equal is subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. American Standard.
      b. Crane Plumbing, L.L.C.
      c. Kohler Co.
      d. Sloan Valve Company.

   2. Fixture:
      a. Standard: ASME A112.19.2/CSA B45.1.
      b. Type: Self-rimming for above-counter mounting.
      c. Nominal Size: Oval, 20 by 17 inches.
      d. Faucet-Hole Punching: Three holes, 4-inch centers.
      e. Faucet-Hole Location: Top.
      f. Color: White.
      g. Mounting Material: Sealant.

   3. Faucet: As specified in Fixture Schedule on P0.03 or approved equal.

2.7 VITREOUS-CHINA, WALL-MOUNTED LAVATORIES

A. Lavatory: Vitreous china, wall mounted, with back.
   1. Manufacturers: As specified in Fixture Schedule on P0.03 or approved equal.
      a. American Standard.
      b. Crane Plumbing, L.L.C.
      c. Kohler Co.
      d. Sloan Valve Company.

   2. Fixture:
      a. Standard: ASME A112.19.2/CSA B45.1.
      b. Type: For wall hanging.
      c. Nominal Size: rectangular, 21 by 18 inches.
      d. Faucet-Hole Punching: Three holes, 4-inch centers.
      e. Faucet-Hole Location: Top.
      f. Color: White.
      g. Mounting Material: Chair carrier.

   3. Faucet: As specified in Fixture Schedule on P0.03 or approved equal.
   4. Coordinate "Support" Subparagraph below with "Supports" Article.
   5. Support: Type II, concealed-arm lavatory carrier with escutcheons.
   6. Lavatory Mounting Height: Refer to Architectural drawings.

2.8 SERVICE SINKS

A. Service Sinks: Enameled, cast iron, floor mounted.
   1. Manufacturers: As specified in Fixture Schedule on P0.03 or approved equal. Approved equal is subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. American Standard.
      b. Commercial Enameling Company.
      c. Gerber Plumbing Fixtures LLC.
      d. Kohler Co.
   2. Fixture:
      a. Standard: ASME A112.19.1/CSA B45.2.
      b. Style: With front apron and raised back.
      c. Nominal Size: 28 by 28 inches.
      d. Color: White.
      e. Drain: Grid with NPS 3 outlet.
      f. Rim Guard: Coated wire.
   3. Faucet: Chicago faucet model 897-RCF, Manual service sink faucet with integral stops.

2.9 SINKS

A. NSF Standard: Comply with NSF 372 for faucet-spout materials that will be in contact with potable water.

B. Sink Basins: Rectangular, drop-in.

   1. Manufacturers: As specified in Fixture Schedule on P0.03 or approved equal. Approved equal is subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      1) JUST
      2) Elkay
      3) Kohler Co.

C. Sink Faucets: Manual type, single control mixing valve.

   1. Commercial and General-Duty, Solid-Brass Faucets:
   2. Manufacturers: As specified in Fixture Schedule on P0.03 or approved equal. Approved equal is subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      1) Chicago Faucets; Geberit Company.
      2) Delta Faucet Company.
      3) Sloan Valve Company.
   3. Standard: ASME A112.18.1/CSA B125.1.
   4. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and sink receptor.

5. Body Type: Widespread.
6. Body Material: Commercial, solid brass.
7. Finish: Chrome plated.
8. Maximum Flow Rate: 1.5 gpm.
9. Handle(s): Lever.
10. Mounting Type: Deck, exposed.
11. Spout Type: Swing, shaped tube.
12. Vacuum Breaker: Not required.
13. Spout Outlet: Hose thread according to ASME B1.20.7.

2.10 KITCHEN SINKS

A. NSF Standard: Comply with NSF 372 for faucet-spout materials that will be in contact with potable water.

B. Sink Basins: Single or Double Basin.
   1. Manufacturers: As specified in Fixture Schedule on P0.03 or approved equal. Approved equal is subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      1) JUST
      2) Elkay
      3) Kohler Co.

C. Sink Faucets: Manual type, single control mixing valve.
   1. Commercial and General-Duty, Solid-Brass Faucets:
   2. Manufacturers: As specified in Fixture Schedule on P0.03 or approved equal. Approved equal is subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      1) Chicago Faucets; Geberit Company.
      2) Delta Faucet Company.
      3) Kohler Co.
      4) Moen Incorporated.
      5) Sloan Valve Company.
   3. Standard: ASME A112.18.1/CSA B125.1.
   4. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and sink receptor.
   5. Body Type: Widespread.
   6. Body Material: Commercial, solid brass.
   7. Finish: Chrome plated.
   8. Maximum Flow Rate: 1.5 gpm.
   9. Handle(s): Lever.
   10. Mounting Type: Deck, exposed.
   11. Spout Type: Swing, shaped tube.
   12. Vacuum Breaker: Not required.
   13. Spout Outlet: Hose thread according to ASME B1.20.7.

2.11 SHOWERS

A. NSF Standard: Comply with NSF 61 Annex G, "Drinking Water System Components - Health Effects," for shower materials that will be in contact with potable water.

B. Showers:

1. Manufacturers: As specified in Fixture Schedule on P0.03 or approved equal.

    a. Best Bath

    b. Acorn Engineering Company.
    c. Chicago Faucets; Geberit Company.
    d. Leonard Valve Company.
2. Faucet:

    a. Standards: ASME A112.18.1/CSA B125.1 and ASSE 1016.
    b. Body Material: Solid brass.
    c. Finish: Polished chrome plate.
    d. Shower-Arm, Flow-Control Fitting: **1.5 gpm.**
    e. EPA WaterSense: Required.
    f. Mounting: Exposed.
    g. Operation: Single-handle, **push-pull or twist or rotate** control.
    h. Antiscald Device: **Integral with mixing valve**.
    i. Check Stops: Check-valve type, integral with or attached to body; on hot- and cold-water supply connections.
    j. Provide Moen Model M-Dura shower system or Equal

3. Supply Connections: NPS 1/2.

2.12 BATHTUBS

1. Manufacturers: As specified in Fixture Schedule on P0.03 or approved equal.

    a. Best Bath

    b. Acorn Engineering Company.
    c. Chicago Faucets; Geberit Company.
    d. Leonard Valve Company.

2. Description: Single-handle, thermostatic mixing valve with hot- and cold-water indicators; check stops; and shower head.
3. Faucet:

    a. Standards: ASME A112.18.1/CSA B125.1 and ASSE 1016.
    b. Body Material: Solid brass.
    c. Finish: Polished chrome plate.
    d. Shower-Arm, Flow-Control Fitting: **1.5 gpm**.
    e. EPA WaterSense: Required.
    f. Mounting: Exposed.

g. Operation: Single-handle, **push-pull or twist or rotate** control.
h. Antiscald Device: **Integral with mixing valve** or **Separate unit**
i. Check Stops: Check-valve type, integral with or attached to body; on hot- and cold-water supply connections.
j. Provide Moen Model M-Dura shower system or Equal

4. Supply Connections: NPS 1/2.

2.13 LAVATORY AND SINK SUPPLY FITTINGS

A. NSF Standard: Comply with NSF 372 for supply-fitting materials that will be in contact with potable water.

B. Standard: ASME A112.18.1/CSA B125.1.

C. Supply Piping: Chrome-plated-brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated-brass or stainless-steel wall flange.

D. Supply Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.

E. Operation: Loose key.

F. Risers:
1. Lavatories: NPS 3/8Chrome-plated, rigid-copper-pipe and brass straight or offset tailpieces, ASME A112.18.6, braided- or corrugated-stainless-steel, flexible hose riser.
2. Sinks: NPS 1/2Chrome-plated, rigid-copper-pipe and brass straight or offset tailpieces, ASME A112.18.6, braided- or corrugated-stainless-steel, flexible hose riser.

2.14 LAVATORY AND SINK WASTE FITTINGS

A. Standard: ASME A112.18.2/CSA B125.2.

B. Drain: Grid type with NPS 1-1/4 or NPS 1-1/2 offset and straight tailpiece.

C. Traps:
1. Lavatories: NPS 1-1/2 by 1-1/4.
2. Sinks: NPS 1-1/2.
3. Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch thick brass tube to wall and chrome-plated, brass or steel wall flange.
4. Material: Stainless-steel, two-piece trap and swivel elbow with 0.012-inch thick stainless-steel tube to wall; and stainless-steel wall flange.

D. Continuous Waste:
1. Size: NPS 1-1/2” or NPS 2”.
2. Material: Chrome-plated, 0.032-inchthick brass tube.

2.15 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.16 SUPPORTS

A. Water Closet Carrier:
1. Manufacturers: As specified in Fixture Schedule on P0.03 or approved equal. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   a. Zurn Industries, LLC.
2. Standard: ASME A112.6.1M.
3. Description: Waste-fitting assembly, as required to match drainage piping material and arrangement with faceplates, couplings gaskets, and feet; bolts and hardware matching fixture.

B. Type I & II Urinal Carrier:
1. Manufacturers: As specified in Fixture Schedule on P0.03 or approved equal.Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   a. Jay R. Smith Mfg. Co.
   b. Josam Company.
   c. MIFAB, Inc.
   d. WATTS.
   e. Zurn Industries, LLC.
2. Standard: ASME A112.6.1M.

C. Type I & II Sink Carrier:
1. Manufacturers: As specified in Fixture Schedule on P0.03 or approved equal. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   a. Jay R. Smith Mfg. Co.
   b. Josam Company.
   c. MIFAB, Inc.
   d. WATTS.
   e. Zurn Industries, LLC.
2. Standard: ASME A112.6.1M.

D. Type I, II & III Lavatory Carrier:

1. Manufacturers: As specified in Fixture Schedule on P0.03 or approved equal. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   a. Jay R. Smith Mfg. Co.
   b. Josam Company.
   c. MIFAB, Inc.
   d. WATTS.
   e. Zurn Industries, LLC.
2. Standard: ASME A112.6.1M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before water-closet installation.

B. Examine walls and floors for suitable conditions where water closets will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Water-Closet Installation:

1. Install level and plumb according to roughing-in drawings.
2. Install floor-mounted water closets on bowl-to-drain connecting fitting attachments to piping or building substrate.
3. Install accessible, wall-mounted water closets at mounting height for handicapped/elderly, according to ICC/ANSI A117.1.

B. Support Installation:

1. Install supports, affixed to building substrate, for floor-mounted, back-outlet water closets.
2. Use carrier supports with waste-fitting assembly and seal.
3. Install floor-mounted, back-outlet water closets attached to building floor substrate, onto waste-fitting seals; and attach to support.
4. Install wall-mounted, back-outlet water-closet supports with waste-fitting assembly and waste-fitting seals; and affix to building substrate.

C. Flushometer-Valve Installation:

1. Install flushometer-valve, water-supply fitting on each supply to each water closet.
2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
3. Install lever-handle flushometer valves for accessible water closets with handle mounted on open side of water closet.

4. Install actuators in locations that are easy for people with disabilities to reach.
5. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

D. Install toilet seats on water closets.

E. Wall Flange and Escutcheon Installation:

1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations and within cabinets and millwork.
2. Install deep-pattern escutcheons if required to conceal protruding fittings.
3. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

F. Joint Sealing:

1. Seal joints between water closets and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
2. Match sealant color to water-closet color.
3. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

3.3 CONNECTIONS

A. Connect water closets with water supplies and soil, waste, and vent piping. Use size fittings required to match water closets.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

D. Where installing piping adjacent to water closets, allow space for service and maintenance.

3.4 ADJUSTING

A. Operate and adjust water closets and controls. Replace damaged and malfunctioning water closets, fittings, and controls.

B. Adjust water pressure at flushometer valves to produce proper flow.

C. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

3.5 CLEANING AND PROTECTION

A. Clean water closets and fittings with manufacturers' recommended cleaning methods and materials.

B. Install protective covering for installed water closets and fittings.

C. Do not allow use of water closets for temporary facilities unless approved in writing by Owner.

D. Fixtures shall be protected during construction from any damages. Refinished fixtures will not be acceptable under any conditions.

END OF SECTION

SECTION 224713 - DRINKING FOUNTAINS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes drinking fountains and related components.

1.3 ACTION SUBMITTALS

A. Submittals shall be formatted per Section 220000 “General Plumbing Requirements”. The manufacturer shall resubmit the specification section showing compliance with each respective paragraphs and specified items and features in that particular specification section. All **exceptions** shall be clearly identified by referencing respective paragraph and other requirements. Next to each specification item, indicate the following:

1. “No Exception Taken”.
2. “Exception”. All exceptions shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.

B. Product Data: For each type of drinking fountain.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include operating characteristics, and furnished specialties and accessories.

C. Sustainable Design Submittals:

1. Product Data: For water consumption.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For drinking fountains to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 DRINKING FOUNTAINS

A. Drinking Fountains: Stainless steel, wall mounted.
   1. Stainless-Steel Drinking Fountains:
      a. Manufacturers: As specified in Fixture Schedule on P0.03 or approved equal. Approved equal is subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
         1) Elkay Manufacturing Co.
         2) Haws Corporation.
         3) Murdock-Super Secur; a member of Morris Group International.
         4) Willoughby Industries.
   2. Standards:
      a. Comply with ASME A112.19.3/CSA B45.4 and ASME A112.19.2/CSA B45.1.
      b. Comply with NSF 61 Annex G.
   3. Type Receptor: With back or on horizontal support.
   4. Receptor Shape: Rectangular.
   5. Back Panel: Stainless-steel wall plate behind drinking fountain.
   6. Bubblers: Two, with adjustable stream regulator, located on deck.
   7. Maximum water flow: 0.15 gpm.
   8. Control: Push button or Push bar.
   9. Drain: Grid type with NPS 1-1/4 tailpiece.
   10. Supply: NPS 3/8 with shutoff valve.
   11. Waste Fitting: ASME A112.18.2/CSA B125.2, NPS 1-1/4 chrome-plated brass P-trap and waste.
   12. Support: Type I water cooler carrier water cooler carrier.
   13. Drinking Fountain Mounting Height: Standard or Accessible or per Architectural plans.

2.2 SUPPORTS

A. Type I Water Cooler Carrier:

   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      a. Jay R. Smith Mfg. Co.
      b. Josam Company.
      c. MIFAB, Inc.
      d. WATTS.
      e. Zurn Industries, LLC.

   2. Standard: ASME A112.6.1M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for water-supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before fixture installation.

B. Examine walls and floors for suitable conditions where fixtures will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install fixtures level and plumb according to roughing-in drawings. For fixtures indicated for children, install at height required by authorities having jurisdiction.

B. Set pedestal drinking fountains on floor.

C. Install recessed drinking fountains secured to wood blocking in wall construction.

D. Install off-the-floor carrier supports, affixed to building substrate, for wall-mounted fixtures.

E. Install water-supply piping with shutoff valve on supply to each fixture to be connected to domestic-water distribution piping. Use ball or gate valve. Install valves in locations where they can be easily reached for operation. Valves are specified in Section 220523 "General Duty Valves for Plumbing Piping."

F. Install trap and waste piping on drain outlet of each fixture to be connected to sanitary drainage system.

G. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons where required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

H. Seal joints between fixtures and walls using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

3.3 CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Install ball or gate shutoff valve on water supply to each fixture. Comply with valve requirements specified in Section 220523 "General Duty Valves for Plumbing Piping."

D. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

A. Adjust fixture flow regulators for proper flow and stream height.

3.5 CLEANING

A. After installing fixtures, inspect unit. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.

B. Clean fixtures, on completion of installation, according to manufacturer's written instructions.

C. Provide protective covering for installed fixtures.

D. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION

SECTION 230000 – GENERAL MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SCOPE

A. Basic mechanical requirements specifically applicable to Division 23 and 33 Sections.

B. Work includes but is not necessarily limited to the following:

1. Labor, materials, services, equipment, and appliances required for completion of tasks as indicated on drawing or in specification or as inherently necessary to prepare spaces and systems for new installations as follows:

a. Heating, ventilating and air conditioning systems and equipment
b. Testing, adjusting and balancing

1.3 DRAWINGS AND SPECIFICATIONS

A. Drawings accompanying these Specifications show intent of Work to be done. Specifications shall identify quality and grade of installation and where equipment and hardware is not particularly specified, Contractor shall provide submittals for all products and install them per manufacturers' recommendations, and in a workmanlike manner.

B. Examine Drawings and Specifications for elements in connection with this Work; determine existing and new general construction conditions and be familiar with all limitations caused by such conditions.

C. Plans are intended to show general arrangement and extent of Work contemplated. Exact location and arrangement of parts shall be determined after the Owner has reviewed equipment, as Work progresses, to conform in best possible manner with surroundings, and as directed by the Owner's Representative.

D. Contract Documents are in part diagrammatic and intended to show the scope and general arrangement of the Work under this Contract. The Contractor shall follow these drawings in laying out the equipment, piping and ductwork. Drawings are not intended to be scaled for roughing in measurements or to serve as shop drawings. Where job conditions require minor changes or adjustments in the indicated locations or arrangement of the Work, such changes shall be made without change in the Contract amount.

E. Follow dimensions without regard to scale. Where no figures or notations are given, the Plans shall be followed.

1.4 UTILITIES

A. Location and sizes of electrical, mechanical and plumbing service facilities are shown in accordance with data secured from existing record drawings and site observations. Data shown are offered as an estimating guide without guarantee of accuracy. Check and verify all data given, and verify exact location of all utility services pertaining to Work prior to excavation or performing Work.

1.5 APPLICABLE REFERENCE STANDARDS, CODES AND REGULATIONS

A. Meet requirements of all state codes having jurisdiction.

B. State of California Code of Regulations:

1. Title 8, Industrial Relations
2. Title 19, State Fire Marshal Regulations
3. 2022 California Building Code (CBC), Title 24, Part 2
4. 2022 California Electrical Code, Title 24, Part 3
5. 2022 California Mechanical Code, Title 24, Part 4
6. 2022 California Plumbing Code, Title 24, Part 5
7. 2022 California Energy Code, Title 24, Part 6
8. 2022 California Fire Code, Title 24, Part 9
9. 2022 California Standards Code, Title 24, Part 12

C. Additional Referenced Standards:

1. AABC Associated Air Balance Council
2. AMCA Air Moving and Conditioning Association
3. AHRI Air-Conditioning, Heating and Refrigeration Institute
4. ASHRAE American Society of Heating, Refrigeration and Air Conditioning Engineers
5. ASME American Society of Mechanical Engineers
6. ASTM American Society for Testing and Materials
7. NEMA National Electrical Manufacturer’s Association
8. NFPA National Fire Protection Association Standards
9. PDI Plumbing and Drainage Institute
10. UL Underwriters Laboratories

D. Codes and ordinances having jurisdiction over Work are minimum requirements; but, if Contract Documents indicate requirements, which are in excess of those minimum requirements, then requirements of the Contract Documents shall be followed. Should there be any conflicts between Contract Documents or codes or any ordinances having jurisdiction, report these to the Owner’s Representative.

E. Obtain permits, and request inspections from authority having jurisdiction.

1.6 PROJECT AND SITE CONDITIONS

A. The arrangement of and connection to equipment shown on the Drawings is based upon information available and is not intended to show exact dimensions peculiar to a specific manufacturer. The Drawings are, in part, diagrammatic and some features of the illustrated equipment installations may require revision to meet actual equipment installation requirements. Structural supports, housekeeping pads, piping connections and adjacent equipment may have to be altered to accommodate the equipment provided. No additional payment will be made for such revisions or alterations.

B. Examine all Drawings and Specifications to be fully cognizant of all work required under this Division.

C. Examine site related work and surfaces before starting work of any Section.

D. Install Work in locations shown on approved Drawings, unless prevented by Project conditions.

E. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission from the Owner's Representative before proceeding.

1.7 COOPERATION WITH WORK UNDER OTHER DIVISIONS

A. Cooperate with other trades to facilitate general progress of Work. Allow all other trades every reasonable opportunity for installation of their work.

B. Work under this Division shall follow general building construction closely. Set pipe sleeves and inserts and verify that openings for chases and pipes are provided.

C. Work with other trades in determining exact location of outlets, pipes, and pieces of equipment to avoid interference with lines required to maintain proper installation of Work.

D. Make such progress in the Work to not delay work of other trades.

E. Mechanical Work shall have precedence over the other in the following sequence:

1. Soil and waste piping
2. Hydronic piping
3. Ductwork
4. Domestic water piping
5. Fire sprinkler piping

1.8 DISCREPANCIES

A. The Contractor shall check all Drawings furnished him immediately upon their receipt and shall promptly notify the Owner's Representative of any discrepancies. Figures marked on Drawings shall in general be followed in preference to scale measurements.

Piping and instrumentation diagrams shall in general govern floor plans and sections. Large-scale drawings shall in general govern small-scale drawings.

B. Where requirements between Drawings and Specifications conflict, the more restrictive provisions shall apply.

C. If any part of the Specifications or Drawings appears unclear or contradictory, apply to Owner's Representative for interpretation and decision as early as possible, including during bidding period. Do not proceed with such work without Owner Representatives decision. Beginning work of any Section constitutes acceptance of conditions.

1.9 CHANGES

A. The Contractor shall be responsible to make and obtain approval from the Owner's Representative for all necessary adjustments in piping and equipment layouts as required to accommodate the relocations of equipment and/or devices, which are affected by any approved authorized changes or Product substitutions. All changes shall be clearly indicated on the "Record" drawings.

1.10 SUBMITTALS

A. Refer to Division 01 for additional requirements.

B. The manufacturer, contractor or supplier shall include a written statement that the submitted equipment, hardware or accessory complies with the requirement of that particular specification section.

C. The manufacturer shall resubmit the specification section showing compliance with each respective paragraphs and specified items and features in that particular specification section.

D. All exceptions shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.

E. Note that prior to acceptance of submittals for review, a submittal schedule shall be submitted to the Owner's Representative.

F. Submit all Division 23 shop drawings and product data grouped and referenced by the specification technical section number in one complete submittal package.

G. Shop Drawings:

1. Include installation details of equipment indicating proposed location, layout and arrangement, accessories, piping, and other items that must be shown to assure a coordinated installation.
2. Indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices.
3. If equipment is rejected, revise drawings to show acceptable equipment and resubmit.

H. Whenever more than one (1) manufacturer’s product is specified, the first named product is the basis of design used in the Drawings and the use of alternate-named manufacturer’s products or substitutes may require modifications to the design.

I. The Contractor shall be responsible for all equipment ordered and/or installed prior to receipt of shop drawings returned from the Owner’s Representative bearing the Owner's Representative stamp of "Reviewed". All corrections or modifications to the equipment as noted on the shop drawings shall be performed and equipment removed from the job site at the request of the Owner’s Representative without additional compensation.

J. Manufacturer's Data: For each manufactured item, provide current manufacturer's descriptive literature of cataloged products, certified equipment drawings, diagrams, performance and characteristic curves if applicable, and catalog cuts.

K. Standard Compliance: When materials or equipment provided by the Contractor must conform to the standards of organizations such as American National Standards Institute (ANSI) or UL, submit proof of such conformance to the Owner Representative for approval. If an organization uses a label or listing to indicate compliance with a particular standard, the label or listing will be acceptable evidence, unless otherwise specified. In lieu of the label or listing, submit a certificate from an independent testing organization, which is competent to perform acceptance testing and is approved by the Owner Representative. The certificate shall state that the item has been tested in accordance with the specified organization's test methods and that the item conforms to the specified organization's standard.

L. Certified Test Reports: Before delivery of materials and equipment, certified copies of all test reports specified in individual sections shall be submitted for approval.

M. Certificates of Compliance or Conformance: Submit manufacturer's certifications as required on products, materials, finish, and equipment indicated in the technical sections. Certifications shall be documents prepared specifically for this Contract. Pre-printed certifications and copies of previously submitted documents will not be acceptable. The manufacturer's certifications shall name the appropriate products, equipment, or materials and the publication specified as controlling the quality of that item. Certification shall not contain statements to imply that the item does not meet requirements specified, such as "as good as"; or "achieve the same end use and results as materials formulated in accordance with the referenced publications"; or "equal or exceed the service and performance of the specified material." Certifications shall simply state that the item conforms to the requirements specified. Certificates shall be printed on the manufacturer's letterhead and shall be signed by the manufacturer's official authorized to sign certificates of compliance or conformance.

1.11 PROJECT RECORD DOCUMENTS

A. Refer to Division 01 for additional requirements.

1. All changes, deviations and information recorded on the “Project Record Drawings” set during Construction shall be redrafted onto the latest version of AutoCAD or Revit, where applicable.

2. Submit completed shop drawings to the Owner prior to completion in AutoCAD format. Contractor hand marked or drafted redlined “Project Record Drawings” will not be accepted.

1.12 PRODUCT ALTERNATIVES OR SUBSTITUTIONS

A. Refer to General Conditions and Division 01 for additional requirements.

1.13 OPERATING INSTRUCTIONS

A. Furnish approved operating instructions for systems and equipment indicated in the technical sections for use by operation and maintenance personnel.

1.14 MANUFACTURER'S RECOMMENDATIONS

A. Where installation procedures or any part thereof are required to be in accordance with manufacturer's recommendations, furnish printed copies of the recommendations prior to installation. Installation of the item shall not proceed until recommendations are received. Failure to furnish recommendations shall be cause for rejection of the equipment or material.

1.15 DELIVERY AND STORAGE

A. Refer to Division 01 for additional requirements.

B. Handle, store, and protect equipment and materials in accordance with the manufacturer's recommendations and with the requirements of NFPA 70B P, Appendix I, titled "Equipment Storage and Maintenance During Construction." Replace damaged or defective items with new items.

1.16 GUARANTEE

A. Except as may be specified under other sections in the Specifications, guarantee all equipment furnished under the Specifications for a period of one year from date of project acceptance against defective workmanship and material and improper installation. Upon notification of failure, correct deficiency immediately and without cost to the Owner.

B. Standard warranty of manufacturer shall apply for replacement of parts after expiration of the above period. Manufacturer shall furnish replacement parts to the Owner for their service agency as directed.

PART 2 - PRODUCTS

Not Applicable.

PART 3 - EXECUTION

3.1 GENERAL

A. Obtain and pay for all permits and inspections, including any independent testing required to verify standard compliance, and deliver certificates for same to the Owner's Representative.

3.2 WORK RESPONSIBILITIES

A. The drawings indicate diagrammatically the desired locations or arrangement of piping, equipment, etc., and are to be followed as closely as possible. Proper judgment must be exercised in executing the work to secure the best possible installation in the available space and to overcome local difficulties due to space limitations or interference with structural conditions.

B. The Contractor is responsible for the correct placing of Work and the proper location and connection of Work in relation to the work of other trades. Advise appropriate trade as to locations of access panels.

C. In the event changes in the indicated locations or arrangements are necessary, due to developed conditions in the building construction or rearrangement of furnishings or equipment, such changes shall be made without extra cost, providing the change is ordered before the ductwork, piping, etc. and work directly connected to same is installed and no extra materials are required.

D. Where equipment is furnished by others, verify dimensions and the correct locations of this equipment before proceeding with the roughing-in of connections.

E. All scaled and figured dimensions are approximate of typical equipment of the class indicated. Before proceeding with any work, carefully check and verify all dimensions, sizes, etc. with the drawings to see that the equipment will fit into the spaces provided without violation of applicable codes.

F. Should any changes to the Work indicated on the Drawings or described in the Specifications be necessary in order to comply with the above requirements, notify the Owner immediately and cease work on all parts of the contract, which are affected until approval for any required modifications to the construction has been obtained from the Owner.

G. Be responsible for any cooperative work, which must be altered due to lack of proper supervision or failure to make proper provisions in time. Such changes shall be under direction of the Owner and shall be made to his satisfaction. Perform all Work with competent and skilled personnel.

H. All work, including aesthetic as well as mechanical aspects of the Work, shall be of the highest quality consistent with the best practices of the trade.

I. Replace or repair, without additional compensation, any Work, which, in the opinion of the Owner, does not comply with these requirements.

3.3 PAINTING

A. Refer to Division 09 for additional requirements.

B. Factory Applied:

1. Mechanical equipment shall have factory-applied painting systems, which shall, as a minimum, meet the requirements of NEMA ICS 6 corrosion-resistance test, except equipment specified to meet requirements of ANSI C37.20 shall have a finish as specified in ANSI C37.20.
2. Refer to individual sections of this Division for more stringent requirements.

C. Field Applied:

1. Paint all mechanical equipment as required to touch up, to match finish on other equipment in adjacent spaces or to meet safety criteria.
2. Paint all exposed, uninsulated mechanical piping, valves, supports, hangers and appurtenances. Provide minimum 5 mils dry film thickness.
3. Paint ductwork flat black that are visible behind air outlets and inlets.
4. Paint all exposed and rooftop ductwork, roof mounted mechanical equipment, ductwork supports, hangers and appurtenances.
5. Paint shall be a high performance polyurethane enamel coating system.

END OF SECTION

SECTION 230513 – COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.3 QUALITY ASSURANCE

A. Bearings: Bearing loads and bearing life shall be determined using AFBMA 9 - Load Ratings and Fatigue Life for Ball Bearings, and AFBMA 11 - Load Ratings and Fatigue Life for Roller Bearings.

B. Comply with NEMA MG 1 unless otherwise indicated.

C. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.

D. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

E. Motor Efficiency: Motors one horsepower and larger shall exceed current NEMA Premium Efficiency standards.

1.4 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

1.5 SUBMITTALS

A. Submittals shall be formatted per Section 230000 “General Mechanical Requirements”. The manufacturer shall resubmit the specification section showing compliance with each respective paragraphs and specified items and features in that particular specification section. All exceptions shall be clearly identified by referencing respective paragraph and other requirements. Next to each specification item, indicate the following:

1. “No Exception Taken”.
2. “Exception”. All exceptions shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.

B. Product Data: For each motor, provide operating weights; and manufacturer's technical data on specified features, performance, electrical ratings, and characteristics. Motor performance; percent efficiency, power factor, torque, RPM, power (W) and current vs. percent of rated power output (Horsepower) curves.

C. Operation and maintenance manual for the motor and installed devices.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified:

1. U.S. Motors.
2. General Electric.
3. Siemens Motors.
4. Baldor - Reliance.
5. Westinghouse.

2.2 SINGLE-PHASE MOTORS

A. Motor shall be an electronic commutation (EC) motor specifically designed for HVAC applications. AC induction type motors are not acceptable.

B. Motors shall be ECM, variable-speed, DC, brushless motors specifically designed for use with single phase, 60 hertz electrical input as shown on Drawings. Motor shall be complete with and operated by a single-phase integrated controller/inverter that operates the wound stator and senses rotor position to electronically commutate the stator. All motors shall be designed for synchronous rotation.

C. Motor rotor shall be permanent magnet type with near zero rotor losses. Motor shall have built-in soft start and soft speed change ramps.

D. Motor shall be able to be mounted with shaft in horizontal or vertical orientation.

E. Motor shall be permanently lubricated with ball bearings.

F. Motor shall maintain a minimum of 70% efficiency over its entire operating range.

G. Provide manual (or optional remote) fan speed output control as indicated on Drawings for field adjustment of motor speed. Inductors shall be provided to minimize harmonic distortion and line noise.

H. Overload Protection:

1. Automatic Speed Control: In the event of overheating or overloading, the motor electronics slow the motor to operate within its acceptable range.
2. Thermal Overload: Internally fused, one-shot type as a last resort to prevent fires.
3. Locked Rotor: If the motor sees a locked rotor condition, it will automatically shut itself down, then try to restart 3 times. After the 3rd try, the motor will not attempt to restart until the power is cycled.

2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Premium efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Enclosure: Totally enclosed fan-cooled (TEFC), cast-iron (may use steel mounting base on 140-T frame series). IEC Protection: IP-44.

E. VFD Compatibility: “Inverter Ready” per NEMA Standard MG1, Part 31.4.4.2.

1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
2. Insulation: Class F or H insulation, with Class B temperature rise, non-hygroscopic.
3. Shaft Grounding Kit to reduce current flow through bearings, which has damaged many motors on campus.

F. Variable torque Ratio: 10:1 minimum.

G. Rotor Balance Requirement: 0.08 Inches per second maximum vibration.

H. Bearings: Shielded antifriction bearings suitable for application specific radial and thrust loading.

1. The manufacturer’s analysis, and selection, shall ensure bearings will have an L_{10} life of not less than 130,000 hours for direct-drive and not less than 40,000 hours for belt-drive.
2. Bearing styles and types matching special loading requirements. Over-sized bearings as required.
3. Ensure motor bearings conform to requirements for Variable Frequency Drive applications.

I. Conduit Boxes: Shall be over-sized NEMA, gasketed, repositionable box for field conduit routing adjustment, with grounding connection.

J. Lifting Lugs: For frame sizes 215 and above, permanent lifting provisions, such as eye bolts, shall be provided.

2.4 ADDITIONAL REQUIREMENTS FOR POLYPHASE MOTORS

A. Outdoor Applications: For outdoor applications provide “rain-proof” motors with options listed below Outdoor motor features listed below offer better environmental enclosure protection, and are in “addition to the required features” of protected indoor motors:

1. IEC Ingress Protection Rating: IP-54.
2. Epoxy paint on enclosure and rotor.
3. Shaft slingers.
4. Stainless steel nameplate and hardware.

B. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive field-installed motors for compliance with requirements, installation tolerances, maintenance clearances and other conditions affecting performance.

B. Examine roughing-in of conduit systems to verify actual locations of conduit connections before motor installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 MOTOR INSTALLATION

A. Anchor each motor assembly to base, adjustable rails, or other support, arranged and sized according to manufacturer's written instructions. Attach by bolting. Level and align motor with base. Align motors, bases, shafts, pulleys and belts with driven equipment, or couplers. Tension belts according to manufacturer's written instructions.

B. Comply with mounting and anchoring requirements specified in Division 23 Section "Vibration and Seismic Controls for HVAC."

C. Connect motor leads to power source using rings and bolts or split bolts as needed. Insulation of connected motor leads shall be of the highest quality and designed to withstand the same temperature as the internal windings. Ordinary electrical tape is not

generally suitable for this service and shall not be used as the only means of insulation. Wire nuts are prohibited.

D. Motor power leads shall be marked at the source and at the connection box on the motor.

3.3 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:

1. Run each motor with its controller. Demonstrate correct rotation, alignment, and speed at motor design load.
2. Test interlocks and control features for proper operation.
3. Verify that current in each phase is within nameplate rating.

B. Testing: Owner’s Representative may engage a qualified testing agency to perform the following field quality-control testing:

1. Perform each electrical test and visual and mechanical inspections stated in NETA ATS, Section 7.15.1 and certify compliance with test parameters.

C. After the Owner’s testing agency is finished, correct any malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and the University shall retest.

3.4 CLEANING

A. After completing equipment installation, inspect unit components. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.

B. Clean motors, on completion of installation, according to manufacturer's written instructions.

END OF SECTION

SECTION 230516 - EXPANSION FITTINGS AND LOOPS FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes Flexible-hose expansion loops for piping crossing building seismic joints.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe and Pressure-Vessel Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Provide flexible hose expansion loop(s) as indicated on the contract drawings or as required to accommodate any thermal expansion, contraction or seismic movement of the piping system.

B. Flexible hose expansion loops shall be manufactured complete with two parallel sections of corrugated metal house, compatible braid, 180 degree return bend, with inlet and outlet connections.

C. Flexible loops shall be capable of movement in the ±X, ±Y, and ±Z planes.

D. Flexible hose expansion loops shall impart no thrust loads to system support, anchors or building structure.

2.2 FLEXIBLE HOSE EXPANSION LOOPS

A. Manufacturers

1. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Metraflex, Inc. (metraloop)
    b. Kinetics
    c. Flexicraft

2. Corrugated Hose: Stainless Steel
3. Braid: 304 Stainless Steel braid shall be used for any series 300 stainless steel hose.
4. Fittings Materials of construction and end fitting type shall be consistent with pipe material and equipment/ pipe connection fittings. Copper fittings shall not be attached to stainless steel hose.
5. Flexible hose expansion loops shall have a factory-supplied, hanger / support lug located at the bottom of the 180deg return.
6. Flexible hose expansion loop(s) shall be furnished with a plugged FPT (3/8") to be used for a drain or air release vent
7. Flexible hose expansion loop(s) shall be rated with an operating pressure in accordance with the table below.

    Flexible Expansion Loop with Steel Hose:

Size	Working Pressure at 70F (Single Braid)	Working Pressure at 70F (Double Braid)
¾	792	1267
1	571	914
1-1/4	531	850
1-1/2	472	755
2	500	750
2-1/2	387	600
3	288	431
4	232	371
6	170	300

    Flexible Expansion Loop with Bronze Hose

Size	Working Pressure at 70F (Single Braid)	Working Pressure at 70F (Double Braid)
¾	468	622
1	334	444
1-1/4	306	407
1-1/2	297	395
2	210	279

2-1/2	194	258
3	166	221
4	109	175

PART 3 - EXECUTION

3.1 EXPANSION LOOP INSTALLATION

A. Install expansion joints of sizes matching sizes of piping in which they are installed.

B. Flexible hose expansion loop return fitting shall be supported to allow movement.

END OF SECTION

SECTION 230517 - SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sleeves.
2. Stack-sleeve fittings.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.3 ACTION SUBMITTALS

A. Submittals shall be formatted per Section 230000 “General Mechanical Requirements”. The manufacturer shall resubmit the specification section showing compliance with each respective paragraphs and specified items and features in that particular specification section. All exceptions shall be clearly identified by referencing respective paragraph and other requirements. Next to each specification item, indicate the following:

1. “No Exception Taken”.
2. “Exception”. All exceptions shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.

B. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with set screws.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Sleeves are not required for core-drilled holes, except where spill control is required

B. Install sleeves for pipes passing through interior concrete and masonry walls, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
b. Exception: Extend sleeves installed in floors for areas indicated 4 inches above finished floor level, including slabs on grade.

2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

a. Steel Pipe Sleeves: For mechanical rooms, and wet area applications where spill containment is required.
b. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 07 Section "Sheet Metal Flashing and Trim" for flashing.
c. Seal space outside of sleeve fittings with grout.

4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.
5. Where required, sleeve application and installation shall comply with UL approved Firestopping Detail.

C. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves.
2. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve.

Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Leak Test: After allowing for a full cure, test sleeves for leaks. Repair leaks and retest until no leaks exist.

B. Sleeves will be considered defective if they do not pass tests and inspections.

END OF SECTION

SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Thermal-hanger shield inserts.
4. Pipe stands.

B. Related Sections:

1. Section 230548 "Vibration and Seismic Controls for HVAC" for vibration isolation devices.
2. Section 233113 "Metal Ducts" for duct hangers and supports.

1.3 REFERENCES

A. ASME B31.9 Building Services Piping

B. MSS SP58 Pipe Hangers and Supports – Materials, Design, Manufacture, Selection, Application and installation

C. MSS SP-69 Pipe Hangers and Supports – Selection and Application

D. MSS SP-89 Pipe Hangers and Supports – Fabrication and Installation Practices

1.4 DEFINITIONS

A. ASCE: American Society of Civil Engineers

B. ASME: American Society of Mechanical Engineers

C. ASTM: America Society for Testing and Material

D. MSS: Manufacturers Standardization Society of the Valve and Fittings Industry Inc.

E. MFMA: Metal Framing Manufacturers Association

F. SEI: Structural Engineering Institute

1.5 ACTION SUBMITTALS

A. Submittals shall be formatted per Section 230000 “General Mechanical Requirements”. The manufacturer shall resubmit the specification section showing compliance with each respective paragraphs and specified items and features in that particular specification section. All **exceptions** shall be clearly identified by referencing respective paragraph and other requirements. Next to each specification item, indicate the following:

1. “No Exception Taken”.
2. “Exception”. All exceptions shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.

B. Product Data: For each type of product indicated including component cut sheets and pre-approved details.

C. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following; include Product Data for components:

1. Trapeze pipe hangers.
2. Pipe stands.

1.6 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.7 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to current ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.

5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Stainless-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

C. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel stainless steel.

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 VERTICAL RISER CLAMPS FOR INSULATED PIPES

A. Vertical Riser Clamps for Insulated Steel Pipes:

1. Manufacturer shall be Pipe Shields Inc. Model E2100 or equal.
2. Carbon steel pipe material, steel straps and base that is compliance with ASTM A36.
3. Insulation shall be calcium silicate, asbestos free, treated with water repellant.
4. Jacket shall be galvanized steel that is in compliance with ASTM A-527.
5. Fasteners shall comply with ASTM A-307 plated.
6. Coating shall be primer coated.

B. Vertical Riser Clamps for Insulated Copper Pipes:

1. Manufacturer shall be Hydra-Zorb Titan Riser Clamp or equal.
2. 25/50 flame spread/smoke spread index.
3. Eliminates insulation compression.
4. Crush resistant.
5. Vertical load rating up to 2400 lbs.

2.4 THERMAL-HANGER SHIELD INSERTS

A. Manufacturers

1. Pipe Shields Inc.
2. Pittsburg Corning Foamglas ONE
3. ITW Insulation Systems TRYMER 2000 XP

B. Cold Piping: Insulation-Insert Material - ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.

C. Hot Piping: Insulation-Insert Material - Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.

D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.5 PIPE STANDS

A. General Requirements for Pipe Stands: Shop or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

B. Compact Pipe Stand: One-piece plastic unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.

C. Low-Type, Single-Pipe Stand: One-piece stainless-steel base unit with plastic roller, for roof installation without membrane penetration.

D. Curb-Mounted-Type Pipe Stands: Shop or field-fabricated pipe supports made from structural-steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

D. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

E. Pipe Stand Installation:

1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. See Section 077200 "Roof Accessories" for curbs.

F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

I. Install lateral bracing with pipe hangers and supports to prevent swaying.

J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

K. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

M. Insulated Piping:

1. Attach clamps and spacers to piping.

a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.

c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

   a. NPS 1/4 to NPS 3-1/2 12 inches long and 0.048 inch thick.
   b. NPS 4: 12 inches long and 0.06 inch thick.
   c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
   d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
   e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.3 PAINTING

A. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Section 099113 "Exterior Painting" Section 099123 "Interior Painting" and Section 099600 "High Performance Coatings."

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.4 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports, metal trapeze pipe hangers and metal framing systems and attachments for general service applications.

F. Use stainless-steel pipe hangers and corrosion-resistant attachments for hostile environment applications.

G. Copper Pipe or Tubing

1. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.
2. Or use padded hangers for piping that is subject to scratching.

H. Use thermal-hanger shield inserts for insulated piping and tubing.

I. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.

13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction might occur.
19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of non-insulated pipe risers NPS 3/4 to NPS 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of non-insulated pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.
3. Insulated piping shall use vertical riser clamps for insulated pipe.

K. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment, up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

L. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.

2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

M. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

N. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

O. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

P. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION

SECTION 230548 - VIBRATION AND SEISMIC CONTROLS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Elastomeric isolation pads.
2. Elastomeric isolation mounts.
3. Restrained elastomeric isolation mounts.
4. Elastomeric hangers.
5. Spring hangers.
6. Snubbers.
7. Restraint channel bracings.
8. Restraint cables.
9. Seismic-restraint accessories.

B. Related Requirements:

1. Section 210548 "Vibration and Seismic Controls for Fire Suppression" for devices for fire-suppression equipment and systems.
2. Section 220548 "Vibration and Seismic Controls for Plumbing" for devices for plumbing equipment and systems.

1.3 DEFINITIONS

A. CBC: California Building Code.

B. ICC-ES: ICC-Evaluation Service.

C. OSHPD: Office of Statewide Health Planning & Development.

1.4 ACTION SUBMITTALS

A. Submittals shall be formatted per Section 230000 “General Mechanical Requirements”. The manufacturer shall resubmit the specification section showing compliance with each respective paragraphs and specified items and features in that particular specification section. All exceptions shall be clearly identified by referencing respective paragraph and other requirements. Next to each specification item, indicate the following:

1. “No Exception Taken”.
2. “Exception”. All exceptions shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.

B. Product Data: For each type of product.

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of vibration isolation device and seismic-restraint component required.

    a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an evaluation service member of ICC-ES or OSHPD.
    b. Annotate to indicate application of each product submitted and compliance with requirements.

3. Interlocking Snubbers: Include ratings for horizontal, vertical, and combined loads.

C. Shop Drawings:

1. Detail fabrication and assembly of equipment bases. Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

D. Delegated-Design Submittal: For each vibration isolation and seismic-restraint device.

1. Include design calculations and details for selecting vibration isolators, seismic restraints, and vibration isolation bases complying with performance requirements, design criteria, and analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
2. Design Calculations: Calculate static and dynamic loading due to equipment weight, operation, and seismic forces required to select vibration isolators and seismic restraints and for designing vibration isolation bases.

    a. Coordinate design calculations with wind load calculations required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.

3. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, spring deflection changes, and seismic loads. Include certification that riser system was examined for excessive stress and that none exists.
4. Seismic-Restraint Details:

    a. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.

b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.

c. Coordinate seismic-restraint and vibration isolation details with wind-restraint details required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Show coordination of vibration isolation device installation and seismic bracing for HVAC piping and equipment with other systems and equipment in the vicinity, including other supports and restraints, if any.

B. Qualification Data: For professional engineer and testing agency.

C. Welding certificates.

D. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7 and that is acceptable to authorities having jurisdiction.

B. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPM number from OSHPD, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are unavailable, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

PART 2 - PRODUCTS

2.1 ELASTOMERIC ISOLATION PADS

A. Elastomeric Isolation Pads.

1. Manufacturer and Model:

    a. Basis of Design

        1) Mason Industries Type MBSW

    b. Or Approved Equal by:

        1) California Dynamics Corporation
        2) Kinetics Noise Control
        3) Vibrex
        4) Isotech Industries

2. Fabrication: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area.
3. Size: Factory or field cut to match requirements of supported equipment.
4. Pad Material: Oil and water resistant with elastomeric properties.
5. Surface Pattern: Waffle pattern.
6. Load-bearing metal plates adhered to pads.
7. Sandwich-Core Material: Resilient and elastomeric

2.2 ELASTOMERIC ISOLATION MOUNTS

A. Double-Deflection, Elastomeric Isolation Mounts.

1. Manufacturer and Model:

    a. Basis of Design

        1) Mason Industries Type ND

    b. Or Approved Equal by:

        1) California Dynamics Corporation
        2) Kinetics Noise Control
        3) Vibrex
        4) Isotech Industries

2. Mounting Plates:

    a. Top Plate: Encapsulated steel load transfer top plates, factory drilled and threaded with threaded studs or bolts.
    b. Baseplate: Encapsulated steel bottom plates with holes provided for anchoring to support structure.

3. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.3 ELASTOMERIC HANGERS

A. Elastomeric Mount in a Steel Frame with Upper and Lower Steel Hanger Rods.

1. Manufacturer and Model:

a. Basis of Design

1) Mason Industries Type HD

b. Or Approved Equal by:

1) California Dynamics Corporation
2) Kinetics Noise Control
3) Vibrex
4) Isotech Industries

2. Frame: Steel, fabricated with a connection for an upper threaded hanger rod and an opening on the underside to allow for a maximum of 30 degrees of angular lower hanger-rod misalignment without binding or reducing isolation efficiency.
3. Dampening Element: Molded, oil-resistant rubber, neoprene, or other elastomeric material with a projecting bushing for the underside opening preventing steel to steel contact.

2.4 SPRING HANGERS

A. Combination Coil-Spring and Elastomeric-Insert Hanger with Spring and Insert in Compression.

1. Manufacturer and Model:

a. Basis of Design

1) Mason Industries Type 30N OR PC30NS

b. Or Approved Equal by:

1) California Dynamics Corporation
2) Kinetics Noise Control
3) Vibrex
4) Isotech Industries

2. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

7. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
8. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.
9. Self-centering hanger-rod cap to ensure concentricity between hanger rod and support spring coil.

2.5 SNUBBERS

A. Manufacturer and Model:

1. Basis of Design
   a. Mason Industries Type Z-1011

2. Or Approved Equal by:
   a. California Dynamics Corporation
   b. Kinetics Noise Control
   c. Vibrex
   d. Isotech Industries

B. Description: Factory fabricated using welded structural-steel shapes and plates, anchor bolts, and replaceable resilient isolation washers and bushings.

1. Anchor bolts for attaching to concrete shall be seismic-rated, drill-in, and stud-wedge or female-wedge type.
2. Resilient Isolation Washers and Bushings: Oil- and water-resistant neoprene.
3. Maximum 1/4-inch air gap, and minimum 1/4-inch-thick resilient cushion.

2.6 RESTRAINT CHANNEL BRACINGS

A. Manufacturer and Model:

1. Basis of Design
   a. Mason Industries Type Seismic Sway Bracing System

2. Or Approved Equal by:
   a. California Dynamics Corporation
   b. Kinetics Noise Control
   c. Vibrex
   d. Isotech Industries

B. Description: MFMA-4, shop- or field-fabricated bracing assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.7 RESTRAINT CABLES

A. Manufacturer and Model:

1. Basis of Design

    a. Mason Industries Type SCBA Assembly, SCR, UC & CCB

2. Or Approved Equal by:

    a. California Dynamics Corporation
    b. Kinetics Noise Control
    c. Vibrex
    d. Isotech Industries

B. Restraint Cables: ASTM A 603 galvanized ASTM A 492 stainless-steel cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; with a minimum of two clamping bolts for cable engagement.

2.8 SEISMIC-RESTRAINT ACCESSORIES

A. Manufacturer and Model:

1. Basis of Design

    a. Mason Industries Type SCR, UC & CCB

2. Or Approved Equal by:

    a. California Dynamics Corporation
    b. Kinetics Noise Control
    c. Vibrex
    d. Isotech Industries

B. Hanger-Rod Stiffener: Reinforcing steel angle clamped to hanger rod.

C. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to rigid channel bracings and restraint cables.

D. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.

E. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices used.

F. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.9 VIBRATION ISOLATION EQUIPMENT BASES

A. Steel Rails: Factory-fabricated, welded, structural-steel rails.

1. Manufacturer and Model:

    a. Basis of Design

        1) Vibrex

    b. Or Approved Equal by:

        1) California Dynamics Corporation
        2) Mason Industries
        3) Kinetics Noise Control

2. Structural Steel: Steel shapes, plates, and bars complying with ASTM A 36/A 36M. Rails shall have shape to accommodate supported equipment.
3. Support Brackets: Factory-welded steel brackets on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.

B. Steel Bases: Factory-fabricated, welded, structural-steel bases and rails.

1. Manufacturer and Model:

    a. Basis of Design

        1) Vibrex

    b. Or Approved Equal by:

        1) California Dynamics Corporation
        2) Mason Industries
        3) Kinetics Noise Control

2. Structural Steel: Steel shapes, plates, and bars complying with ASTM A 36/A 36M. Bases shall have shape to accommodate supported equipment.
3. Support Brackets: Factory-welded steel brackets on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by [an evaluation service member of ICC-ES] [OSHPD] [an agency acceptable to authorities having jurisdiction].

B. Hanger-Rod Stiffeners: Install hanger-rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength is adequate to carry present and future static and seismic loads within specified loading limits.

3.3 VIBRATION CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Installation of vibration isolators must not cause any change of position of equipment, piping, or ductwork resulting in stresses or misalignment.

B. Equipment Restraints:

1. Install seismic snubbers on HVAC equipment mounted on vibration isolators. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure.
2. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
3. Install seismic-restraint devices using methods approved by an evaluation service member of an evaluation service member of ICC-ES or OSHPD that provides required submittals for component.

C. Piping Restraints:

1. Comply with requirements in MSS SP-127.
2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
3. Brace a change of direction longer than 12 feet.

D. Install cables so they do not bend across edges of adjacent equipment or building structure.

E. Install seismic-restraint devices using methods approved by an evaluation service member of an evaluation service member of ICC-ES or OSHPD that provides required submittals for component.

F. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.

G. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

H. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment. Comply with requirements in Section 232113 "Hydronic Piping" for piping flexible connections.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.
3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
4. Test at least four of each type and size of installed anchors and fasteners selected by Structural Engineer of Record.
5. Test to 90 percent of rated proof load of device.
6. Measure isolator restraint clearance.
7. Measure isolator deflection.
8. Verify snubber minimum clearances.
9. Test and adjust restrained-air-spring isolator controls and safeties.

D. Remove and replace malfunctioning units and retest as specified above.

E. Prepare test and inspection reports.

3.6 ADJUSTING

A. Adjust isolators after piping system is at operating weight.

B. Adjust limit stops on restrained-spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

END OF SECTION

SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Pipe labels.
3. Duct labels.
4. Valve tags.

1.3 ACTION SUBMITTALS

A. Submittals shall be formatted per Section 230000 “General Mechanical Requirements”. The manufacturer shall resubmit the specification section showing compliance with each respective paragraphs and specified items and features in that particular specification section. All exceptions shall be clearly identified by referencing respective paragraph and other requirements. Next to each specification item, indicate the following:

1. “No Exception Taken”.
2. “Exception”. All exceptions shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.

B. Product Data: For each type of product.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

D. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 GENERAL

A. Manufacturers:

1. Craftmark Identification Systems
2. Seton Identification Products
3. MSI Marking Services
4. Setmark

2.2 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: Brass or anodized aluminum, 0.032-inch minimum thickness and having predrilled or stamped holes for attachment hardware.
2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
3. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
4. Fasteners: Stainless-steel rivets or contact-type permanent adhesive, compatible with label and substrate.
5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:

1. Material and Thickness: Three-layer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick and having predrilled holes for attachment hardware.
2. Color Coding:

    a. Letter Color: White.
    b. Background Color: Red.

3. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
4. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
5. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
6. Fasteners: Stainless-steel rivets or contact-type permanent adhesive, compatible with label and substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.3 PIPE LABELS

A. Do not use pipe labels or plastic tapes for bare pipes conveying fluids at temperatures of 125 deg F (52 deg C) or higher.

B. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

C. Pre-tensioned Pipe Labels for Outside Diameter Less or Equal to 8 Inches: Pre-coiled, semi-rigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

D. Self-Adhesive Pipe Labels for Outside Diameter Greater than 8 Inches: Printed plastic with contact-type, permanent-adhesive backing. Either marker shall show accepted color-coded background, proper color of legend in relation to background color, accepted legend letter size, accepted marker length.

E. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

2.4 DUCT LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

B. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

C. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

D. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

E. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

F. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions, or as separate unit on each duct label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

2.5 VALVE TAGS

A. Valve Tags: Stamped or engraved with ¼-inch letters for piping system abbreviation and ½ inch sequenced numbers.

1. Tag Material: Brass, 0.032-inch minimum thickness and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass wire-link or beaded chain; or S-hook.

B. Valve Schedules: For each piping system, on 8-1/2 by 11 inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve tag schedule shall be included in operation and maintenance data.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

3.3 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.4 PIPE LABEL INSTALLATION

A. Piping Color-Coding: Painting of piping is specified in Section 099123 "Interior Painting"

B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Within one foot of each valve and control device.
2. Near each branch connection and riser takeoff.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. Near major equipment items and other points of origination and termination.
5. At access doors, manholes, and similar access points that permit view of concealed piping.
6. Spaced at maximum intervals of 20 feet along each run, but not less than once in each room at entrance and exit of each concealed space.
7. On piping above removable acoustical ceilings.

C. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.

D. Pipe Label Color Schedule:

1. Refrigerant Piping:

a. Background Color: Yellow.
b. Letter Color: Black.

3.5 DUCT LABEL INSTALLATION

A. Locate ductwork labels where ductwork is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Within one foot of each control device.
2. Near each branch connection and riser takeoff.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. Near major equipment items and other points of origination and termination.
5. Spaced at maximum intervals of 20 feet along each run, but not less than once in each room at entrance and exit of each concealed space.
6. On ductwork above removable acoustical ceilings.

B. Install plastic-laminated duct labels with permanent adhesive on air ducts in the following color codes:

1. Exhaust Air Ducts:

a. Background Color: Yellow.
b. Letter Color: Black.

2. Supply Air, Return Air and Outside Air:

    a. Background Color: Blue.
    b. Letter Color: White

3. Return Air and Outside Air:

    a. Background Color: Green.
    b. Letter Color: White

3.6 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except valves within factory-fabricated equipment units; faucets; convenience and lawn-watering hose connections. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size and Shape:

    a. Refrigerant: 2 inches, round.

2. Valve-Tag Color:

    a. Refrigerant: Natural.

3. Letter Color:

    a. Refrigerant: Black.

C. All above and below grade and interior and exterior valves shall be tagged. Submit valve tag chart to the Owner Representative for review and approval at the completion of the project.

END OF SECTION

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Balancing Air Systems:

    a. Constant-volume air systems.

2. Testing, Adjusting, and Balancing Equipment:

    a. Motors.
    b. Condensing units.
    c. Heat-transfer coils.

3. Sound tests.
4. Control system verification.

1.3 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. BAS: Building automation systems.

C. NEBB: National Environmental Balancing Bureau.

D. TAB: Testing, adjusting, and balancing.

E. TAB Specialist: An independent entity meeting qualifications to perform TAB work.

F. TDH: Total dynamic head.

1.4 ACTION SUBMITTALS

A. Submittals shall be formatted per Section 230000 “General Mechanical Requirements”. The manufacturer shall resubmit the specification section showing compliance with each respective paragraphs and specified items and features in that particular specification

section. All exceptions shall be clearly identified by referencing respective paragraph and other requirements. Next to each specification item, indicate the following:

1. “No Exception Taken”.
2. “Exception”. All exceptions shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.

B. TAB Report:

1. Air-Balance Report for Prerequisite IEQ 1: Documentation indicating that work complies with ASHRAE 62.1, Section 7.2.2 - "Air Balancing."
2. TAB Report for Prerequisite EA 2: Documentation indicating that work complies with ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: Submit documentation that the TAB specialist and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

B. Contract Documents Examination Report: Submit the Contract Documents review report as specified in Part 3.

C. Strategies and Procedures Plan: Submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.

D. Sample report forms.

E. Instrument calibration reports, to include the following:

1. Instrument type and make.
2. Serial number.
3. Application.
4. Dates of use.
5. Dates of calibration.

F. Submit the following once systems are installed and ready for TAB

1. System Readiness Checklists: Submit system readiness checklists as specified in "Preparation" Article.
2. Examination Report: Submit a summary report of the examination review required in "Examination" Article.
3. Certified TAB reports.

1.6 QUALITY ASSURANCE

A. TAB Specialists Qualifications: Engage an independent TAB Contractor certified by AABC or NEBB.

1. TAB Field Supervisor: Employee of the TAB specialist and certified by AABC or NEBB.

2. TAB Technician: Employee of the TAB specialist and certified by AABC, NEBB as a TAB technician.

B. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."

C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.

B. Examine installed systems for balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.

F. Examine equipment performance data including fan curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

H. Examine test reports specified in individual system and equipment Sections.

I. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.

J. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

K. Examine operating safety interlocks and controls on HVAC equipment.

L. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes the following:

1. Equipment and systems to be tested.
2. Strategies and step-by-step procedures for balancing the systems.
3. Instrumentation to be used.
4. Sample forms with specific identification for all equipment.

B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:

1. Airside:

a. Verify that leakage and pressure tests on air distribution systems have been satisfactorily completed.
b. Duct systems are complete with terminals installed.
c. Volume, smoke, and fire dampers are open and functional.
d. Clean filters are installed.
e. Fans are operating, free of vibration, and rotating in correct direction.
f. Variable-frequency controllers' startup is complete and safeties are verified.
g. Automatic temperature-control systems are operational.
h. Ceilings are installed.
i. Windows and doors are installed.
j. Suitable access to balancing devices and equipment is provided.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in ASHRAE Standard 111 or SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing" and in this Section.

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.

1. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 233300 "Air Duct Accessories."
2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 230713 "Duct Insulation," Section 230716 "HVAC Equipment Insulation," and Section 230719 "HVAC Piping Insulation."

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross-check the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. For variable-air-volume systems, develop a plan to simulate diversity.

D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

G. Verify that motor starters are equipped with properly sized thermal protection.

H. Check dampers for proper position to achieve desired airflow path.

I. Check for airflow blockages.

J. Check condensate drains for proper connections and functioning.

K. Check for proper sealing of air-handling-unit components.

L. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.

a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
b. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
c. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
d. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.

2. Measure fan static pressures as follows:

a. Measure static pressure directly at the fan outlet or through the flexible connection.
b. Measure static pressure directly at the fan inlet or through the flexible connection.
c. Measure static pressure across each component that makes up the air-handling system.
d. Report artificial loading of filters at the time static pressures are measured.

3. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
4. Obtain approval from Owner for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload occurs. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows.

1. Measure airflow of submain and branch ducts.
2. Adjust submain and branch duct volume dampers for specified airflow.
3. Re-measure each submain and branch duct after all have been adjusted.

C. Adjust air inlets and outlets for each space to indicated airflows.

1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
2. Measure inlets and outlets airflow.
3. Adjust each inlet and outlet for specified airflow.
4. Re-measure each inlet and outlet after they have been adjusted.

D. Verify final system conditions.

1. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to design if necessary.
2. Re-measure and confirm that total airflow is within design.

3. Re-measure all final fan operating data, rpms, volts, amps, and static profile.
4. Mark all final settings.
5. Test system in economizer mode. Verify proper operation and adjust if necessary.
6. Measure and record all operating data.
7. Record final fan-performance data.

3.6 PROCEDURES FOR MOTORS

A. Motors 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating.
3. Motor rpm.
4. Phase and hertz.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter size and thermal-protection-element rating.
8. Service factor and frame size.

3.7 PROCEDURES FOR CONDENSING UNITS

A. Verify proper rotation of fans.

B. Measure entering- and leaving-air temperatures.

C. Record fan and motor operating data.

3.8 PROCEDURES FOR HEAT-TRANSFER COILS

A. Measure, adjust, and record the following data for each refrigerant coil:

1. Dry-bulb temperature of entering and leaving air.
2. Wet-bulb temperature of entering and leaving air.
3. Airflow.

3.9 SOUND TESTS

A. After the systems are balanced and construction is Substantially Complete, measure and record sound levels at 20 locations as designated by the Architect.

B. Instrumentation:

1. The sound-testing meter shall be a portable, general-purpose testing meter consisting of a microphone, processing unit, and readout.
2. The sound-testing meter shall be capable of showing fluctuations at minimum and maximum levels, and measuring the equivalent continuous sound pressure level (LEQ).

3. The sound-testing meter must be capable of using 1/3 octave band filters to measure mid-frequencies from 31.5 Hz to 8000 Hz.
4. The accuracy of the sound-testing meter shall be plus or minus one decibel.

C. Test Procedures:

1. Perform test at quietest background noise period. Note cause of unpreventable sound that affects test outcome.
2. Equipment should be operating at design values.
3. Calibrate the sound-testing meter prior to taking measurements.
4. Use a microphone suitable for the type of noise levels measured that is compatible with meter. Provide a windshield for outside or in-duct measurements.
5. Record a set of background measurements in dBA and sound pressure levels in the eight un-weighted octave bands 63 Hz to 8000 Hz (NC) with the equipment off.
6. Take sound readings in dBA and sound pressure levels in the eight un-weighted octave bands 63 Hz to 8000 Hz (NC) with the equipment operating.
7. Take readings no closer than 36 inches from a wall or from the operating equipment and approximately 60 inches from the floor, with the meter held or mounted on a tripod.
8. For outdoor measurements, move sound-testing meter slowly and scan area that has the most exposure to noise source being tested. Use A-weighted scale for this type of reading.

D. Reporting:

1. Report shall record the following:

a. Location.
b. System tested.
c. dBA reading.
d. Sound pressure level in each octave band with equipment on and off.

2. Plot sound pressure levels on NC worksheet with equipment on and off.

3.10 CONTROLS VERIFICATION

A. In conjunction with system balancing, perform the following:

1. Verify temperature control system is operating within the design limitations.
2. Confirm that the sequences of operation are in compliance with Contract Documents.
3. Verify that controllers are calibrated and function as intended.
4. Verify that controller set points are as indicated.
5. Verify the operation of lockout or interlock systems.
6. Verify the operation of valve and damper actuators.
7. Verify that controlled devices are properly installed and connected to correct controller.
8. Verify that controlled devices travel freely and are in position indicated by controller: open, closed, or modulating.

9. Verify location and installation of sensors to ensure that they sense only intended temperature, humidity, or pressure.

B. Reporting: Include a summary of verifications performed, remaining deficiencies, and variations from indicated conditions.

3.11 TOLERANCES

A. Set HVAC system's airflow rates and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus 5 percent or minus 0 percent.
2. Air Outlets and Inlets: Plus or minus 10 percent.
3. Heating-Water Flow Rate: Plus or minus 10 percent.
4. Cooling-Water Flow Rate: Plus or minus 10 percent.

B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

3.12 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.
3. Certify validity and accuracy of field data.

B. Final Report Contents: In addition to certified field-report data, include the following:
1. Fan curves.
2. Manufacturers' test data.
3. Field test reports prepared by system and equipment installers.
4. Other information relative to equipment performance; do not include Shop Drawings and Product Data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB specialist.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB supervisor who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.

11. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer's name, type, size, and fittings.
14. Notes to explain why certain final data in the body of reports vary from indicated values.
15. Test conditions for fans and pump performance forms including the following:

    a. Settings for outdoor-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Face and bypass damper settings at coils.
    e. Fan drive settings including settings and percentage of maximum pitch diameter.
    f. Inlet vane settings for variable-air-volume systems.
    g. Settings for supply-air, static-pressure controller.
    h. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Water and steam flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Balancing stations.
7. Position of balancing devices.

E. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

    a. System identification.
    b. Location.
    c. Make and type.
    d. Model number and size.
    e. Manufacturer's serial number.
    f. Arrangement and class.
    g. Sheave make, size in inches, and bore.
    h. Center-to-center dimensions of sheave and amount of adjustments in inches.

2. Motor Data:

    a. Motor make, and frame type and size.

b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
g. Number, make, and size of belts.

3. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Suction static pressure in inches wg.

F. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

a. System and air-handling-unit number.
b. Location and zone.
c. Traverse air temperature in deg F.
d. Duct static pressure in inches wg.
e. Duct size in inches.
f. Duct area in sq. ft.
g. Indicated airflow rate in cfm.
h. Indicated velocity in fpm.
i. Actual airflow rate in cfm.
j. Actual average velocity in fpm.
k. Barometric pressure in psig.

G. Air-Terminal-Device Reports:

1. Unit Data:

a. System and air-handling unit identification.
b. Location and zone.
c. Apparatus used for test.
d. Area served.
e. Make.
f. Number from system diagram.
g. Type and model number.
h. Size.
i. Effective area in sq. ft.

2. Test Data (Indicated and Actual Values):

a. Airflow rate in cfm.
b. Air velocity in fpm.

c. Preliminary airflow rate as needed in cfm.
d. Preliminary velocity as needed in fpm.
e. Final airflow rate in cfm.
f. Final velocity in fpm.
g. Space temperature in deg F.

H. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:

1. Unit Data:

a. System and air-handling-unit identification.
b. Location and zone.
c. Room or riser served.
d. Coil make and size.
e. Flowmeter type.

2. Test Data (Indicated and Actual Values):

a. Airflow rate in cfm.
b. Entering-water temperature in deg F.
c. Leaving-water temperature in deg F.
d. Water pressure drop in feet of head or psig.
e. Entering-air temperature in deg F.
f. Leaving-air temperature in deg F.

I. Instrument Calibration Reports:

1. Report Data:

a. Instrument type and make.
b. Serial number.
c. Application.
d. Dates of use.
e. Dates of calibration.

3.13 VERIFICATION OF TAB REPORT

A. The TAB specialist's test and balance engineer shall conduct the inspection in the presence of commissioning authority.

B. Commissioning authority shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.

C. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."

D. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

E. If TAB work fails, proceed as follows:

1. TAB specialists shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
2. If the second final inspection also fails, Owner may contract the services of another TAB specialist to complete TAB work according to the Contract Documents and deduct the cost of the services from the original TAB specialist's final payment.
3. If the second verification also fails, Owner may contact AABC, NEBB or TABB Headquarters regarding the Performance Guaranty.

F. Prepare test and inspection reports.

3.14 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION

SECTION 230713 - DUCT INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section. Review these documents for coordination with additional requirements and information that apply to work under this Section

1.2 SUMMARY

A. Section includes insulating the following duct services:

1. Indoor supply, return and outdoor air.

B. Related Sections:

1. Section 230719 "HVAC Piping Insulation."
2. Section 233113 "Metal Ducts" for duct liners.

1.3 ACTION SUBMITTALS

A. Submittals shall be formatted per Section 230000 “General Mechanical Requirements”. The manufacturer shall resubmit the specification section showing compliance with each respective paragraphs and specified items and features in that particular specification section. All exceptions shall be clearly identified by referencing respective paragraph and other requirements. Next to each specification item, indicate the following:

1. “No Exception Taken”.
2. “Exception”. All exceptions shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.

B. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any).

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

C. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.8 SCHEDULING

A. Schedule insulation application after pressure testing systems. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. CertainTeed Corporation; SoftTouch Duct Wrap
b. Johns Manville; Microlite.
c. Knauf Insulation; Friendly Feel Duct Wrap.
d. Owens Corning; SOFTR All-service Duct Wrap.

2.2 FIRE-RATED INSULATION SYSTEMS

A. Fire-Rated Board: Structural-grade, press-molded, xonolite calcium silicate, fireproofing board suitable for operating temperatures up to 1700 deg F. Comply with ASTM C 656, Type II, Grade 6. Tested and certified to provide a [1] [2]-hour fire rating by an NRTL acceptable to authorities having jurisdiction.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. 3M

B. Fire-Rated Blanket: High-temperature, flexible, blanket insulation with FSK jacket that is tested and certified to provide a 2-hour fire rating by an NRTL acceptable to authorities having jurisdiction.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. 3M.
b. Morgan Thermal Ceramics

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Childers Brand; H. B. Fuller Construction Products.
b. Eagle Bridges - Marathon Industries.
c. Mon-Eco Industries, Inc.

2.3 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Childers Brand; H. B. Fuller Construction Products.
b. Foster Brand; H. B. Fuller
c. Knauf Insulation.

2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
5. Color: White.

C. Vapor-Barrier Permeance: ASTM 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Childers Brand; H. B. Fuller Construction Products.; CP10
b. Eagle Bridges - Marathon Industries.; 550
c. Foster Brand; H. B. Fuller Construction Products.; 146-50

2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mil dry film thickness.
3. Service Temperature Range: Minus 50 to plus 220 deg F.
4. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
5. Color: White.

2.4 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Childers Brand; H. B. Fuller Construction Products.; CP-76.
    b. Foster Brand; H. B. Fuller Construction Products.; 95-44.
    c. Mon-Eco Industries, Inc.; 44-05
    d. Eagle Bridges – Marathon Industries; 405.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: 20 to plus 250 deg F.
5. Color: Aluminum.
6. For indoor applications, use sealants that have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Use sealants that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.

2.5 TAPES

A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Compac Corporation; 110 and 111.
    b. ABI, Ideal Tape Division; 491 AWF FSK.
    c. Venture Tape; 1525 CW NT, 1528 CW, and 1528 CW/SQ.
    d. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.

2. Width: 3 inches.
3. Thickness: 6.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

2.6 SECUREMENTS

A. Bands:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ITW Insulation Systems; Illinois Tool Works, Inc.; Gerrard Strapping and Seals.
b. RPR Products, Inc.; Insul-Mate Strapping, Seals, and Springs.

2. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with wing seal or closed seal.
3. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

a. Midwest Fasteners or approved equal.
b. Baseplate: Galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
c. Spindle: Zinc-coated, low-carbon steel, fully annealed, 0.106-inch- diameter shank, length to suit depth of insulation indicated.
d. Adhesive-backed base with a peel-off protective cover.

4. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick, galvanized-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

B. Wire: 0.062-inch soft-annealed, stainless steel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.

B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Keep insulation materials dry during application and finishing.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

K. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.

L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.

E. Insulation Installation at Floor Penetrations:

1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.

3.5 INSTALLATION OF MINERAL-FIBER INSULATION

A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 50 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not over compress insulation during installation.
    e. Impale insulation over pins and attach speed washers.
    f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

    a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
    b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.

5. Overlap un-faced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.6 FIRE-RATED INSULATION SYSTEM INSTALLATION

A. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous fire rating.

B. Insulate duct access panels and doors to achieve same fire rating as duct.

C. Install firestopping at penetrations through fire-rated assemblies. Fire-stop systems are specified in Section 078413 "Penetration Firestopping."

3.7 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor supply, return and outdoor air.

B. Items Not Insulated:

1. Metal ducts with duct liner of sufficient thickness to comply with Title 24 energy code. Exposed, visible ductwork shall have internal liner rather than external insulation.
2. Metal ducts located in conditioned spaces.
3. Factory-insulated flexible ducts.
4. Factory-insulated plenums and casings.
5. Flexible connectors.
6. Vibration-control devices.
7. Factory-insulated access panels and doors.

3.8 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Supply, outdoor air, and return air duct and plenum insulation shall be the following:

1. Mineral-Fiber Blanket: 3 inches thick and 0.75-lb/cu. ft. nominal density to achieve T24 minimum R-8 rating.

END OF SECTION

SECTION 230719 - HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes insulating the following HVAC piping systems:

1. Condensate drain piping.
2. Refrigerant suction and hot-gas piping.

B. Related Sections:

1. Section 230713 "Duct Insulation."

1.3 ACTION SUBMITTALS

A. Submittals shall be formatted per Section 230000 “General Mechanical Requirements”. The manufacturer shall resubmit the specification section showing compliance with each respective paragraphs and specified items and features in that particular specification section. All exceptions shall be clearly identified by referencing respective paragraph and other requirements. Next to each specification item, indicate the following:

1. “No Exception Taken”.
2. “Exception”. All exceptions shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.

B. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance, thickness, and jackets (both factory and field applied, if any). Clearly mark the materials being provided and its intended use of each product

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

C. Field quality-control reports if requested by the Owner’s Representative.

1.5 QUALITY ASSURANCE

A. Insulation materials shall be manufactured at facilities certified and registered with an approved registrar to conform to the ISO 9001 Quality Standard.

B. All work shall conform to accepted industry and trade standards for commercial and industrial insulations and shall conform with manufacturer's recommendations.

C. Installation shall be by licensed applicators.

D. Insulation materials that have become wet or contaminated shall not be installed.

E. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

F. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver all materials (insulation, coverings, tapes, cements, adhesives, coatings, etc.) to the jobsite in factory containers with manufacturer's label showing manufacturer, product name and product hazard information.

B. Insulation shall be delivered to the job site in original, unopened manufacturer's containers.

C. Insulation shall be stored in a dry location and kept dry throughout construction. Wet or damaged insulation shall be removed and replaced by the Contractor at no additional cost.

1.7 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Systems."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.8 SCHEDULING

A. Schedule insulation application after pressure testing systems. Insulation application may begin on segments that have satisfactory test results.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Products shall not contain CFC, asbestos, lead, mercury, or mercury compounds.

B. Insulation shall meet fire and smoke hazard ratings as tested under procedure ASTM E-84, NFPA 255, and UL 723 and shall not exceed flame spread rating of 25 and maximum smoke developed rating of 50.

C. Flexible Elastomeric Insulation:

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Armacell LLC Armaflex.
   b. Aeroflex USA, Inc. Aerocel.
   c. K-Flex USA Insul-sheet.

2. Closed-cell. Comply with ASTM C 534, Type I for tubular materials.
3. Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
4. Pipe insulation shall be fabricated according to the requirements of ASTM C1639 “Standard Specification for Fabrication of Cellular Glass Pipe and Tubing Insulation”.
5. Thermal Conductivity: 0.25 Btu-in/hr-ft^2-°F at 75°F.
6. Short runs of pipe or valves and fittings where it is impractical to install tubing insulation shall be insulated with two layers of 1/4” elastomeric foam tape.

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated. Adhesives shall contain no flammable solvents if that option is available.

B. Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Aeroflex USA Inc.; Aeroseal.
   b. Armacell LCC; 520 BLV Adhesive.
   c. Foster Products Corporation, H. B. Fuller Company; 85-75.
   d. RBX Corporation; Rubatex Contact Adhesive.

2. For indoor applications use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Dow Chemical Company (The); 739, Dow Silicone.
b. Johns-Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
c. P.I.C. Plastics, Inc.; Welding Adhesive.
d. Speedline Corporation; Speedline Vinyl Adhesive.

2. For indoor applications use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 MASTICS

A. Materials shall water based and be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 40 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; CP-35.
b. Design Polymerics 3040 with zero VOC's.
c. Foster Products Corporation, H. B. Fuller Company; 30-90.

2. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
5. Color: White.

2.4 FACTORY-APPLIED JACKETS

A. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.5 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Johns Manville; Zeston.
    b. P.I.C. Plastics, Inc.; FG Series.
    c. Proto Corporation; LoSmoke.
    d. Speedline Corporation; SmokeSafe.

2. Adhesive: As recommended by jacket material manufacturer.
3. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

    a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

C. Moisture Barrier Jacket:

1. Manufacturer: Pittsburg Corning PITTWRAP or approved equal.
2. 125 mil thick heat-seal multi-ply laminate consisting of three layers of a polymer-modified bituminous compound separated by glass reinforcement and aluminum foil.

D. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Childers Products, Division of ITW; Metal Jacketing Systems.
    b. PABCO Metals Corporation; Surefit.
    c. RPR Products, Inc.; Insul-Mate.

2. Factory cut and rolled to size.
3. Finish and thickness are indicated in field-applied jacket schedules.
4. Moisture Barrier for Indoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.
5. Moisture Barrier for Outdoor Applications: 3-mil- thick, heat-bonded polyethylene and 40 pound kraft paper.
6. Factory-Fabricated Fitting Covers:

    a. Same material, finish, and thickness as jacket.
    b. Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
    c. Tee covers.

d. Flange and union covers.
e. End caps.
f. Beveled collars.
g. Valve covers.
h. Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

2.6 TAPES

A. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive. Suitable for indoor and outdoor applications.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0555.
b. Compac Corp.; 130.
c. Ideal Tape Co., Inc., an American Biltrite Company; 370 White PVC tape.
d. Venture Tape; 1506 CW NS.

2. Width: 2 inches.
3. Thickness: 6 mils.
4. Adhesion: 64 ounces force/inch in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch in width.

B. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
b. Compac Corp.; 120.
c. Ideal Tape Co., Inc., an American Biltrite Company; 488 AWF.
d. Venture Tape; 1525 CW, 1528 CW, and 1528 CW/SQ.

2. Width: 2 inches.
3. Thickness: 3.7 mils.
4. Adhesion: 100 ounces force/inch in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch in width.

2.7 SECUREMENTS

A. Aluminum Bands: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020-inch thick, 1/2 inch 3/4 inch wide with closed seal.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following]:

a. ITW Insulation Systems; Gerrard Strapping and Seals.

b. RPR Products, Inc.; Insul-Mate Strapping, Seals, and Springs.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch wide, stainless steel or Monel.

C. Wire: 0.062-inch soft-annealed, Monel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify all inspection and acceptance testing of the piping as required by the specification has been completed and that the piping is ready for installation of insulation.
2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.
4. Verify there is adequate clearance to install the pipe insulation in accordance with the operation performance parameters of the specification, such as access to controls, valves and for maintenance and repair.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Insulation shall not be installed until the following have been completed and documentation has been submitted to Owner for approval and record:

1. Cleaning and flushing
2. Pressure testing

B. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

C. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

D. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

E. Install insulation with longitudinal seams at top and bottom of horizontal runs.

F. Install multiple layers of insulation with longitudinal and end seams staggered.

G. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

H. Keep insulation materials dry during application and finishing.

I. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

J. Install insulation with least number of joints practical.

K. Install rigid pre-insulated pipe supports to protect from compression of insulation material due to point loads.

L. Provide aluminum sleeves at all pipe support joints, between hanger support and exterior layer of insulating systems, to protect from compression of insulation material due to point loads.

M. Install insulation on piping accessories requiring future reoccuring access and service with factory fabricated insulation covers that are easily removed and reapplied.

N. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

O. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

P. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1.5 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.

    a. For below-ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

Q. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

R. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

S. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

T. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations:

1. Terminate insulation with sleeve seal at wall penetration.
2. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.

3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations: Install insulation continuously through walls and partitions.

E. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.

8. For services not specified to receive a field-applied jacket, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

B. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

C. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer’s recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.

4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 FIELD-APPLIED JACKET INSTALLATION

A. Where PVC jackets are indicated, install as follows:

1. With 1-inch overlap at longitudinal seams and end joints; for horizontal applications.
2. Seal with manufacturer's recommended adhesive.
3. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

B. Where metal jackets are indicated, install as follows:

1. With 2-inch overlap at longitudinal seams and end joints.
2. Overlap longitudinal seams arranged to shed water.
3. Seal end joints with weatherproof sealant recommended by insulation manufacturer.
4. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.9 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range.

3.10 ABOVEGROUND PIPING INSULATION SCHEDULE

A. Refrigerant Piping:

1. Low Pressure Vapor Line, below 40°F: Flexible elastomeric, 1 inch thick.
2. Low Pressure Vapor Line, 40°F and above: Flexible elastomeric, 0.5 inch thick.
3. High Pressure Vapor Line, 141°F to 200°F: Flexible elastomeric, 1.5 inches thick.
4. High Pressure Vapor Line, 201°F to 250°F: Flexible elastomeric, 2.5 inches thick.
5. Liquid Line, 140°F and below: Flexible elastomeric, 1 inch thick.

B. Condensate Drain Piping:

1. All Pipe Sizes: Flexible elastomeric, 0.5 inch thick.

3.11 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Piping, Concealed: None.

B. Piping, Exposed: PVC, 30 mils thick for all indoor applications.

3.12 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Piping, Exposed: Aluminum, Stucco Embossed, 0.024 inch thick.

END OF SECTION

SECTION 230923 - DIRECT DIGITAL CONTROL (DDC) SYSTEM FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. DDC system for monitoring and controlling of HVAC systems.
2. Delivery of selected control devices to equipment and systems manufacturers for factory installation and to HVAC systems installers for field installation.

1.3 DEFINITIONS

A. Algorithm: A logical procedure for solving a recurrent mathematical problem. A prescribed set of well-defined rules or processes for solving a problem in a finite number of steps.

B. Analog: A continuously varying signal value, such as current, flow, pressure, or temperature.

C. BACnet Specific Definitions:

1. BACnet: Building Automation Control Network Protocol, ASHRAE 135. A communications protocol allowing devices to communicate data over and services over a network.
2. BACnet Interoperability Building Blocks (BIBBs): BIBB defines a small portion of BACnet functionality that is needed to perform a particular task. BIBBs are combined to build the BACnet functional requirements for a device.
3. BACnet/IP: Defines and allows using a reserved UDP socket to transmit BACnet messages over IP networks. A BACnet/IP network is a collection of one or more IP subnetworks that share the same BACnet network number.
4. BACnet Testing Laboratories (BTL): Organization responsible for testing products for compliance with ASHRAE 135, operated under direction of BACnet International.
5. PICS (Protocol Implementation Conformance Statement): Written document that identifies the particular options specified by BACnet that are implemented in a device.

D. Binary: Two-state signal where a high signal level represents ON" or "OPEN" condition and a low signal level represents "OFF" or "CLOSED" condition. "Digital" is sometimes used interchangeably with "Binary" to indicate a two-state signal.

E. Controller: Generic term for any standalone, microprocessor-based, digital controller residing on a network, used for local or global control. Three types of controllers are indicated: Network Controller, Programmable Application Controller, and Application-Specific Controller.

F. Control System Integrator: An entity that assists in expansion of existing enterprise system and support of additional operator interfaces to I/O being added to existing enterprise system.

G. COV: Changes of value.

H. DDC System Provider: Authorized representative of, and trained by, DDC system manufacturer and responsible for execution of DDC system Work indicated.

I. Distributed Control: Processing of system data is decentralized and control decisions are made at subsystem level. System operational programs and information are provided to remote subsystems and status is reported back. On loss of communication, subsystems shall be capable of operating in a standalone mode using the last best available data.

J. DOCSIS: Data-Over Cable Service Interface Specifications.

K. E/P: Voltage to pneumatic.

L. Gateway: Bidirectional protocol translator that connects control systems that use different communication protocols.

M. HLC: Heavy load conditions.

N. I/O: System through which information is received and transmitted. I/O refers to analog input (AI), binary input (BI), analog output (AO) and binary output (BO). Analog signals are continuous and represent control influences such as flow, level, moisture, pressure, and temperature. Binary signals convert electronic signals to digital pulses (values) and generally represent two-position operating and alarm status. "Digital," (DI and (DO), is sometimes used interchangeably with "Binary," (BI) and (BO), respectively.

O. I/P: Current to pneumatic.

P. LAN: Local area network.

Q. LNS: LonWorks Network Services.

R. LON Specific Definitions:

1. FTT-10: Echelon Transmitter-Free Topology Transceiver.
2. LonMark: Association comprising suppliers and installers of LonTalk products. Association provides guidelines for implementing LonTalk protocol to ensure interoperability through a standard or consistent implementation.
3. LonTalk: An open standard protocol developed by the Echelon Corporation that uses a "Neuron Chip" for communication. LonTalk is a register trademark of Echelon.
4. LonWorks: Network technology developed by Echelon.

5. Node: Device that communicates using CEA-709.1-C protocol and that is connected to a CEA-709.1-C network.
6. Node Address: The logical address of a node on the network, consisting of a Domain number, Subnet number, and Node number. "Node number" portion of an address is a number assigned to device during installation, is unique within a subnet, and is not a factory-set unique Node ID.
7. Node ID: A unique 48-bit identifier assigned at factory to each CEA-709.1-C device. Sometimes called a "Neuron ID."
8. Program ID: An identifier (number) stored in a device (usually EEPROM) that identifies node manufacturer, functionality of device (application and sequence), transceiver used, and intended device usage.
9. Standard Configuration Property Type (SCPT): Pronounced "skip-it." A standard format type maintained by LonMark International for configuration properties.
10. Standard Network Variable Type (SNVT): Pronounced "snivet." A standard format type maintained by LonMark used to define data information transmitted and received by individual nodes. "SNVT" is used in two ways. It is an acronym for "Standard Network Variable Type" and is often used to indicate a network variable itself (i.e., it can mean "a network variable of a standard network variable type").
11. Subnet: Consists of a logical grouping of up to 127 nodes, where logical grouping is defined by node addressing. Each subnet is assigned a number, which is unique within a Domain. See "Node Address."
12. TP/FT-10: Free Topology Twisted Pair network defined by CEA-709.3 and is most common media type for a CEA-709.1-C control network.
13. TP/XF-1250: High-speed, 1.25-Mbps, twisted-pair, doubly terminated bus network defined by "LonMark Interoperability Guidelines" typically used only to connect multiple TP/FT-10 networks.
14. User-Defined Configuration Property Type (UCPT): Pronounced "U-Keep-It." A Configuration Property format type that is defined by device manufacturer.
15. User-Defined Network Variable Type (UNVT): Network variable format defined by device manufacturer. UNVTs create non-standard communications that other vendors' devices may not correctly interpret and may negatively impact system operation. UNVTs are not allowed.

S. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

T. Mobile Device: A data-enabled phone or tablet computer capable of connecting to a cellular data network and running a native control application or accessing a web interface.

U. Modbus TCP/IP: An open protocol for exchange of process data.

V. MS/TP: Master-slave/token-passing, IEE 8802-3. Datalink protocol LAN option that uses twisted-pair wire for low-speed communication.

W. MTBF: Mean time between failures.

X. Network Controller: Digital controller, which supports a family of programmable application controllers and application-specific controllers, that communicates on peer-to-peer network for transmission of global data.

Y. Network Repeater: Device that receives data packet from one network and rebroadcasts it to another network. No routing information is added to protocol.

Z. Peer to Peer: Networking architecture that treats all network stations as equal partners.

AA. POT: Portable operator's terminal.

BB. PUE: Performance usage effectiveness.

CC. RAM: Random access memory.

DD. RF: Radio frequency.

EE. Router: Device connecting two or more networks at network layer.

FF. Server: Computer used to maintain system configuration, historical and programming database.

GG. TCP/IP: Transport control protocol/Internet protocol.

HH. UPS: Uninterruptible power supply.

II. USB: Universal Serial Bus.

JJ. User Datagram Protocol (UDP): This protocol assumes that the IP is used as the underlying protocol.

KK. VAV: Variable air volume.

LL. WLED: White light emitting diode.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product include the following:

1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Operating characteristics, electrical characteristics, and furnished accessories indicating process operating range, accuracy over range, control signal over range, default control signal with loss of power, calibration data specific to each unique application, electrical power requirements, and limitations of ambient operating environment, including temperature and humidity.
3. Product description with complete technical data, performance curves, and product specification sheets.
4. Installation, operation and maintenance instructions including factors effecting performance.

5. Bill of materials of indicating quantity, manufacturer, and extended model number for each unique product.

6. When manufacturer's product datasheets apply to a product series rather than a specific product model, clearly indicate and highlight only applicable information.
7. Each submitted piece of product literature shall clearly cross reference specification and drawings that submittal is to cover.

B. Shop Drawings:

1. General Requirements:

    a. Include cover drawing with Project name, location, Owner, Architect, Contractor and issue date with each Shop Drawings submission.
    b. Include a drawing index sheet listing each drawing number and title that matches information in each title block.

2. Include plans, elevations, sections, and mounting details where applicable.
3. Include details of product assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
4. Detail means of vibration isolation and show attachments to rotating equipment.
5. Plan Drawings indicating the following:

    a. Screened backgrounds of walls, structural grid lines, HVAC equipment, ductwork and piping.
    b. Room names and numbers with coordinated placement to avoid interference with control products indicated.
    c. Each desktop workstation, server, gateway, router, DDC controller, control panel instrument connecting to DDC controller, and damper and valve connecting to DDC controller, if included in Project.
    d. Exact placement of products in rooms, ducts, and piping to reflect proposed installed condition.
    e. Network communication cable and raceway routing.
    f. Proposed routing of wiring, cabling, conduit, and tubing, coordinated with building services for review before installation.

6. Schematic drawings for each controlled HVAC system indicating the following:

    a. I/O points labeled with point names shown. Indicate instrument range, normal operating set points, and alarm set points. Indicate fail position of each damper and valve, if included in Project.
    b. I/O listed in table format showing point name, type of device, manufacturer, model number, and cross-reference to product data sheet number.
    c. A graphic showing location of control I/O in proper relationship to HVAC system.
    d. Wiring diagram with each I/O point having a unique identification and indicating labels for all wiring terminals.
    e. Unique identification of each I/O that shall be consistently used between different drawings showing same point.

f. Elementary wiring diagrams of controls for HVAC equipment motor circuits including interlocks, switches, relays and interface to DDC controllers.
g. Narrative sequence of operation.
h. Graphic sequence of operation, showing all inputs and output logical blocks.

7. Control panel drawings indicating the following:

a. Panel dimensions, materials, size, and location of field cable, raceways, and tubing connections.
b. Interior subpanel layout, drawn to scale and showing all internal components, cabling and wiring raceways, nameplates and allocated spare space.
c. Front, rear, and side elevations and nameplate legend.
d. Unique drawing for each panel.

8. DDC system network riser diagram indicating the following:

a. Each device connected to network with unique identification for each.
b. Interconnection of each different network in DDC system.
c. For each network, indicate communication protocol, speed and physical means of interconnecting network devices, such as copper cable type, or optical fiber cable type. Indicate raceway type and size for each.
d. Each network port for connection of an operator workstation or other type of operator interface with unique identification for each.

9. DDC system electrical power riser diagram indicating the following:

a. Each point of connection to field power with requirements (volts/phase//hertz/amperes/connection type) listed for each.
b. Each control power supply including, as applicable, transformers, power-line conditioners, transient voltage suppression and high filter noise units, DC power supplies, and UPS units with unique identification for each.
c. Each product requiring power with requirements (volts/phase//hertz/amperes/connection type) listed for each.
d. Power wiring type and size, race type, and size for each.

10. Monitoring and control signal diagrams indicating the following:

a. Control signal cable and wiring between controllers and I/O.
b. Point-to-point schematic wiring diagrams for each product.
c. Control signal tubing to sensors, switches and transmitters.
d. Process signal tubing to sensors, switches and transmitters.

11. Color graphics indicating the following:

a. Itemized list of color graphic displays to be provided.
b. For each display screen to be provided, a true color copy showing layout of pictures, graphics and data displayed.
c. Intended operator access between related hierarchical display screens.

C. System Description:

1. Full description of DDC system architecture, network configuration, operator interfaces and peripherals, servers, controller types and applications, gateways, routers and other network devices, and power supplies.
2. Complete listing and description of each report, log and trend for format and timing and events which initiate generation.
3. System and product operation under each potential failure condition including, but not limited to, the following:

    a. Loss of power.
    b. Loss of network communication signal.
    c. Loss of controller signals to inputs and outpoints.
    d. Operator workstation failure.
    e. Server failure.
    f. Gateway failure.
    g. Network failure
    h. Controller failure.
    i. Instrument failure.
    j. Control damper and valve actuator failure.
4. Description of testing plans and procedures.
5. Description of Owner training.

D. Delegated-Design Submittal: For DDC system products and installation indicated as being delegated.

1. Supporting documentation showing DDC system design complies with performance requirements indicated, including calculations and other documentation necessary to prove compliance.
2. Schedule and design calculations for control dampers and actuators.

    a. Flow at Project design and minimum flow conditions.
    b. Face velocity at Project design and minimum airflow conditions.
    c. Pressure drop across damper at Project design and minimum airflow conditions.
    d. AMCA 500-D damper installation arrangement used to calculate and schedule pressure drop, as applicable to installation.
    e. Maximum close-off pressure.
    f. Leakage airflow at maximum system pressure differential (fan close-off pressure).
    g. Torque required at worst case condition for sizing actuator.
    h. Actuator selection indicating torque provided.
    i. Actuator signal to control damper (on, close or modulate).
    j. Actuator position on loss of power.
    k. Actuator position on loss of control signal.

1.6 INFORMATIONAL SUBMITTALS

A. Coordination Drawings:

1. Plan drawings and corresponding product installation details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

    a. Product installation location shown in relationship to room, duct, pipe and equipment.
    b. Structural members to which products will be attached.
    c. Wall-mounted instruments located in finished space showing relationship to light switches, fire-alarm devices and other installed devices.
    d. Size and location of wall access panels for products installed behind walls and requiring access.

B. Qualification Data:

1. Systems Provider Qualification Data:

    a. Resume of project manager assigned to Project.
    b. Resumes of application engineering staff assigned to Project.
    c. Resumes of installation and programming technicians assigned to Project.
    d. Resumes of service technicians assigned to Project.
    e. Brief description of past project including physical address, floor area, number of floors, building system cooling and heating capacity and building's primary function.
    f. Description of past project DDC system, noting similarities to Project scope and complexity indicated.
    g. Names of staff assigned to past project that will also be assigned to execute work of this Project.
    h. Owner contact information for past project including name, phone number, and e-mail address.
    i. Contractor contact information for past project including name, phone number, and e-mail address.

2. Manufacturer's qualification data.
3. Testing agency's qualifications data.

C. Welding certificates.

D. Product Certificates:

1. Data Communications Protocol Certificates: Certifying that each proposed DDC system component complies with ASHRAE 135.
2. Data Communications Protocol Certificates: Certifying that each proposed DDC system component complies with LonWorks.

E. Preconstruction Test Reports: For each separate test performed.

F. Source quality-control reports.

G. Field quality-control reports.

H. Sample Warranty: For manufacturer's warranty.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For DDC system to include in emergency, operation and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

a. Project Record Drawings of as-built versions of submittal Shop Drawings provided in electronic PDF format.
b. Testing and commissioning reports and checklists of completed final versions of reports, checklists, and trend logs.
c. As-built versions of submittal Product Data.
d. Names, addresses, e-mail addresses and 24-hour telephone numbers of Installer and service representatives for DDC system and products.
e. Operator's manual with procedures for operating control systems including logging on and off, handling alarms, producing point reports, trending data, overriding computer control and changing set points and variables.
f. Programming manuals with description of programming language and syntax, of statements for algorithms and calculations used, of point database creation and modification, of program creation and modification, and of editor use.
g. Engineering, installation, and maintenance manuals that explain how to:

1) Design and install new points, panels, and other hardware.
2) Perform preventive maintenance and calibration.
3) Debug hardware problems.
4) Repair or replace hardware.

h. Documentation of all programs created using custom programming language including set points, tuning parameters, and object database.
i. Backup copy of graphic files, programs, and database on electronic media such as DVDs.
j. List of recommended spare parts with part numbers and suppliers.
k. Complete original-issue documentation, installation, and maintenance information for furnished third-party hardware including computer equipment and sensors.
l. Complete original-issue copies of furnished software, including operating systems, custom programming language, operator workstation software, and graphics software.
m. Licenses, guarantees, and warranty documents.
n. Recommended preventive maintenance procedures for system components, including schedule of tasks such as inspection, cleaning, and calibration; time between tasks; and task descriptions.
o. Owner training materials.

1.8 QUALITY ASSURANCE

A. DDC System Manufacturer Qualifications:

1. Nationally recognized manufacturer of DDC systems and products.
2. DDC systems with similar requirements to those indicated for a continuous period of 10 years within time of bid.
3. DDC systems and products that have been successfully tested and in use on at least five past projects.
4. Having complete published catalog literature, installation, operation and maintenance manuals for all products intended for use.
5. Having full-time in-house employees for the following:

    a. Product research and development.
    b. Product and application engineering.
    c. Product manufacturing, testing and quality control.
    d. Technical support for DDC system installation training, commissioning and troubleshooting of installations.
    e. Owner operator training.

B. DDC System Provider Qualifications:

1. Authorized representative of, and trained by, DDC system manufacturer.
2. Demonstrated past experience with installation of DDC system products being installed for period within five consecutive years before time of bid.
3. Demonstrated past experience on five projects of similar complexity, scope and value.
4. Each person assigned to Project shall have demonstrated past experience.
5. Staffing resources of competent and experienced full-time employees that are assigned to execute work according to schedule.
6. Service and maintenance staff assigned to support Project during warranty period.
7. Product parts inventory to support on-going DDC system operation for a period of not less than 5 years after Substantial Completion.
8. DDC system manufacturer's backing to take over execution of Work if necessary to comply with requirements indicated. Include Project-specific written letter, signed by manufacturer's corporate officer, if requested.

1.9 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on field mockups.
1. Include test assemblies representative of proposed materials and construction.
2. Build mockup at testing agency facility using personnel, materials, and methods of construction that will be used at Project site.

B. Preconstruction Testing: Performed by a qualified testing agency on manufacturer's standard assemblies.

1.10 WARRANTY

A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace products that fail in materials or workmanship within specified warranty period.

1. Failures shall be adjusted, repaired, or replaced at no additional cost or reduction in service to Owner.
2. Include updates or upgrades to software and firmware if necessary to resolve deficiencies.

    a. Install updates only after receiving Owner's written authorization.

3. Warranty service shall occur during normal business hours and commence within 24 hours of Owner's warranty service request.
4. Warranty Period: Two year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 DDC SYSTEM MANUFACTURERS

A. Alerton compass (existing campus network) – BACnet MSTP

2.2 DDC SYSTEM DESCRIPTION

A. Microprocessor-based monitoring and control including analog/digital conversion and program logic. A control loop or subsystem in which digital and analog information is received and processed by a microprocessor, and digital control signals are generated based on control algorithms and transmitted to field devices to achieve a set of predefined conditions.

    1. DDC system shall consist of a high-speed, peer-to-peer network of distributed DDC controllers, other network devices, operator interfaces, and software.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 WEB ACCESS

A. DDC system shall be Web based to match existing system

    1. Web-Based Access to DDC System:

        a. DDC system software shall be based on server thin-client architecture, designed around open standards of Web technology. DDC system server shall be accessed using a Web browser over DDC system network, using Owner's LAN, and remotely over Internet.
        b. Intent of thin-client architecture is to provide operators complete access to DDC system via a Web browser. No special software other than a Web browser shall be required to access graphics, point displays, and trends; to configure trends, points, and controllers; and to edit programming.
        c. Web access shall be password protected.

2.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional to design DDC system to satisfy requirements indicated.

1. System Performance Objectives:

a. DDC system shall manage HVAC systems.
b. DDC system control shall operate HVAC systems to achieve optimum operating costs while using least possible energy and maintaining specified performance.
c. DDC system shall respond to power failures, HVAC equipment failures, and adverse and emergency conditions encountered through connected I/O points.
d. DDC system shall operate while unattended by an operator and through operator interaction.
e. DDC system shall record trends and transaction of events and produce report information such as performance, energy, occupancies, and equipment operation.

B. DDC Data Access:

1. When logged into the system, operator shall be able to also interact with any DDC controller connected to DDC system as required for functional operation of DDC system.
2. System(s) shall be used for application configuration; for archiving, reporting and trending of data; for operator transaction archiving and reporting; for network information management; for alarm annunciation; and for operator interface tasks and controls application management.

C. Future Expandability:

1. DDC system size shall be expandable to an ultimate capacity of at least two times total I/O points indicated.
2. Additional DDC controllers, I/O and associated wiring shall be all that is needed to achieve ultimate capacity. Initial network infrastructure shall be designed and installed to support ultimate capacity.
3. Operator interfaces installed initially shall not require hardware and software additions and revisions for ultimate capacity.

2.5 DDC SYSTEM OPERATOR INTERFACES

A. Operator Means of System Access: Operator shall be able to access entire DDC system through any of multiple means, including, but not limited to, the following:

1. Desktop and portable workstation with hardwired connection through LAN port.
2. Portable operator terminal with hardwired connection through LAN port.
3. Portable operator workstation with wireless connection through LAN router.
4. Mobile device and application with secured wireless connection through LAN router or cellular data service.

5. Remote connection through web access.

B. Access to system, regardless of operator means used, shall be transparent to operator.

C. Network Ports: For hardwired connection of desktop or portable workstation. Network port shall be easily accessible, properly protected, clearly labeled, and installed at the following locations:

1. Each mechanical equipment room.
2. Each boiler room.
3. Each chiller room or outdoor chiller yard.
4. Each cooling tower location.
5. Each different roof level with roof-mounted air-handling units or rooftop units.
6. Security system command center.
7. Fire-alarm system command center.

2.6 NETWORKS

A. Acceptable networks for connecting workstations, mobile devices, and network controllers include the following:

1. ATA 878.1, ARCNET.
2. CEA-709.1-C.
3. IP.
4. IEEE 8802-3, Ethernet.

B. Acceptable networks for connecting programmable application controllers include the following:

1. ATA 878.1, ARCNET.
2. CEA-709.1-C.
3. IP.
4. IEEE 8802-3, Ethernet.

C. Acceptable networks for connecting application-specific controllers include the following:

1. ATA 878.1, ARCNET.
2. CEA-709.1-C.
3. EIA-485A.
4. IP.
5. IEEE 8802-3, Ethernet.

2.7 NETWORK COMMUNICATION PROTOCOL

A. Network communication protocol(s) used throughout entire DDC system shall be open to Owner and available to other companies for use in making future modifications to DDC system.

B. ASHRAE 135 Protocol:

1. ASHRAE 135 communication protocol shall be sole and native protocol used throughout entire DDC system.
2. DDC system shall not require use of gateways except to integrate HVAC equipment and other building systems and equipment, not required to use ASHRAE 135 communication protocol.
3. If used, gateways shall connect to DDC system using ASHRAE 135 communication protocol and Project object properties and read/write services indicated by interoperability schedule.
4. Operator workstations, controllers and other network devices shall be tested and listed by BACnet Testing Laboratories.

C. CEA-709.1-C Protocol:

1. DDC system shall be an open implementation of LonWorks technology using CEA 709.1-C communication protocol and using LonMark SNVTs as defined in LonMark SNVT list exclusively for communication throughout DDC system.
2. LNS shall be used for all network management including addressing and binding of network variables.

    a. Final LNS database shall be submitted with Project closeout submittals.
    b. All devices shall be online and commissioned into LNS database.

3. All devices connected to DDC system network(s) shall use CEA-709.1-C protocol and be installed so SCPT output from any node on network can be bound to any other node in the domain.

D. Industry Standard Protocols:

1. DDC system shall use any one or a combination of the following industry standard protocols for network communication while complying with other DDC system requirements indicated:

    a. ASHRAE 135.
    b. CEA-709.1-C.
    c. Modbus Application Protocol Specification V1.1b.
2. Portions of DDC system networks using ASHRAE 135 communication protocol shall be an open implementation of network devices complying with ASHRAE 135. Network devices shall be tested and listed by BACnet Testing Laboratories.
3. Portions of DDC system networks using CEA-709.1-C communication protocol shall be an open implementation of LonWorks technology using CEA-709.1-C communication protocol and using LonMark SNVTs as defined in LonMark SNVT list exclusively for DDC system.
4. Portions of DDC system networks using Modbus Application Protocol Specification V1.1b communication protocol shall be an open implementation of network devices and technology complying with Modbus Application Protocol Specification V1.1b.
5. Gateways shall be used to connect networks and network devices using different protocols.

2.8 DDC SYSTEM WIRELESS NETWORKS

A. Installer shall design wireless networks to comply with DDC system performance requirements indicated. Wireless network devices shall co-exist on same network with hardwired devices.

B. Hardwired controllers shall be capable of retrofit to wireless devices with no special software.

C. A wireless coordinator shall provide a wireless interface between programmable application controllers, application-specific controllers, and network controllers.

D. Wireless Coordinators:

1. Each wireless mesh network shall use wireless coordinator(s) for initiation and formation of network.
2. Use direct sequence spread spectrum RF technology.
3. Operate on the 2.4-GHz ISM Band.
4. Comply with IEEE 802.15.4 for low-power, low duty-cycle RF transmitting systems.
5. FCC compliant to 47 CFR 15, Subpart B, Class A.
6. Operate as a bidirectional transceiver with sensors and routers to confirm and synchronize data transmission.
7. Capable of communication with sensors and routers up to a maximum distance of 250 feet (76 m) in line of sight.
8. Include visual indicators to provide diagnostic information required for operator verification of operation.

E. Wireless Routers:

1. Each wireless mesh network shall use wireless routers with any controller to provide a wireless interface to a network controller, through a wireless coordinator.
2. Use direct sequence spread spectrum RF technology.
3. Operate on the 2.4-GHz ISM Band.
4. Comply with IEEE 802.15.4 for low-power, low duty-cycle RF transmitting systems.
5. FCC compliant to 47 CFR 15, Subpart B, Class A.
6. Operate as a bidirectional transceiver with other mesh network devices to ensure network integrity.
7. Capable of communication with other mesh network devices at a maximum distance of 250 feet (76 m) in line of sight.
8. Include indication for use in commissioning and troubleshooting.

F. Wireless Temperature Sensors:

1. Wireless temperature sensors shall sense and transmit room temperatures, temperature set point, room occupancy notification and low battery condition to an associated router.
2. Use direct sequence spread spectrum RF technology.
3. Operate on the 2.4-GHz ISM Band.
4. Comply with IEEE 802.15.4 for low-power, low duty-cycle RF transmitting systems.
5. FCC compliant to CFR 15, Subpart B, Class A.
6. Include set point adjustment between 55 to 85 deg F (13 to 30 deg C).

7. Multiple sensors shall be able to report to a router connected to a DDC controller for averaging or high and low selection.

G. One-to-One Wireless Network Receivers:

1. One-to-one wireless receivers shall receive wireless RF signals containing temperature data from multiple wireless room temperature sensors and communicate information to programmable application controllers or application-specific controllers.

a. Use direct sequence spread spectrum RF technology.
b. Operate on the 2.4-GHz ISM Band.
c. Comply with IEEE 802.15.4 for low-power, low duty-cycle RF transmitting systems.
d. FCC compliant to 47 CFR 15, Subpart B, Class A.
e. Operate as a bidirectional transceiver with the sensors to confirm and synchronize data transmission.
f. Capable of communication up to a distance of 200 feet (61 m).
g. Include visual indication of the following:

1) Power.
2) Receiver activity.
3) Wireless RF transmission from wireless sensors.
4) No transmission, weak signal, adequate signal or excellent signal.

H. One-to-One Wireless Network Sensors:

1. One-to-one wireless sensors shall sense and report room temperatures to one-to-one receiver.

a. Use direct sequence spread spectrum RF technology.
b. Operate on the 2.4-GHz ISM Band.
c. Comply with IEEE 802.15.4 for low-power, low duty-cycle RF transmitting systems.
d. FCC compliant to CFR 15, Subpart B, Class A.
e. Include set point adjustment between 55 to 85 deg F (13 to 30 deg C).

2.9 SYSTEM SOFTWARE

A. System Software Minimum Requirements:
1. Operating system shall be capable of operating DOS and Microsoft Windows applications.
2. Database management software shall manage all data on an integrated and non-redundant basis. Additions and deletions to database shall be without detriment to existing data. Include cross linkages so no data required by a program can be deleted by an operator until that data have been deleted from respective programs.
3. Network communications software shall manage and control multiple network communications to provide exchange of global information and execution of global programs.

4. Operator interface software shall include day-to-day operator transaction processing, alarm and report handling, operator privilege level and data segregation control, custom programming, and online data modification capability.
5. Scheduling software shall schedule centrally based time and event, temporary, and exception day programs.

B. Operator Interface Software:

1. Minimize operator training through use of English language prorating and English language point identification.
2. Minimize use of a typewriter-style keyboard through use of a pointing device similar to a mouse.
3. Operator sign-off shall be a manual operation or, if no keyboard or mouse activity takes place, an automatic sign-off.
4. Automatic sign-off period shall be programmable from one to 60 minutes in one-minute increments on a per operator basis.
5. Operator sign-on and sign-off activity shall be recorded and sent to printer.
6. Security Access:

    a. Operator access to DDC system shall be under password control.
    b. An alphanumeric password shall be field assignable to each operator.
    c. Operators shall be able to access DDC system by entry of proper password.
    d. Operator password shall be same regardless of which computer or other interface means is used.
    e. Additions or changes made to passwords shall be updated automatically.
    f. Each operator shall be assigned an access level to restrict access to data and functions the operator is cable of performing.
    g. Software shall have at least five access levels.
    h. Each menu item shall be assigned an access level so that a one-for-one correspondence between operator assigned access level(s) and menu item access level(s) is required to gain access to menu item.
    i. Display menu items to operator with those capable of access highlighted. Menu and operator access level assignments shall be online programmable and under password control.

7. Data Segregation:

    a. Include data segregation for control of specific data routed to a workstation, to an operator or to a specific output device, such as a printer.
    b. Include at least [32] segregation groups.
    c. Segregation groups shall be selectable such as "fire points," "fire points on second floor," "space temperature points," "HVAC points," and so on.
    d. Points shall be assignable to multiple segregation groups. Display and output of data to printer or monitor shall occur where there is a match of operator or peripheral segregation group assignment and point segregations.
    e. Alarms shall be displayed and printed at each peripheral to which segregation allows, but only those operators assigned to peripheral and having proper authorization level will be allowed to acknowledge alarms.

f. Operators and peripherals shall be assignable to multiple segregation groups and all assignments are to be online programmable and under password control.

8. Operators shall be able to perform commands including, but not limited to, the following:

a. Start or stop selected equipment.
b. Adjust set points.
c. Add, modify, and delete time programming.
d. Enable and disable process execution.
e. Lock and unlock alarm reporting for each point.
f. Enable and disable totalization for each point.
g. Enable and disable trending for each point.
h. Override control loop set points.
i. Enter temporary override schedules.
j. Define holiday schedules.
k. Change time and date.
l. Enter and modify analog alarm limits.
m. Enter and modify analog warning limits.
n. View limits.
o. Enable and disable demand limiting.
p. Enable and disable duty cycle.
q. Display logic programming for each control sequence.

9. Reporting:

a. Generated automatically and manually.
b. Sent to displays, printers and disk files.
c. Types of Reporting:

1) General listing of points.
2) List points currently in alarm.
3) List of off-line points.
4) List points currently in override status.
5) List of disabled points.
6) List points currently locked out.
7) List of items defined in a "Follow-Up" file.
8) List weekly schedules.
9) List holiday programming.
10) List of limits and deadbands.

10. Summaries: For specific points, for a logical point group, for an operator selected group(s), or for entire system without restriction due to hardware configuration.

C. Graphic Interface Software:

1. Include a full interactive graphical selection means of accessing and displaying system data to operator. Include at least five levels with the penetration path operator assignable (for example, site, building, floor, air-handling unit, and supply

temperature loop). Native language descriptors assigned to menu items are to be operator defined and modifiable under password control.

2. Include a hierarchical-linked dynamic graphic operator interface for accessing and displaying system data and commanding and modifying equipment operation. Interface shall use a pointing device with pull-down or penetrating menus, color and animation to facilitate operator understanding of system.
3. Include at least 10 levels of graphic penetration with the hierarchy operator assignable.
4. Descriptors for graphics, points, alarms and such shall be modified through operator's workstation under password control.
5. Graphic displays shall be online user definable and modifiable using the hardware and software provided.
6. Data to be displayed within a graphic shall be assignable regardless of physical hardware address, communication or point type.
7. Graphics are to be online programmable and under password control.
8. Points may be assignable to multiple graphics where necessary to facilitate operator understanding of system operation.
9. Graphics shall also contain software points.
10. Penetration within a graphic hierarchy shall display each graphic name as graphics are selected to facilitate operator understanding.
11. Back-trace feature shall permit operator to move upward in the hierarchy using a pointing device. Back trace shall show all previous penetration levels. Include operator with option of showing each graphic full screen size with back trace as horizontal header or by showing a "stack" of graphics, each with a back trace.
12. Display operator accessed data on the monitor.
13. Operator shall select further penetration using pointing device to click on a site, building, floor, area, equipment, and so on. Defined and linked graphic below that selection shall then be displayed.
14. Include operator with means to directly access graphics without going through penetration path.
15. Dynamic data shall be assignable to graphics.
16. Display points (physical and software) with dynamic data provided by DDC system with appropriate text descriptors, status or value, and engineering unit.
17. Use color, rotation, or other highly visible means, to denote status and alarm states. Color shall be variable for each class of points, as chosen by operator.
18. Points shall be dynamic with operator adjustable update rates on a per point basis from [**one**] <**Insert value**> second to over a [**minute**] <**Insert value**>.
19. For operators with appropriate privilege, points shall be commanded directly from display using pointing device.

    a. For an analog command point such as set point, current conditions and limits shall be displayed and operator can position new set point using pointing device.
    b. For a digital command point such as valve position, valve shall show its current state such as open or closed and operator could select alternative position using pointing device.
    c. Keyboard equivalent shall be available for those operators with that preference.

20. Operator shall be able to split or resize viewing screen into quadrants to show one graphic on one quadrant of screen and other graphics or spreadsheet, bar chart,

word processing, curve plot and other information on other quadrants on screen. This feature shall allow real-time monitoring of one part of system while displaying other parts of system or data to better facilitate overall system operation.

21. Help Features:

    a. On-line context-sensitive help utility to facilitate operator training and understanding.
    b. Bridge to further explanation of selected keywords. Document shall contain text and graphics to clarify system operation.

        1) If help feature does not have ability to bridge on keywords for more information, a complete set of user manuals shall be provided in an indexed word-processing program, which shall run concurrently with operating system software.

    c. Available for Every Menu Item:

        1) Index items for each system menu item.

22. Graphic generation software shall allow operator to add, modify, or delete system graphic displays.

    a. Include libraries of symbols depicting HVAC symbols such as fans, coils, filters, dampers, valves pumps, and electrical symbols[**similar to those indicated**].
    b. Graphic development package shall use a pointing device in conjunction with a drawing program to allow operator to perform the following:

        1) Define background screens.
        2) Define connecting lines and curves.
        3) Locate, orient and size descriptive text.
        4) Define and display colors for all elements.
        5) Establish correlation between symbols or text and associated system points or other displays.

D. Project-Specific Graphics: Graphics documentation including, but not limited to, the following:

1. Site plan showing each building, and additional site elements, which are being controlled or monitored by DDC system.
2. Plan for each building floor, including interstitial floors, and each roof level of each building, showing the following:

    a. Room layouts with room identification and name.
    b. Locations and identification of all monitored and controlled HVAC equipment and other equipment being monitored and controlled by DDC system.
    c. Location and identification of each hardware point being controlled or monitored by DDC system.
    d. <**Insert requirements**>.

3. Control schematic for each of following, including a graphic system schematic representation[**, similar to that indicated on Drawings,**] with point identification, set point and dynamic value indication[**, sequence of operation**] [**and**] [**control logic diagram**].
4. Graphic display for each piece of equipment connected to DDC system through a data communications link. Include dynamic indication of all points associated with equipment.
5. DDC system network riser diagram that shows schematic layout for entire system including all networks and all controllers, [**gateways**] [**operator workstations**] [**and**] [**other network devices**].

E. Customizing Software:

1. Software to modify and tailor DDC system to specific and unique requirements of equipment installed, to programs implemented and to staffing and operational practices planned.
2. Online modification of DDC system configuration, program parameters, and database using menu selection and keyboard entry of data into preformatted display templates.
3. As a minimum, include the following modification capability:

    a. Operator assignment shall include designation of operator passwords, access levels, point segregation and auto sign-off.
    b. Peripheral assignment capability shall include assignment of segregation groups and operators to consoles and printers, designation of backup workstations and printers, designation of workstation header points and enabling and disabling of print-out of operator changes.
    c. System configuration and diagnostic capability shall include communications and peripheral port assignments, DDC controller assignments to network, DDC controller enable and disable, assignment of command trace to points and application programs and initiation of diagnostics.
    d. System text addition and change capability shall include English or native language descriptors for points, segregation groups and access levels and action messages for alarms, run time and trouble condition.
    e. Time and schedule change capability shall include time and date set, time and occupancy schedules, exception and holiday schedules and daylight savings time schedules.
    f. Point related change capability shall include the following:

        1) System and point enable and disable.
        2) Run-time enable and disable.
        3) Assignment of points to segregation groups, calibration tables, lockout, and run time and to a fixed I/O value.
        4) Assignment of alarm and warning limits.

    g. Application program change capability shall include the following:

        1) Enable and disable of software programs.
        2) Programming changes.

3) Assignment of comfort limits, global points, time and event initiators, time and event schedules and enable and disable time and event programs.

4. Software shall allow operator to add points, or groups of points, to DDC system and to link them to energy optimization and management programs. Additions and modifications shall be online programmable using operator workstation, downloaded to other network devices and entered into their databases. After verification of point additions and associated program operation, database shall be uploaded and recorded on hard drive and disk for archived record.
5. Include high-level language programming software capability for implementation of custom DDC programs. Software shall include a compiler, linker, and up- and down-load capability.
6. Include a library of DDC algorithms, intrinsic control operators, arithmetic, logic and relational operators for implementation of control sequences. Also include, as a minimum, the following:

    a. Proportional control (P).
    b. Proportional plus integral (PI).
    c. Proportional plus integral plus derivative (PID).
    d. Adaptive and intelligent self-learning control.

        1) Algorithm shall monitor loop response to output corrections and adjust loop response characteristics according to time constant changes imposed.
        2) Algorithm shall operate in a continuous self-learning manner and shall retain in memory a stored record of system dynamics so that on system shut down and restart, learning process starts from where it left off.

7. Fully implemented intrinsic control operators including sequence, reversing, ratio, time delay, time of day, highest select AO, lowest select AO, analog controlled digital output, analog control AO, and digitally controlled AO.
8. Logic operators such as "And," "Or," "Not," and others that are part of a standard set available with a high-level language.
9. Arithmetic operators such as "Add," "Subtract," "Multiply," "Divide," and others that are part of a standard set available with a high-level language.
10. Relational operators such as "Equal To," "Not Equal To," "Less Than," "Greater Than," and others that are part of a standard set available with a high-level language.

F. Alarm Handling Software:

1. Include alarm handling software to report all alarm conditions monitored and transmitted through DDC controllers[**, gateways**] [**and other network devices**].
2. Include first in, first out handling of alarms according to alarm priority ranking, with most critical alarms first, and with buffer storage in case of simultaneous and multiple alarms.
3. Alarm handling shall be active at all times to ensure that alarms are processed even if an operator is not currently signed on to DDC system.
4. Alarms display shall include the following:

a. Indication of alarm condition such as "Abnormal Off," "Hi Alarm," and "Low Alarm."
b. "Analog Value" or "Status" group and point identification with native language point descriptor such as "Space Temperature, Building 110, 2nd Floor, Room 212."
c. Discrete per point alarm action message, such as "Call Maintenance Dept. Ext-5561."
d. Include extended message capability to allow assignment and printing of extended action messages. Capability shall be operator programmable and assignable on a per point basis.

5. Alarms shall be directed to appropriate operator workstations, printers, and individual operators by privilege level and segregation assignments.
6. Send e-mail alarm messages to designated operators.
7. Send e-mail, page, text and voice messages to designated operators for critical alarms.
8. Alarms shall be categorized and processed by class.

a. Class 1:

1) Associated with fire, security and other extremely critical equipment monitoring functions; have alarm, trouble, return to normal, and acknowledge conditions printed and displayed.
2) Unacknowledged alarms to be placed in unacknowledged alarm buffer.
3) All conditions shall cause an audible sound and shall require individual acknowledgment to silence audible sound.

b. Class 2:

1) Critical, but not life-safety related, and processed same as Class 1 alarms, except do not require individual acknowledgment.
2) Acknowledgement may be through a multiple alarm acknowledgment.

c. Class 3:

1) General alarms; printed, displayed and placed in unacknowledged alarm buffer queues.
2) Each new alarm received shall cause an audible sound. Audible sound shall be silenced by "acknowledging" alarm or by pressing a "silence" key.
3) Acknowledgement of queued alarms shall be either on an individual basis or through a multiple alarm acknowledgement.
4) Alarms returning to normal condition shall be printed and not cause an audible sound or require acknowledgment.

d. Class 4:

1) Routine maintenance or other types of warning alarms.
2) Alarms to be printed only, with no display, no audible sound and no acknowledgment required.

9. Include an unacknowledged alarm indicator on display to alert operator that there are unacknowledged alarms in system. Operator shall be able to acknowledge alarms on an individual basis or through a multiple alarm acknowledge key, depending on alarm class.
10. To ensure that no alarm records are lost, it shall be possible to assign a backup printer to accept alarms in case of failure of primary printer.

G. Reports and Logs:

1. Include reporting software package that allows operator to select, modify, or create reports using DDC system I/O point data available.
2. Each report shall be definable as to data content, format, interval and date.
3. Report data shall be sampled and stored on DDC controller, within storage limits of DDC controller, and then uploaded to archive on [**workstation**] [**server**] for historical reporting.
4. Operator shall be able to obtain real-time logs of all I/O points by type or status, such as alarm, point lockout, or normal.
5. Reports and logs shall be stored on [**workstation**] [**and**] [**server**] hard drives in a format that is readily accessible by other standard software applications, including spreadsheets and word processing.
6. Reports and logs shall be readily printed and set to be printed either on operator command or at a specific time each day.

H. Standard Reports: Standard DDC system reports shall be provided and operator shall be able to customize reports later.

1. All I/O: With current status and values.
2. Alarm: All current alarms, except those in alarm lockout.
3. Disabled I/O: All I/O points that are disabled.
4. Alarm Lockout I/O: All I/O points in alarm lockout, whether manual or automatic.
5. Alarm Lockout I/O in Alarm: All I/O in alarm lockout that are currently in alarm.
6. Logs:

    a. Alarm history.
    b. System messages.
    c. System events.
    d. Trends.

I. Custom Reports: Operator shall be able to easily define any system data into a daily, weekly, monthly, or annual report. Reports shall be time and date stamped and shall contain a report title.

J. Tenant Override Reports: Prepare Project-specific reports.

1. Weekly report showing daily total time in hours that each tenant has requested after-hours HVAC.
2. Monthly report showing daily total time in hours that each tenant has requested after-hours HVAC.
3. Annual summary report that shows after-hours HVAC usage on a monthly basis.

K. HVAC Equipment Reports: Prepare Project-specific reports.

1. Chiller Report: Daily report showing operating conditions of each chiller according to ASHRAE 147, including, but not limited to, the following:

    a. Chilled-water entering temperature.
    b. Chilled-water leaving temperature.
    c. Chilled-water flow rate.
    d. Chilled-water inlet and outlet pressures.
    e. Evaporator refrigerant pressure and temperature.
    f. Condenser refrigerant pressure and liquid temperature.
    g. Condenser-water entering temperature.
    h. Condenser-water leaving temperature.
    i. Condenser-water flow rate.
    j. Refrigerant levels.
    k. Oil pressure and temperature.
    l. Oil level.
    m. Compressor refrigerant discharge temperature.
    n. Compressor refrigerant suction temperature.
    o. Addition of refrigerant.
    p. Addition of oil.
    q. Vibration levels or observation that vibration is not excessive.
    r. Motor amperes per phase.
    s. Motor volts per phase.
    t. Refrigerant monitor level (PPM).
    u. Purge exhaust time or discharge count.
    v. Ambient temperature (dry bulb and wet bulb).
    w. Date and time logged.

2.10 ASHRAE 135 GATEWAYS

A. Include BACnet communication ports, whenever available as an equipment OEM standard option, for integration via a single communication cable.

B. Include gateways to connect BACnet to legacy systems, existing non-BACnet devices, and existing non-BACnet DDC-controlled equipment, only when specifically requested and approved by Owner.

C. Include with each gateway an interoperability schedule showing each point or event on legacy side that BACnet "client" will read, and each parameter that BACnet network will write to. Describe this interoperability of BACnet services, or BIBBs, defined in ASHRAE 135, Annex K.

D. Gateway Minimum Requirements:

1. Read and view all readable object properties on non-BACnet network to BACnet network and vice versa where applicable.
2. Write to all writeable object properties on non-BACnet network from BACnet network and vice versa where applicable.
3. Include single-pass (only one protocol to BACnet without intermediary protocols) translation from non-BACnet protocol to BACnet and vice versa.

4. Comply with requirements of Data Sharing Read Property, Data Sharing Write Property, Device Management Dynamic Device Binding-B, and Device Management Communication Control BIBBs according to ASHRAE 135.
5. Hardware, software, software licenses, and configuration tools for operator-to-gateway communications.
6. Backup programming and parameters on CD media and the ability to modify, download, backup, and restore gateway configuration.

2.11 DDC CONTROLLERS

A. DDC system shall consist of a combination of network controllers, programmable application controllers and application-specific controllers to satisfy performance requirements indicated.

B. DDC controllers shall perform monitoring, control, energy optimization and other requirements indicated.

C. DDC controllers shall use a multitasking, multiuser, real-time digital control microprocessor with a distributed network database and intelligence.

D. Each DDC controller shall be capable of full and complete operation as a completely independent unit and as a part of a DDC system wide distributed network.

E. Power and Noise Immunity:

1. Controller shall operate at 90 to 110 percent of nominal voltage rating and shall perform an orderly shutdown below 80 percent of nominal voltage.
2. Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios with up to 5 W of power located within36 inches (900 mm) of enclosure.

3. Memory shall support DDC controller's operating system and database and shall include the following:

    a. Monitoring and control.
    b. Energy management, operation and optimization applications.
    c. Alarm management.
    d. Historical trend data of all connected I/O points.
    e. Maintenance applications.
    f. Operator interfaces.
    g. Monitoring of manual overrides.

F. Maintenance and Support: Include the following features to facilitate maintenance and support:

1. Mount microprocessor components on circuit cards for ease of removal and replacement.
2. Means to quickly and easily disconnect controller from network.
3. Means to quickly and easily access connect to field test equipment.
4. Visual indication that controller electric power is on, of communication fault or trouble, and that controller is receiving and sending signals to network.

G. General Requirements for CEA-709.1-C DDC Controllers:

1. Controllers shall be LonMark certified.
2. Distinguishable and accessible switch, button, or pin, when pressed shall broadcast its 48-bit Node ID and Program ID over network.
3. TP/FT-10 transceiver according to CEA-709.3 and connections for TP/FT-10 control network wiring.
4. TP/XF-1250 transceiver according to CEA-709.3 and connections for TP/XF-1250 control network wiring.
5. Communicate using CEA-709.1-C protocol.
6. Controllers configured into subnets, as required, to comply with performance requirements indicated.
7. Network communication through LNS network management and database standard for CEA-709.1-C network devices.
8. Locally powered, not powered through network connection.
9. Functionality required to support applications indicated, including, but not limited to, the following:

    a. Input and outputs indicated and as required to support sequence of operation and application in which it is used. SNVTs shall have meaningful names identifying the value represented by an SNVT. Unless an SNVT of an appropriate engineering type is unavailable, all network variables shall be of an SNVT with engineering units appropriate to value the variable represents.
    b. Configurable through SCPTs defined in LonMark SCPT List, operator-defined UCPTs, network configuration inputs (NCIs) of an SNVT type defined in LonMark SNVT List, NCIs of an operator-defined network variable type, or hardware settings on controller itself for all settings and parameters used by application in which it is used.

10. Programmable controllers shall conform to LonMark Interoperability Guidelines and have LonMark certification.

H. Input and Output Point Interface:

1. Hardwired input and output points shall connect to network, programmable application and application-specific controllers.
2. Input and output points shall be protected so shorting of point to itself, to another point, or to ground will not damage controller.
3. Input and output points shall be protected from voltage up to 24 V of any duration so that contact will not damage controller.
4. AIs:

    a. AIs shall include monitoring of low-voltage (zero- to 10-V dc), current (4 to 20 mA) and resistance signals from thermistor and RTD sensors.
    b. AIs shall be compatible with, and field configurable to, sensor and transmitters installed.
    c. Controller AIs shall perform analog-to-digital (A-to-D) conversion with a minimum resolution of [**8**] [**12**] <**Insert value**> bits or better to comply with accuracy requirements indicated.
    d. Signal conditioning including transient rejection shall be provided for each AI.

e. Capable of being individually calibrated for zero and span.
f. Incorporate common-mode noise rejection of at least 50 dB from zero to 100 Hz for differential inputs, and normal-mode noise rejection of at least 20 dB at 60 Hz from a source impedance of 10000 ohms.

5. AOs:

a. Controller AOs shall perform analog-to-digital (A-to-D) conversion with a minimum resolution of [**8**] [**12**] <**Insert value**> bits or better to comply with accuracy requirements indicated.
b. Output signals shall have a range of [**4 to 20 mA dc**] [**or**] [**zero- to 10-V dc**] as required to include proper control of output device.
c. Capable of being individually calibrated for zero and span.
d. AOs shall not exhibit a drift of greater than 0.4 percent of range per year.

6. BIs:

a. Controller BIs shall accept contact closures and shall ignore transients of less than 5-ms duration.
b. Isolation and protection against an applied steady-state voltage of up to 180-V ac peak.
c. BIs shall include a wetting current of at least 12 mA to be compatible with commonly available control devices and shall be protected against effects of contact bounce and noise.
d. BIs shall sense "dry contact" closure without external power (other than that provided by the controller) being applied.
e. Pulse accumulation input points shall comply with all requirements of BIs and accept up to 10 pulses per second for pulse accumulation. Buffer shall be provided to totalize pulses. Pulse accumulator shall accept rates of at least 20 pulses per second. The totalized value shall be reset to zero on operator's command.

7. BOs:

a. Controller BOs shall include relay contact closures or triac outputs for momentary and maintained operation of output devices.

1) Relay contact closures shall have a minimum duration of 0.1 second. Relays shall include at least 180 V of isolation. Electromagnetic interference suppression shall be provided on all output lines to limit transients to non-damaging levels. Minimum contact rating shall be 1 A at 24-V ac.
2) Triac outputs shall include at least 180 V of isolation. Minimum contact rating shall be 1 A at 24-V ac.

b. BOs shall include for two-state operation or a pulsed low-voltage signal for pulse-width modulation control.
c. BOs shall be selectable for either normally open or normally closed operation.
d. Include tristate outputs (two coordinated BOs) for control of three-point floating-type electronic actuators without feedback.

e. Limit use of three-point floating devices to VAV terminal unit control applications, [**and other applications indicated on Drawings,**] <**Insert applications**>. Control algorithms shall operate actuator to one end of its stroke once every [**12**] [**24**] <**Insert time**> hours for verification of operator tracking.

2.12 NETWORK CONTROLLERS

A. General Network Controller Requirements:

1. Include adequate number of controllers to achieve performance indicated.
2. System shall consist of one or more independent, standalone, microprocessor-based network controllers to manage global strategies indicated.
3. Controller shall have enough memory to support its operating system, database, and programming requirements.
4. Data shall be shared between networked controllers and other network devices.
5. Operating system of controller shall manage input and output communication signals to allow distributed controllers to share real and virtual object information and allow for central monitoring and alarms.
6. Controllers [**that perform scheduling**]shall have a real-time clock.
7. Controller shall continually check status of its processor and memory circuits. If an abnormal operation is detected, controller shall assume a predetermined failure mode and generate an alarm notification.
8. Controllers shall be fully programmable.

B. Communication:

1. Network controllers shall communicate with other devices on DDC system [**Level one**] <**Insert level**> network.
2. Network controller also shall perform routing if connected to a network of programmable application and application-specific controllers.

C. Operator Interface:

1. Controller shall be equipped with a service communications port for connection to a portable operator's workstation[**or mobile device**].
2. Local Keypad and Display:

    a. Equip controller with local keypad and digital display for interrogating and editing data.
    b. Use of keypad and display shall require security password.

D. Serviceability:

1. Controller shall be equipped with diagnostic LEDs or other form of local visual indication of power, communication, and processor.
2. Wiring and cable connections shall be made to field-removable, modular terminal strips or to a termination card connected by a ribbon cable.
3. Controller shall maintain BIOS and programming information in event of a power loss for at least [**72**] [**96**] <**Insert number**> hours.

2.13 PROGRAMMABLE APPLICATION CONTROLLERS

A. General Programmable Application Controller Requirements:

1. Include adequate number of controllers to achieve performance indicated.
2. Controller shall have enough memory to support its operating system, database, and programming requirements.
3. Data shall be shared between networked controllers and other network devices.
4. Operating system of controller shall manage input and output communication signals to allow distributed controllers to share real and virtual object information and allow for central monitoring and alarms.
5. Controller shall continually check status of its processor and memory circuits. If an abnormal operation is detected, controller shall assume a predetermined failure mode and generate an alarm notification.
6. Controllers shall be fully programmable.

B. Communication:

1. Programmable application controllers shall communicate with other devices on network.

C. Operator Interface:

1. Controller shall be equipped with a service communications port for connection to a portable operator's workstation **or mobile device**.
2. Local Keypad and Display:

    a. Equip controller with local keypad and digital display for interrogating and editing data.
    b. Use of keypad and display shall require security password.

D. Serviceability:

1. Controller shall be equipped with diagnostic LEDs or other form of local visual indication of power, communication, and processor.
2. Wiring and cable connections shall be made to field-removable, modular terminal strips or to a termination card connected by a ribbon cable.
3. Controller shall maintain BIOS and programming information in event of a power loss for at least 72 hours.

2.14 APPLICATION-SPECIFIC CONTROLLERS

A. Description: Microprocessor-based controllers, which through hardware or firmware design are dedicated to control a specific piece of equipment. Controllers are not fully user-programmable but are configurable and customizable for operation of equipment they are designed to control.

1. Capable of standalone operation and shall continue to include control functions without being connected to network.
2. Data shall be shared between networked controllers and other network devices.

B. Communication: Application-specific controllers shall communicate with other application-specific controller and devices on network, and to programmable application and network controllers.

C. Serviceability:

1. Controller shall be equipped with diagnostic LEDs or other form of local visual indication of power, communication, and processor.
2. Wiring and cable connections shall be made to field-removable, modular terminal strips or to a termination card connected by a ribbon cable.
3. Controller shall use nonvolatile memory and maintain all BIOS and programming information in event of power loss.

2.15 CONTROLLER SOFTWARE

A. General Controller Software Requirements:

1. Software applications shall reside and operate in controllers. Editing of applications shall occur at operator workstations.
2. I/O points shall be identified by up to [**30**] <**Insert number**>-character point name and up to [**16**] <**Insert number**>-character point descriptor. Same names shall be used at operator workstations.
3. Control functions shall be executed within controllers using DDC algorithms.
4. Controllers shall be configured to use stored default values to ensure fail-safe operation. Default values shall be used when there is a failure of a connected input instrument or loss of communication of a global point value.

B. Security:

1. Operator access shall be secured using individual security passwords and user names.
2. Passwords shall restrict operator to points, applications, and system functions as assigned by system manager.
3. Operator log-on and log-off attempts shall be recorded.
4. System shall protect itself from unauthorized use by automatically logging off after last keystroke. The delay time shall be operator-definable.

C. Scheduling: Include capability to schedule each point or group of points in system. Each schedule shall consist of the following:

1. Weekly Schedule:

a. Include separate schedules for each day of week.
b. Each schedule should include the capability for start, stop, optimal start, optimal stop, and night economizer.
c. Each schedule may consist of up to 10 events.
d. When a group of objects are scheduled together, include capability to adjust start and stop times for each member.

2. Exception Schedules:

a. Include ability for operator to designate any day of the year as an exception schedule.
b. Exception schedules may be defined up to a year in advance. Once an exception schedule is executed, it will be discarded and replaced by regular schedule for that day of week.

3. Holiday Schedules:

a. Include capability for operator to define up to 99 special or holiday schedules.
b. Schedules may be placed on scheduling calendar and will be repeated each year.
c. Operator shall be able to define length of each holiday period.

D. System Coordination:

1. Include standard application for proper coordination of equipment.
2. Application shall include operator with a method of grouping together equipment based on function and location.
3. Group may then be used for scheduling and other applications.

E. Binary Alarms:

1. Each binary point shall be set to alarm based on operator-specified state.
2. Include capability to automatically and manually disable alarming.

F. Analog Alarms:

1. Each analog object shall have both high and low alarm limits.
2. Alarming shall be able to be automatically and manually disabled.

G. Alarm Reporting:

1. Operator shall be able to determine action to be taken in event of an alarm.
2. Alarms shall be routed to appropriate operator workstations based on time and other conditions.
3. Alarm shall be able to start programs, print, be logged in event log, generate custom messages, and display graphics.

H. Remote Communication:

1. System shall have ability to dial out in the event of an alarm.

I. Electric Power Demand Limiting:

1. Demand-limiting program shall monitor building or other operator-defined electric power consumption from signals connected to electric power meter or from a watt transducer or current transformer.
2. Demand-limiting program shall predict probable power demand such that action can be taken to prevent exceeding demand limit. When demand prediction exceeds demand limit, action will be taken to reduce loads in a predetermined

manner. When demand prediction indicates demand limit will not be exceeded, action will be taken to restore loads in a predetermined manner.

3. Demand reduction shall be accomplished by the following means:

    a. Reset air-handling unit supply temperature set points.
    b. Reset space temperature set points.
    c. De-energize equipment based on priority.

4. Demand-limiting parameters, frequency of calculations, time intervals, and other relevant variables shall be based on the means by which electric power service provider computes demand charges.
5. Include demand-limiting prediction and control for any individual meter monitored by system or for total of any combination of meters.
6. Include means operator to make the following changes online:

    a. Addition and deletion of loads controlled.
    b. Changes in demand intervals.
    c. Changes in demand limit for meter(s).
    d. Maximum shutoff time for equipment.
    e. Minimum shutoff time for equipment.
    f. Select rotational or sequential shedding and restoring.
    g. Shed and restore priority.

7. Include the following information and reports, to be available on an hourly, daily, weekly, monthly and annual basis:

    a. Total electric consumption.
    b. Peak demand.
    c. Date and time of peak demand.
    d. Daily peak demand.

J. Maintenance Management: System shall monitor equipment status and generate maintenance messages based on operator-designated run-time, starts, and calendar date limits.

K. Sequencing: Include application software based on sequences of operation indicated to properly sequence chillers, boilers, and other applicable HVAC equipment.

L. Control Loops:

1. Support any of the following control loops, as applicable to control required:

    a. Two-position (on/off, open/close, slow/fast) control.
    b. Proportional control.
    c. Proportional plus integral (PI) control.
    d. Proportional plus integral plus derivative (PID) control.

        1) Include PID algorithms with direct or reverse action and anti-windup.
        2) Algorithm shall calculate a time-varying analog value used to position an output or stage a series of outputs.

3) Controlled variable, set point, and PID gains shall be operator-selectable.

e. Adaptive (automatic tuning).

M. Staggered Start: Application shall prevent all controlled equipment from simultaneously restarting after a power outage. Order which equipment (or groups of equipment) is started, along with the time delay between starts, shall be operator-selectable.

N. Energy Calculations:

1. Include software to allow instantaneous power or flow rates to be accumulated and converted to energy usage data.
2. Include an algorithm that calculates a sliding-window average (rolling average). Algorithm shall be flexible to allow window intervals to be operator specified (such as 15, 30, or 60 minutes).
3. Include an algorithm that calculates a fixed-window average. A digital input signal shall define start of window period (such as signal from utility meter) to synchronize fixed-window average with that used by utility.

O. Anti-Short Cycling:

1. BO points shall be protected from short cycling.
2. Feature shall allow minimum on-time and off-time to be selected.

P. On and Off Control with Differential:

1. Include an algorithm that allows a BO to be cycled based on a controlled variable and set point.
2. Algorithm shall be direct- or reverse-acting and incorporate an adjustable differential.

Q. Run-Time Totalization:

1. Include software to totalize run-times for all BI [**and BO**]points.
2. A high run-time alarm shall be assigned, if required, by operator.

2.16 ENCLOSURES

A. General Enclosure Requirements:

1. House each controller and associated control accessories in a single enclosure. Enclosure shall serve as central tie-in point for control devices such as switches, transmitters, transducers, power supplies and transformers.
2. Do not house more than one controller in a single enclosure.
3. Include enclosure door with key locking mechanism. Key locks alike for all enclosures and include one pair of keys per enclosure.
4. Equip doors of enclosures housing controllers and components with analog or digital displays with windows to allow visual observation of displays without opening enclosure door.

2.17 ELECTRICAL POWER DEVICES

A. Transformers:

1. Transformer shall be sized for the total connected load, plus an additional 25 percent of connected load.
2. Transformer shall have both primary and secondary fuses.

B. Power-Line Conditioner:

1. General Power-Line Conditioner Requirements:

   a. Design to ensure maximum reliability, serviceability and performance.
   b. Overall function of the power-line conditioner is to receive raw, polluted electrical power and purify it for use by electronic equipment. The power-line conditioner shall provide isolated, regulated, transient and noise-free sinusoidal power to loads served.

2. Standards: NRTL listed per UL 1012.
3. Performance:

   a. Single phase, continuous, 100 percent duty rated KVA/KW capacity. Design to supply power for linear or nonlinear, high crest factor, resistive and reactive loads.
   b. Automatically regulate output voltage to within 2 percent or better with input voltage fluctuations of plus 10 to minus 20 percent of nominal when system is loaded 100 percent. Use Variable Range Regulation to obtain improved line voltage regulation when operating under less than full load conditions.

      1) At 75 Percent Load: Output voltage automatically regulated to within 3 percent with input voltage fluctuations of plus 10 to minus 35 percent of nominal.
      2) At 50 Percent Load: Output voltage automatically regulated to within 3 percent with input voltage fluctuations of plus 10 to minus 40 percent of nominal.
      3) At 25 Percent Load: Output voltage automatically regulated to within 3 percent with input voltage fluctuations of plus 10 to minus 45 percent of nominal.

   c. With input voltage distortion of up to 40 percent, limit the output voltage sine wave to a maximum harmonic content of 5 percent.
   d. Automatically regulate output voltage to within 2.5 percent when load (resistive) changes from zero percent to 100 percent to zero percent.
   e. Output voltage returns to 95 percent of nominal level within two cycles and to 100 percent within three cycles when the output is taken from no load to full resistive load or vice-versa. Recovery from partial resistive load changes is corrected in a shorter period of time.
   f. K Factor: 30, designed to operate with nonlinear, non-sinusoidal, high crest factor loads without overheating.
   g. Input power factor within 0.95 approaching unity with load power factor as poor as 0.6.
   h. Attenuate load-generated odd current harmonics 23 dB at the input.

i. Electrically isolate the primary from the secondary. Meet isolation criteria as defined in NFPA 70, Article 250-5D.
j. Lighting and Surge Protection: Compares to UL 1449 rating of 330 V when subjected to Category B3 (6000 V/3000 A) combination waveform as established by IEEE C62.41.
k. Common-mode noise attenuation of 140 dB.
l. Transverse-mode noise attenuation of 120 dB.
m. With loss of input power for up to 16.6 ms, the output sine wave remains at usable ac voltage levels.
n. Reliability of 200,000 hours' MTBF.
o. At full load, when measured at 1-m distance, audible noise is not to exceed 54 dB.
p. Approximately 92 percent efficient at full load.

4. Transformer Construction:

a. Ferroresonant, dry type, convection cooled, 600V class. Transformer windings of Class H (220 deg C) insulated copper.
b. Use a Class H installation system throughout with operating temperatures not to exceed 150 deg C over a 40-deg C ambient temperature.
c. Configure transformer primary for multi-input voltage. Include input terminals for source conductors and ground.
d. Manufacture transformer core using M-6 grade, grain-oriented, stress-relieved transformer steel.
e. Configure transformer secondary in a 240/120-V split with a 208-V tap or straight 120 V, depending on power output size.
f. Electrically isolate the transformer secondary windings from the primary windings. Bond neutral conductor to cabinet enclosure and output neutral terminal.
g. Include interface terminals for output power hot, neutral and ground conductors.
h. Label leads, wires and terminals to correspond with circuit wiring diagram.
i. Vacuum impregnate transformer with epoxy resin.

5. Cabinet Construction:

a. Design for panel or floor mounting.
b. NEMA 250, Type 1, general-purpose, indoor enclosure.
c. Manufacture the cabinet from heavy gauge steel complying with UL 50.
d. Include a textured baked-on paint finish.

C. Transient Voltage Suppression and High-Frequency Noise Filter Unit:
1. The maximum continuous operating voltage shall be at least 125 percent.
2. The operating frequency range shall be 47 to 63 Hz.
3. Protection modes according to NEMA LS-1.
4. The rated single-pulse surge current capacity, for each mode of protection, shall be no less than the following:

a. Line to Neutral: 45,000 A.
b. Neutral to Ground: 45,000 A.
c. Line to Ground: 45,000 A.

d. Per Phase: 90,000 A.

5. Clamping voltages shall be in compliance with test and evaluation procedures defined in NEMA LS-1. Maximum clamping voltage shall be as follows:

   a. Line to Neutral: 360 V.
   b. Line to Ground: 360 V.
   c. Neutral to Ground: 360 V.

6. Electromagnetic interference and RF interference noise rejection or attenuation values shall comply with test and evaluation procedures defined in NEMA LS-1.

   a. Line to Neutral:

      1) 100 kHz: 42 dB.
      2) 1 MHz: 25 dB.
      3) 10 MHz: 21 dB.
      4) 100 MHz: 36 dB.

   b. Line to Ground:

      1) 100 kHz: 16 dB.
      2) 1 MHz: 55 dB.
      3) 10 MHz: 81 dB.
      4) 100 MHz: 80 dB.

7. Unit shall have LED status indicator that extinguishes to indicate a failure.
8. Unit shall be listed by an NRTL as a transient voltage surge suppressor per UL 1449, and as an electromagnetic interference filter per UL 1283.
9. Unit shall not generate any appreciable magnetic field.
10. Unit shall not generate an audible noise.

D. DC Power Supply:
   1. Plug-in style suitable for mating with a standard eight-pin octal socket. Include the power supply with a mating mounting socket.
   2. Enclose circuitry in a housing.
   3. Include both line and load regulation to ensure a stable output. To protect both the power supply and the load, power supply shall have an automatic current limiting circuit.
   4. Performance:

      a. Output voltage nominally 25-V dc within 5 percent.
      b. Output current up to 100 mA.
      c. Input voltage nominally 120-V ac, 60 Hz.
      d. Load regulation within 0.5 percent from zero- to 100-mA load.
      e. Line regulation within 0.5 percent at a 100-mA load for a 10 percent line change.
      f. Stability within 0.1 percent of rated volts for 24 hours after a 20-minute warmup.

2.18 RACEWAYS

A. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems" for electrical power raceways and boxes.

B. Comply with requirements in Section 270528 "Pathways for Communications Systems" for raceways for balanced twisted pair cables and optical fiber cables.

2.19 OPTICAL FIBER CABLE AND CONNECTORS

A. Comply with requirements in Section 271323 "Communications Optical Fiber Backbone Cabling" for optical fiber backbone cabling and connectors.

B. Comply with requirements in Section 271523 "Communications Optical Fiber Horizontal Cabling" for optical fiber horizontal cabling and connectors.

C. Raceway and Boxes:

1. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
2. Paint cover plates on junction boxes and conduit same color as the tape banding for conduits. After painting, label cover plate "HVAC Controls," using an engraved phenolic tag.
3. For raceways housing pneumatic tubing, add a phenolic tag labeled "HVAC Instrument Air Tubing."
4. For raceways housing air signal tubing, add a phenolic tag labeled "HVAC Air Signal Tubing."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Verify compatibility with and suitability of substrates.

B. Examine roughing-in for products to verify actual locations of connections before installation.

1. Examine roughing-in for instruments installed in piping to verify actual locations of connections before installation.
2. Examine roughing-in for instruments installed in duct systems to verify actual locations of connections before installation.

C. Examine walls, floors, roofs, and ceilings for suitable conditions where product will be installed.

D. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 DDC SYSTEM INTERFACE WITH EXISTING SYSTEMS

A. Interface with Existing Systems:

1. DDC systems shall interface existing systems to achieve integration.
2. Monitoring and Control of DDC System by Existing Control System:

    a. DDC system performance requirements shall be satisfied when monitoring and controlling DDC system by existing control system.
    b. Operator of existing system shall be able to upload, download, monitor, trend, control and program every input and output point in DDC system from existing control system using existing control system software and operator workstations.
    c. Remote monitoring and control from existing control system shall not require operators of existing control system to learn new software.

3. Integration of Existing Control System into DDC System:

    a. Existing control system performance requirements shall be satisfied when monitoring and controlling existing control system through DDC system.
    b. Operator shall be able to upload, download, monitor, alarm, report, trend, control and program every input and output point in existing system from DDC system using operator workstations and software provided. The combined systems shall share one database.
    c. Interface of existing control system I/O points into DDC system shall be transparent to operators. All operational capabilities shall be identical regardless of whether I/O already exists or I/O is being installed.

B. Integration with Existing Enterprise System:

1. DDC system shall interface with an existing enterprise system to adhere to Owner standards already in-place and to achieve integration.
2. Owner's control system integrator will provide the following services:

    a. Enterprise system expansion and development of graphics, logs, reports, trends and other operational capabilities of enterprise system for I/O being added to DDC control system for use by enterprise system operators.
    b. Limited assistance during commissioning to extent of DDC system integration with existing enterprise system.
    c. Prepare on-site demonstration mockup of integration of DDC system to be installed with existing system before installing DDC system.

3. Engage Owner's control system integrator to provide the following services:

a. Enterprise system expansion and development of graphics, logs, reports, trends and other operational capabilities of enterprise system for I/O being added to DDC control system for use by enterprise system operators.
b. Limited assistance during commissioning to extent of DDC system integration with existing enterprise system.
c. Prepare on-site demonstration mockup of integration of DDC system to be installed with existing system before installing DDC system.

4. Attend meetings with control system integrator to integrate DDC system.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install products to satisfy more stringent of all requirements indicated.

B. Install products level, plumb, parallel, and perpendicular with building construction.

C. If codes and referenced standards are more stringent than requirements indicated, comply with requirements in codes and referenced standards.

D. Fabricate openings and install sleeves in ceilings, floors, roof, and walls required by installation of products. Before proceeding with drilling, punching, and cutting, check for concealed work to avoid damage. Patch, flash, grout, seal, and refinish openings to match adjacent condition.

E. Firestop Penetrations Made in Fire-Rated Assemblies: Comply with requirements in Section 078413 "Penetration Firestopping."

F. Seal penetrations made in acoustically rated assemblies. Comply with requirements in Section 079200 "Joint Sealants."

G. Welding Requirements:

1. Restrict welding and burning to supports and bracing.
2. No equipment shall be cut or welded without approval. Welding or cutting will not be approved if there is risk of damage to adjacent Work.
3. Welding, where approved, shall be by inert-gas electric arc process and shall be performed by qualified welders according to applicable welding codes.
4. If requested on-site, show satisfactory evidence of welder certificates indicating ability to perform welding work intended.

H. Fastening Hardware:

1. Stillson wrenches, pliers, and other tools that damage surfaces of rods, nuts, and other parts are prohibited for work of assembling and tightening fasteners.
2. Tighten bolts and nuts firmly and uniformly. Do not overstress threads by excessive force or by oversized wrenches.
3. Lubricate threads of bolts, nuts and screws with graphite and oil before assembly.

I. If product locations are not indicated, install products in locations that are accessible and that will permit service and maintenance from floor, equipment platforms, or catwalks without removal of permanently installed furniture and equipment.

J. Corrosive Environments:

1. Avoid or limit use of materials in corrosive airstreams and environments, including, but not limited to, the following:

   a. Laboratory exhaust-air streams.
   b. Process exhaust-air streams.

2. When conduit is in contact with a corrosive airstream and environment, use Type 316 stainless-steel conduit and fittings or conduit and fittings that are coated with a corrosive-resistant coating that is suitable for environment. Comply with requirements for installation of raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."
3. Where instruments are located in a corrosive airstream and are not corrosive resistant from manufacturer, field install products in NEMA 250, Type 4X enclosure constructed of Type 316L stainless steel.

3.4 CONTROLLER INSTALLATION

A. Install controllers in enclosures to comply with indicated requirements.

B. Connect controllers to field power supply

C. Install controller with latest version of applicable software and configure to execute requirements indicated.

D. Test and adjust controllers to verify operation of connected I/O to achieve performance indicated requirements while executing sequences of operation.

E. Installation of Network Controllers:

1. Quantity and location of network controllers shall be determined by DDC system manufacturer to satisfy requirements indicated.
2. Install controllers in a protected location that is easily accessible by operators.

F. Installation of Programmable Application Controllers:

1. Quantity and location of programmable application controllers shall be determined by DDC system manufacturer to satisfy requirements indicated.
2. Install controllers in a protected location that is easily accessible by operators.

G. Application-Specific Controllers:

1. Quantity and location of application-specific controllers shall be determined by DDC system manufacturer to satisfy requirements indicated.
2. For controllers not mounted directly on equipment being controlled, install controllers in a protected location that is easily accessible by operators.

3.5 INSTALLATION OF WIRELESS ROUTERS FOR OPERATOR INTERFACE

A. Install wireless routers to achieve optimum performance and best possible coverage.

B. Mount wireless routers in a protected location that is within 60 inches of floor and easily accessible by operators.

C. Connect wireless routers to field power supply and to UPS units if network controllers are powered through UPS units.

D. Install wireless router with latest version of applicable software and configure wireless router with WPA2 security and password protection. Create access password with not less than 12 characters consisting of letters and numbers and at least one special character. Document password in operations and maintenance manuals for reference by operators.

E. Test and adjust wireless routers for proper operation with portable workstation and other wireless devices intended for use by operators.

3.6 ENCLOSURES INSTALLATION

A. Install the following items in enclosures, to comply with indicated requirements:

1. Gateways.
2. Routers.
3. Controllers.
4. Electrical power devices.
5. UPS units.
6. Relays.
7. Accessories.
8. Instruments.
9. Actuators

3.7 ELECTRIC POWER CONNECTIONS

A. Connect electrical power to DDC system products requiring electrical power connections.

B. Design of electrical power to products not indicated with electric power is delegated to DDC system provider and installing trade. Work shall comply with NFPA 70 and other requirements indicated.

C. Comply with requirements in Section 262816 "Enclosed Switches and Circuit Breakers" for electrical power circuit breakers.

D. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for electrical power conductors and cables.

E. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems" for electrical power raceways and boxes.

3.8 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements in Section 260553 "Identification for Electrical Systems" for identification products and installation.

B. Install self-adhesive labels with unique identification on face for each of the following:

1. Operator workstation.
2. Server.
3. Printer.
4. Gateway.
5. Router.
6. Protocol analyzer.
7. DDC controller.
8. Enclosure.
9. Electrical power device.
10. UPS unit.
11. Accessory.

C. Install unique instrument identification on face of each instrument connected to a DDC controller.

D. Install unique identification on face of each control [**damper**] [**and**] [**valve**] actuator connected to a DDC controller.

E. Where product is installed above accessible tile ceiling, also install matching identification on face of ceiling grid located directly below.

F. Where product is installed above an inaccessible ceiling, also install identification on face of access door directly below.

G. Warning Labels and Signs:

1. Shall be permanently attached to equipment that can be automatically started by DDC control system.
2. Shall be located in highly visible location near power service entry points.

3.9 CONTROL WIRE, CABLE AND RACEWAYS INSTALLATION

A. Comply with NECA 1.

B. Wire and Cable Installation:

1. Comply with installation requirements in Section 260523 "Control-Voltage Electrical Power Cables."
2. Comply with installation requirements in Section 271313 "Communications Copper Backbone Cabling."
3. Comply with installation requirements in Section 271513 "Communications Copper Horizontal Cabling."

4. Install cables with protective sheathing that is waterproof and capable of withstanding continuous temperatures of 90 deg C with no measurable effect on physical and electrical properties of cable.

    a. Provide shielding to prevent interference and distortion from adjacent cables and equipment.

5. Terminate wiring in a junction box.

    a. Clamp cable over jacket in junction box.
    b. Individual conductors in the stripped section of the cable shall be slack between the clamping point and terminal block.

6. Terminate field wiring and cable not directly connected to instruments and control devices having integral wiring terminals using terminal blocks.
7. Install signal transmission components according to IEEE C2, REA Form 511a, NFPA 70, and as indicated.
8. Use shielded cable to transmitters.
9. Use shielded cable to temperature sensors.
10. Perform continuity and meager testing on wire and cable after installation.

C. Conduit Installation:

1. Comply with Section "260533 "Raceways and Boxes for Electrical Systems" for control-voltage conductors.
2. Comply with Section 270528 "Pathways for Communications Systems" for balanced twisted pair cabling and optical fiber installation.

3.10 DDC SYSTEM I/O CHECKOUT PROCEDURES

A. Check installed products before continuity tests, leak tests and calibration.

B. Check instruments for proper location and accessibility.

C. Check instruments for proper installation on direction of flow, elevation, orientation, insertion depth, or other applicable considerations that will impact performance.

D. Check instrument tubing for proper isolation, fittings, slope, dirt legs, drains, material and support.

E. For pneumatic products, verify that air supply for each product is properly installed.

F. Control Damper Checkout:

1. For pneumatic dampers, verify that pressure gages are provided in each air line to damper actuator and positioner.
2. Verify that control dampers are installed correctly for flow direction.
3. Verify that proper blade alignment, either parallel or opposed, has been provided.
4. Verify that damper frame attachment is properly secured and sealed.
5. Verify that damper actuator and linkage attachment is secure.

6. Verify that actuator wiring is complete, enclosed and connected to correct power source.
7. Verify that damper blade travel is unobstructed.

G. Control Valve Checkout:

1. For pneumatic valves, verify that pressure gages are provided in each air line to valve actuator and positioner.
2. Verify that control valves are installed correctly for flow direction.
3. Verify that valve body attachment is properly secured and sealed.
4. Verify that valve actuator and linkage attachment is secure.
5. Verify that actuator wiring is complete, enclosed and connected to correct power source.
6. Verify that valve ball, disc or plug travel is unobstructed.
7. After piping systems have been tested and put into service, but before insulating and balancing, inspect each valve for leaks. Adjust or replace packing to stop leaks. Replace the valve if leaks persist.

H. Instrument Checkout:

1. Verify that instrument is correctly installed for location, orientation, direction and operating clearances.
2. Verify that attachment is properly secured and sealed.
3. Verify that conduit connections are properly secured and sealed.
4. Verify that wiring is properly labeled with unique identification, correct type and size and is securely attached to proper terminals.
5. Inspect instrument tag against approved submittal.
6. For instruments with tubing connections, verify that tubing attachment is secure and isolation valves have been provided.
7. For flow instruments, verify that recommended upstream and downstream distances have been maintained.
8. For temperature instruments:

a. Verify sensing element type and proper material.
b. Verify length and insertion.

3.11 DDC SYSTEM I/O ADJUSTMENT, CALIBRATION AND TESTING:

A. Calibrate each instrument installed that is not factory calibrated and provided with calibration documentation.

B. Provide a written description of proposed field procedures and equipment for calibrating each type of instrument. Submit procedures before calibration and adjustment.

C. For each analog instrument, make a three-point test of calibration for both linearity and accuracy.

D. Equipment and procedures used for calibration shall comply with instrument manufacturer's written instructions.

E. Provide diagnostic and test equipment for calibration and adjustment.

F. Field instruments and equipment used to test and calibrate installed instruments shall have accuracy at least twice the instrument accuracy being calibrated. An installed instrument with an accuracy of 1 percent shall be checked by an instrument with an accuracy of 0.5 percent.

G. Calibrate each instrument according to instrument instruction manual supplied by manufacturer.

H. If after calibration indicated performance cannot be achieved, replace out-of-tolerance instruments.

I. Comply with field testing requirements and procedures indicated by ASHRAE's Guideline 11, "Field Testing of HVAC Control Components," in the absence of specific requirements, and to supplement requirements indicated.

J. Analog Signals:

1. Check analog voltage signals using a precision voltage meter at zero, 50, and 100 percent.
2. Check analog current signals using a precision current meter at zero, 50, and 100 percent.
3. Check resistance signals for temperature sensors at zero, 50, and 100 percent of operating span using a precision-resistant source.

K. Digital Signals:

1. Check digital signals using a jumper wire.
2. Check digital signals using an ohmmeter to test for contact making or breaking.

L. Meters: Check sensors at zero, 50, and 100 percent of Project design values.

M. Sensors: Check sensors at zero, 50, and 100 percent of Project design values.

N. Switches: Calibrate switches to make or break contact at set points indicated.

O. Transmitters:

1. Check and calibrate transmitters at zero, 50, and 100 percent of Project design values.
2. Calibrate resistance temperature transmitters at zero, 50, and 100 percent of span using a precision-resistant source.

3.12 DDC SYSTEM CONTROLLER CHECKOUT

A. Verify power supply.

1. Verify voltage, phase and hertz.
2. Verify that protection from power surges is installed and functioning.
3. Verify that ground fault protection is installed.

4. If applicable, verify if connected to UPS unit.
5. If applicable, verify if connected to a backup power source.
6. If applicable, verify that power conditioning units, transient voltage suppression and high-frequency noise filter units are installed.

B. Verify that wire and cabling is properly secured to terminals and labeled with unique identification.

C. Verify that spare I/O capacity is provided.

3.13 DDC CONTROLLER I/O CONTROL LOOP TESTS

A. Testing:

1. Test every I/O point connected to DDC controller to verify that safety and operating control set points are as indicated and as required to operate controlled system safely and at optimum performance.
2. Test every I/O point throughout its full operating range.
3. Test every control loop to verify operation is stable and accurate.
4. Adjust control loop proportional, integral and derivative settings to achieve optimum performance while complying with performance requirements indicated. Document testing of each control loop's precision and stability via trend logs.
5. Test and adjust every control loop for proper operation according to sequence of operation.
6. Test software and hardware interlocks for proper operation. Correct deficiencies.
7. Operate each analog point at the following:

    a. Upper quarter of range.
    b. Lower quarter of range.
    c. At midpoint of range.

8. Exercise each binary point.
9. For every I/O point in DDC system, read and record each value at operator workstation, at DDC controller and at field instrument simultaneously. Value displayed at operator workstation, at DDC controller and at field instrument shall match.
10. Prepare and submit a report documenting results for each I/O point in DDC system and include in each I/O point a description of corrective measures and adjustments made to achieve desire results.

3.14 DDC SYSTEM VALIDATION TESTS

A. Perform validation tests before requesting final review of system. Before beginning testing, first submit Pretest Checklist and Test Plan.

B. After approval of Test Plan, execute all tests and procedures indicated in plan.

C. After testing is complete, submit completed test checklist.

D. Pretest Checklist: Submit the following list with items checked off once verified:

1. Detailed explanation for any items that are not completed or verified.
2. Required mechanical installation work is successfully completed and HVAC equipment is working correctly.
3. HVAC equipment motors operate below full-load amperage ratings.
4. Required DDC system components, wiring, and accessories are installed.
5. Installed DDC system architecture matches approved Drawings.
6. Control electric power circuits operate at proper voltage and are free from faults.
7. Required surge protection is installed.
8. DDC system network communications function properly, including uploading and downloading programming changes.
9. Using BACnet protocol analyzer, verify that communications are error free.
10. Each controller's programming is backed up.
11. Equipment, products, tubing, wiring cable and conduits are properly labeled.
12. All I/O points are programmed into controllers.
13. Testing, adjusting and balancing work affecting controls is complete.
14. Dampers and actuators zero and span adjustments are set properly.
15. Each control damper and actuator goes to failed position on loss of power.
16. Valves and actuators zero and span adjustments are set properly.
17. Each control valve and actuator goes to failed position on loss of power.
18. Meter, sensor and transmitter readings are accurate and calibrated.
19. Control loops are tuned for smooth and stable operation.
20. View trend data where applicable.
21. Each controller works properly in standalone mode.
22. Safety controls and devices function properly.
23. Interfaces with fire-alarm system function properly.
24. Electrical interlocks function properly.
25. Operator workstations and other interfaces are delivered, all system and database software is installed, and graphic are created.
26. Record Drawings are completed.

E. Validation Test:

1. Verify operating performance of each I/O point in DDC system.
    a. Verify analog I/O points at operating value.
    b. Make adjustments to out-of-tolerance I/O points.
        1) Identify I/O points for future reference.
        2) Simulate abnormal conditions to demonstrate proper function of safety devices.
        3) Replace instruments and controllers that cannot maintain performance indicated after adjustments.
2. Simulate conditions to demonstrate proper sequence of control.
3. Readjust settings to design values and observe ability of DDC system to establish desired conditions.
4. After 24 Hours following Initial Validation Test:
    a. Re-check I/O points that required corrections during initial test.

b. Identify I/O points that still require additional correction and make corrections necessary to achieve desired results.

5. After 24 Hours of Second Validation Test:

a. Re-check I/O points that required corrections during second test.
b. Continue validation testing until I/O point is normal on two consecutive tests.

6. Completely check out, calibrate, and test all connected hardware and software to ensure that DDC system performs according to requirements indicated.
7. After validation testing is complete, prepare and submit a report indicating all I/O points that required correction and how many validation re-tests it took to pass. Identify adjustments made for each test and indicate instruments that were replaced.

3.15 DDC SYSTEM WIRELESS NETWORK VERIFICATION

A. DDC system Installer shall design wireless DDC system networks to comply with performance requirements indicated.

B. Installer shall verify wireless network performance through field testing and shall document results in a field test report.

C. Testing and verification of all wireless devices shall include, but not be limited to, the following:

1. Speed.
2. Online status.
3. Signal strength.

3.16 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.17 DEMONSTRATION

A. Engage a factory-authorized service representative with complete knowledge of Project-specific system installed to train Owner's maintenance personnel to adjust, operate, and maintain DDC system.

B. Extent of Training:

1. Base extent of training on scope and complexity of DDC system indicated and training requirements indicated. Provide extent of training required to satisfy requirements indicated even if more than minimum training requirements are indicated.

2. Inform Owner of anticipated training requirements if more than minimum training requirements are indicated.

C. Attendee Training Manuals:

1. Provide each attendee with a color hard copy of all training materials and visual presentations.
2. Hard-copy materials shall be organized in a three-ring binder with table of contents and individual divider tabs marked for each logical grouping of subject matter. Organize material to provide space for attendees to take handwritten notes within training manuals.
3. In addition to hard-copy materials included in training manual, provide each binder with a sleeve or pocket that includes a DVD or flash drive with PDF copy of all hard-copy materials.

D. Organization of Training Sessions:

1. Organize training sessions into logical groupings of technical content and to reflect different levels of operators having access to system. Plan training sessions to accommodate the following three levels of operators:

    a. Daily operators.
    b. Advanced operators.
    c. System managers and administrators.

2. Plan and organize training sessions to group training content to protect DDC system security. Some attendees may be restricted to some training sessions that cover restricted content for purposes of maintaining DDC system security.

E. On-Site Training:

1. Owner will provide conditioned classroom or workspace with ample desks or tables, chairs, power and data connectivity for instructor and each attendee.
2. Instructor shall provide training materials, projector and other audiovisual equipment used in training.
3. Provide as much of training located on-site as deemed feasible and practical by Owner.
4. On-site training shall include regular walk-through tours, as required, to observe each unique product type installed with hands-on review of operation, calibration and service requirements.
5. Operator workstation provided with DDC system shall be used in training. If operator workstation is not indicated, provide a temporary workstation to convey training content.

F. Training Content for Daily Operators:

1. Basic operation of system.
2. Understanding DDC system architecture and configuration.
3. Understanding each unique product type installed including performance and service requirements for each.

4. Understanding operation of each system and equipment controlled by DDC system including sequences of operation, each unique control algorithm and each unique optimization routine.
5. Operating operator workstations, printers and other peripherals.
6. Logging on and off system.
7. Accessing graphics, reports and alarms.
8. Adjusting and changing set points and time schedules.
9. Recognizing DDC system malfunctions.
10. Understanding content of operation and maintenance manuals including control drawings.
11. Understanding physical location and placement of DDC controllers and I/O hardware.
12. Accessing data from DDC controllers.
13. Operating portable operator workstations.
14. Review of DDC testing results to establish basic understanding of DDC system operating performance and HVAC system limitations as of Substantial Completion.
15. Running each specified report and log.
16. Displaying and demonstrating each data entry to show Project-specific customizing capability. Demonstrating parameter changes.
17. Stepping through graphics penetration tree, displaying all graphics, demonstrating dynamic updating, and direct access to graphics.
18. Executing digital and analog commands in graphic mode.
19. Demonstrating control loop precision and stability via trend logs of I/O for not less than 10 percent of I/O installed.
20. Demonstrating DDC system performance through trend logs and command tracing.
21. Demonstrating scan, update, and alarm responsiveness.
22. Demonstrating spreadsheet and curve plot software, and its integration with database.
23. Demonstrating on-line user guide, and help function and mail facility.
24. Demonstrating multitasking by showing dynamic curve plot, and graphic construction operating simultaneously via split screen.
25. Demonstrating the following for HVAC systems and equipment controlled by DDC system:

    a. Operation of HVAC equipment in normal-off, -on and failed conditions while observing individual equipment, dampers and valves for correct position under each condition.
    b. For HVAC equipment with factory-installed software, show that integration into DDC system is able to communicate with DDC controllers or gateways, as applicable.
    c. Using graphed trends, show that sequence of operation is executed in correct manner, and HVAC systems operate properly through complete sequence of operation including seasonal change, occupied and unoccupied modes, warm-up and cool-down cycles and other modes of operation indicated.
    d. Hardware interlocks and safeties function properly and DDC system performs correct sequence of operation after electrical power interruption and resumption after power is restored.
    e. Reporting of alarm conditions for each alarm, and confirm that alarms are received at assigned locations, including operator workstations.

f. Each control loop responds to set point adjustment and stabilizes within time period indicated.
g. Sharing of previously graphed trends of all control loops to demonstrate that each control loop is stable and set points are being maintained.

G. Training Content for Advanced Operators:

1. Making and changing workstation graphics.
2. Creating, deleting and modifying alarms including annunciation and routing.
3. Creating, deleting and modifying point trend logs including graphing and printing on an ad-hoc basis and operator-defined time intervals.
4. Creating, deleting and modifying reports.
5. Creating, deleting and modifying points.
6. Creating, deleting and modifying programming including ability to edit control programs off-line.
7. Creating, deleting and modifying system graphics and other types of displays.
8. Adding DDC controllers and other network communication devices such as gateways and routers.
9. Adding operator workstations.
10. Performing DDC system checkout and diagnostic procedures.
11. Performing DDC controllers operation and maintenance procedures.
12. Performing operator workstation operation and maintenance procedures.
13. Configuring DDC system hardware including controllers, workstations, communication devices and I/O points.
14. Maintaining, calibrating, troubleshooting, diagnosing and repairing hardware.
15. Adjusting, calibrating and replacing DDC system components.

H. Training Content for System Managers and Administrators:

1. DDC system software maintenance and backups.
2. Uploading, downloading and off-line archiving of all DDC system software and databases.
3. Interface with Project-specific, third-party operator software.
4. Understanding password and security procedures.
5. Adding new operators and making modifications to existing operators.
6. Operator password assignments and modification.
7. Operator authority assignment and modification.
8. Workstation data segregation and modification.

I. Video of Training Sessions:

1. Provide a digital video and audio recording of each training session. Create a separate recording file for each session.
2. Stamp each recording file with training session number, session name and date.
3. Provide Owner with two copies of digital files on DVDs or flash drives for later reference and for use in future training.
4. Owner retains right to make additional copies for intended training purposes without having to pay royalties.

END OF SECTION

SECTION 230993 - SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes control sequences for HVAC systems, subsystems, and equipment. Refer to the controls portion of this Specification and the Drawings for a complete understanding of the control sequences. Contractor shall be responsible for coordinating this section with Division 230900 and service representatives of the equipment manufacturers to implement these control sequences along with Division 26. Prior to providing submittals, all field wiring connections shall be determined and shown on the submittals for electrical and controls interface.

B. All setpoints, overrides, or ranges listed in this sequence shall be adjustable through the graphic user interface (GUI) and not on the (programming) wire sheet. I.E. through the graphic you can manipulate timers, enable/disable, etc.

C. Related Sections include the following:

1. Section 230900 "Instrumentation & Controls for HVAC" for control equipment and devices and for submittal requirements.

1.2 DEFINITIONS

A. AI: Analog Input

B. AO: Analog Output

C. ASC: Application Specific Controller

D. ADJ: Adjustable setpoint

E. DDC: Direct digital control

F. CHW: Chilled water

G. HHW: Heating hot water

H. VAV: Variable Air Volume

I. CV: Control Valve

J. DI: Digital Input

K. DO: Digital Output

L. SOO: Sequence of Operations

1.3 SUBMITTALS

A. Submit the following under provisions of section 230900:

1. Submit diagrams indicating control system components. Label with settings, adjustable range of control and limits. Include written description of control and alarms.
2. Submit a re-written control sequence of operations, indicating specifics for each control component on how proper sequencing is to occur.

1.4 SEQUENCE OF OPERATIONS

A. General

1. Contractor shall review sequences prior to programming and suggest modifications where required to achieve the design intent. Contractor may also suggest modifications to improve performance and stability or to simplify or reorganize logic in a manner that provides equal or better performance. Proposed changes in sequences shall be included as a part of Submittal Package.
2. Include costs for minor program modifications if required to provide proper performance of the system.
3. Unless otherwise indicated in SOOs, control loops shall be enabled and disabled based on the status of the system being controlled to prevent wind-up. Loops shall also be initiated with the output set to a neutral (deadband) condition, e.g. valves and dampers close, VFDs at minimum speed, etc.
4. When SOOs use outdoor air temperature present value and there are multiple outdoor air sensors, the physically closest valid sensor reading shall be used. Outdoor air temperature sensors at air handler outdoor air intakes shall be considered valid only when the supply fan is proven on and unit is in occupied mode (airflow across the sensor). The general TS-4 outdoor air temperature sensor shall be valid only if all outdoor air intake sensors are invalid. The outdoor air temperature used for graphics display, optimum start, plant OAT lockout, and other global sequences shall be the average of all valid sensor readings.
5. The term “proven” (i.e. “proven on”/ “proven off”) shall mean that the equipment’s DI status point matches the state set by the equipment’s DO command point.
6. The term “PID loop” or “control loop” is used generically for all control loops and shall not be interpreted as requiring proportional plus integral plus derivative gains on all loops.
7. All setpoints, timers, deadbands, PID gains, etc. listed in sequences shall be capable of being adjusted by the operator without having to access programming whether indicated as adjustable in sequences or not. Software (virtual) points shall be used for these setpoints. Fixed scalar numbers shall not be imbedded in programs unless the value will never need to be adjusted.

8. Values for all points, including real (hardware) points used in control sequences shall be capable of being overridden by the user (e.g. for testing and commissioning). If hardware design prevents this for hardware points, they shall be equated to a software point and the software point shall be used in all sequences. Exception: Not required for ASC hardware points.
9. Electricity Demand Limiting

    a. On home page, provide three manual software switches: Demand Limit Level 1 to 3. These can be manually set by operator to initiate demand limit sequences herein. (These switches may also in the future be tied to PG&E demand reduction contacts.)
    b. Sliding Window: The demand control function shall utilize a sliding window method selectable in increments of one minute, up to 60 minutes, 15 minute default.
    c. Demand Levels: Demand time periods shall be set up as per utility rate schedule. For each On-Peak or Partial-Peak period, three demand level limits can be defined. When the measured demand exceeds the limit, the Demand Limit Level switch for that level shall be set; when demand is less than 10% (adjustable) below the limit, the switch shall be reset. These levels are used at the zone level (see Zone Control sequences) to shed demand.
    d. Electricity Rate Calculation

        1) A program shall be created that calculates electricity cost as would be billed by the utility using the applicable utility rate schedule.
        2) Utility cost shall be calculated real-time and summed for each month and year. For each month, store peak kW, kWh, and cost for each time-of-day rate period. Retain data for one year so that data may be displayed side-by-side as month-this-year and month-last-year. Also store month-to-date and year-to-date data.
        3) Enter latest applicable rate schedule from utility upon start-up. Rates shall be stored in software points so that they may be easily displayed and edited.

10. Alarm Levels

    a. The operator shall be able to create, edit or delete categories (alarm level). An icon shall be associated with each category, enabling the operator to easily sort through multiple events displayed. Alarm levels shall be initially configured by the Contractor as follows:
    b. Level 1: Critical/life safety
    c. Level 2: Significant equipment failure
    d. Level 3: Non-critical equipment failure/operation
    e. Level 4: Energy conservation monitor
    f. Level 5: Maintenance indication, notification

B. VRF SYSTEM CONTROLS

1. The VRF systems have integral control programming via the manufacturer provided interface.

2. The fan coils and condensing units operate on manufacturer standard logic to maintain temperature setpoints in each space
3. Provide BMS interface for each VRF system so the BMS can remotely monitor status of each equipment and space temperature and setpoints.

C. DORM ROOM MODULARS – PTHP CONTROL

1. The BMS shall read space temperature and setpoint from BMS connected thermostats in each room.
2. The PTHP shall operate based on integral controls to maintain space temperature.

D. KITCHEN HOOD EXHAUST CONTROLS

1. Start Up and Shut Down

a. The hood EF can be started and stopped by the local hood switch.

E. CONSTANT VOLUME EXHAUST FANS (RESTROOMS, JANITOR, TRASH, ETC)

1. EFs shall be enabled by schedule 24/7, with the capability for an operational schedule if desired.
2. EFs for these spaces shall run at constant volume.

F. BDF/IDF, ELECTRICAL, AND ELEVATOR MACHINE ROOMS

1. The BMS only monitors the temperature of these rooms via a BMS connected thermostat.

a. A high level alarm shall annunciate if rooms exceed 90 deg F (adjustable), indicating possible equipment failure.
b. BMS shall allow each of these rooms setpoints to be adjusted independently for alarm purposes.

1.5 GRAPHIC PAGES

A. Provide graphic pages to include at least the following:

1. All timers, time remaining on timers, set points or operation ranges shall be visible and adjustable through the GUI.
2. A status LED shall be shown on the graphic next to each piece of equipment to show if the device is in hand (local control) the LED shall be blue, forced through the Graphics page in hand the LED shall be yellow, in alarm the LED shall be red, if the equipment is in auto and off the LED shall be black, if the equipment is in auto and operating the LED shall be green.
3. Summary pages with current setpoints and temperatures in all zones.

1.6 BUILDING REPORTS

A. Provide year-round scheduling incorporating holidays and vacations as provided by the Owner.

A. BMS shall monitor and trend all connected meters including water meters (see div 22), gas meters, and electric meters. Controls contractor shall coordinate with all disciplines to ensure all meters are connected.

B. Trending of system and component operation and completion of trend logs in tabular and graphical format suitable for binding in a weekly, monthly, and yearly report. Reports shall consist of full-page form-fed output with headers, subheadings, dates, times, instrument numbers, etc. Output shall be submitted for review and approval. The term unedited below is understood to mean that the contractor will not remove any values from the trends even if they are considered faults or anomalies.

1. Weekly report shall consist of the following:

a. Hourly and daily load for the following systems:

1) Water consumption – Domestic system (Gallons)
2) Voltage (V)
3) Peak electric demand (kW)
4) Continuous electric load (kWh)

b. Maximum hourly and daily load for the following systems:

1) Water consumption rate – Domestic system (GPH)
2) Voltage (V)
3) Peak electric demand (kW)

c. Events and occurrences.

2. Monthly report shall consist of the following:

a. Monthly load for the following systems:

1) Water consumption – Domestic system (gallons)
2) Voltage (V)
3) Peak electric demand (kW)
4) Continuous electric load (kWh)

b. Maximum monthly load for the following systems:

1) Water consumption rate – Domestic system (GPH)
2) Voltage (V)
3) Peak electric demand (kW)

c. Hours of operation for each piece of equipment.
d. Identification of equipment approaching elapsed time for preventative maintenance.

e. Identification of equipment passed elapsed time for preventative maintenance.

3. Yearly report shall consist of the following:

a. Yearly load for the following systems:

1) Water consumption – Domestic system (gallons)
2) Voltage (V)
3) Peak electric demand (kW)
4) Continuous electric load (kWh)

b. Maximum yearly load for the following systems:

1) Water consumption rate – Domestic system (GPH)
2) Voltage (V)
3) Peak electric demand (kW)

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 232300 - REFRIGERANT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Refrigerant pipes and fittings.
2. Refrigerant piping valves and specialties.
3. Refrigerants.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of valve, refrigerant piping, and piping specialty.

B. Shop Drawings:

1. Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes; flow capacities; valve arrangements and locations; slopes of horizontal runs; oil traps; double risers; wall and floor penetrations; and equipment connection details.
2. Show piping size and piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.
3. Show interface and spatial relationships between piping and equipment.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to 2010 ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

B. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

C. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.7 PRODUCT STORAGE AND HANDLING

A. Store piping with end caps in place to ensure that piping interior and exterior are clean when installed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-410A:

1. Suction Lines for Air-Conditioning Applications: 300 psig
2. Suction Lines for Heat-Pump Applications: 535 psig
3. Hot-Gas and Liquid Lines: 535 psig

2.2 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 88, Type K or L

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.

E. Brazing Filler Metals: AWS A5.8/A5.8M.

F. Flexible Connectors:

1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
2. End Connections: Socket ends.
3. Working Pressure Rating: Factory test at minimum 500 psig.
4. Maximum Operating Temperature: 250 deg F.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS FOR REFRIGERANT R-410A

A. Suction Lines NPS 1-1/2 and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed joints.

B. Hot-Gas and Liquid Lines: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed joints.

C. Safety-Relief-Valve Discharge Piping: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with soldered joints.

D. Safety-Relief-Valve Discharge Piping:
   1. NPS 1-1/2 and Smaller: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

A. Install service valves for gage taps at inlet and outlet of hot-gas bypass valves and strainers if they are not an integral part of valves and strainers.

B. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.

C. Install thermostatic expansion valves as close as possible to distributors on evaporators.
   1. Install valve so diaphragm case is warmer than bulb.
   2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.
   3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.

D. Install safety relief valves where required by 2010 ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.

E. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.

F. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for the device being protected:
   1. Solenoid valves.
   2. Thermostatic expansion valves.
   3. Compressor.

G. Install filter dryers in liquid line between compressor and thermostatic expansion valve.

H. Install flexible connectors at compressors.

3.3 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

B. Install refrigerant piping according to ASHRAE 15.

C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping adjacent to machines to allow service and maintenance.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

K. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Section 083113 "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.

L. Install refrigerant piping in protective conduit where installed belowground.

M. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

N. Slope refrigerant piping as follows:

1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
2. Install horizontal suction lines with a uniform slope downward to compressor.
3. Install traps and double risers to entrain oil in vertical runs.
4. Liquid lines may be installed level.

O. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

P. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

Q. Identify refrigerant piping and valves according to Section 230553 "Identification for HVAC Piping and Equipment."

R. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

S. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

3.4 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide), during brazing or welding, to prevent scale formation.

D. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

1. Use Type BCuP (copper-phosphorus) alloy for joining copper socket fittings with copper pipe.
2. Use Type BAg (cadmium-free silver) alloy for joining copper with bronze or steel.

F. Threaded Joints: Thread steel pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and to restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry-seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Steel pipe can be threaded, but threaded joints must be seal brazed or seal welded.

H. Welded Joints: Construct joints according to AWS D10.12M/D10.12.

I. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.5 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements for seismic restraints in Section 230548 "Vibration and Seismic Controls for HVAC."

B. Comply with Section 230529 "Hangers and Supports for HVAC Piping and Equipment" for hangers, supports, and anchor devices.

C. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
2. Roller hangers and spring hangers for individual horizontal runs 20 feet or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
4. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

D. Install hangers for copper tubing, with maximum horizontal spacing and minimum rod diameters, to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

E. Support vertical runs of copper tubing to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.6 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Comply with ASME B31.5, Chapter VI.
2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in "Performance Requirements" Article.

    a. Fill system with nitrogen to the required test pressure.
    b. System shall maintain test pressure at the manifold gage throughout duration of test.
    c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
    d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

B. Prepare test and inspection reports.

3.7 SYSTEM CHARGING

A. Charge system using the following procedures:

1. Install core in filter dryers after leak test but before evacuation.

2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
4. Charge system with a new filter-dryer core in charging line.

3.8 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.

B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.

D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:

1. Open shutoff valves in condenser water circuit.
2. Verify that compressor oil level is correct.
3. Open compressor suction and discharge valves.
4. Open refrigerant valves except bypass valves that are used for other purposes.
5. Check open compressor-motor alignment and verify lubrication for motors and bearings.

E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION

SECTION 233113 - METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Single-wall round and flat-oval ducts and fittings.
3. Sheet metal materials.
4. Duct liner.
5. Sealant and gaskets.
6. Hangers and supports.
7. Seismic-restraint devices.

B. Related Sections:

1. Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Section 233300 "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 PERFORMANCE REQUIREMENTS

A. Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.

B. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.4 ACTION SUBMITTALS

A. Submittals shall be formatted per Section 230000 “General Mechanical Requirements”. The manufacturer shall resubmit the specification section showing compliance with each respective paragraphs and specified items and features in that particular specification section. All exceptions shall be clearly identified by referencing respective paragraph and other requirements. Next to each specification item, indicate the following:

1. "No Exception Taken".
2. "Exception". All exceptions shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.

B. Product Data: For each type of the following products:

1. Liners and adhesives.
2. Sealants and gaskets.
3. Seismic-restraint devices.

C. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
4. Elevation of top of ducts.
5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment, seismic restraints, and vibration isolation.
13. Sheet metal thicknesses.
14. Joint and seam construction and sealing.
15. Reinforcement details and spacing.
16. Materials, fabrication, assembly, and spacing of hangers and supports.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
2. Suspended ceiling components.
3. Structural members to which duct will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Penetrations of smoke barriers and fire-rated construction.
6. Items penetrating finished ceiling including the following:

    a. Lighting fixtures.
    b. Air outlets and inlets.
    c. Speakers.

d. Sprinklers.
e. Access panels.
f. Perimeter moldings.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
3. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."

C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SINGLE-WALL ROUND AND FLAT-OVAL DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

1. Factory- or shop-fabricated spiral lock seam duct:

    a. No snap lock
    b. Factory-fabricated longitudinal seam acceptable for ducts larger than standard factory sizes

2. Manufacturers:

    a. United Sheet Metal Division, United McGill
    b. Semco Manufacturing, Inc.
    c. Or equal

B. Flat-Oval Ducts: Indicated dimensions are the duct width (major dimension) and diameter of the round sides connecting the flat portions of the duct (minor dimension).

C. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.
2. Fabricate flat-oval ducts larger than 72 inches in width (major dimension) with butt-welded longitudinal seams.

E. Fittings:

1. Same material and construction as duct in which installed
2. For ductwork exposed to occupant view, do not use fabricated fittings at taps to terminal units and outlets. Instead use saddle tap cut into continuous spiral duct. Intent is for spiral duct to be continuous for aesthetic reasons. Saddle tap flange width shall be 0.5 inches or less.

F. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct

construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. General Applications (except as noted below): G60 Galvanized Coating.
2. Plenum Walls and Blank-Offs Where in Contact with Cooling Coil: G90 Galvanized Coating.
3. Exterior Applications: G90 Galvanized Coating.
4. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.

D. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304L or 316L, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.

E. Aluminum Sheets: Comply with ASTM B 209 Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.

F. Factory- or Shop-Applied Antimicrobial Coating:

1. Apply to the surface of sheet metal that will form the interior surface of the duct. An untreated clear coating shall be applied to the exterior surface.
2. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
3. Coating containing the antimicrobial compound shall have a hardness of 2H, minimum, when tested according to ASTM D 3363.
4. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
5. Antimicrobial coating on sheet metal is not required for duct containing liner treated with antimicrobial coating.

G. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

H. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.4 DUCT LINER

A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. CertainTeed Corporation; Insulation Group
    b. Johns Manville
    c. Knauf Insulation

    d. Maximum Thermal Conductivity:

        1) Type I, Flexible: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
        2) Type II, Rigid: 0.23 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.

2. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
3. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.

    a. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
    b. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Insulation Pins and Washers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135-inch-diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick stainless steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

C. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 7-11, "Flexible Duct Liner Installation."

1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
3. Butt transverse joints without gaps, and coat joint with adhesive.
4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.

5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
6. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
7. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:

    a. Fan discharges.
    b. Intervals of lined duct preceding unlined duct.

8. Secure insulation between perforated sheet metal inner duct of same thickness as specified for outer shell. Use mechanical fasteners that maintain inner duct at uniform distance from outer shell without compressing insulation.

    a. Sheet Metal Inner Duct Perforations: 3/32-inch diameter, with an overall open area of 23 percent.

2.5 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Two-Part Tape Sealing System:

1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
2. Tape Width: 3 inches.
3. Sealant: Modified styrene acrylic.
4. Water resistant.
5. Mold and mildew resistant.
6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
7. Service: Indoor and outdoor.
8. Service Temperature: Minus 40 to plus 200 deg F.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
10. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
11. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.

2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

D. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.
6. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

2.6 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: steel rods and nuts.

B. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

C. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

D. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.

E. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

F. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

G. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.

3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

2.7 SEISMIC-RESTRAINT DEVICES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Hilti Corp.
2. Mason Industries
3. TOLCO; a brand of NIBCO Inc.
4. Unistrut Corporation; Tyco International, Ltd.

B. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by the Office of Statewide Health Planning and Development for the State of California.

C. Channel Support System: Shop- or field-fabricated support assembly made of slotted steel channels rated in tension, compression, and torsion forces and with accessories for attachment to braced component at one end and to building structure at the other end. Include matching components and corrosion-resistant coating.

D. Restraint Cables: ASTM A 603, galvanized-steel cables with end connections made of cadmium-plated steel assemblies with brackets, swivel, and bolts designed for restraining cable service; and with an automatic-locking and clamping device or double-cable clips.

E. Hanger Rod Stiffener: Reinforcing steel angle or channel unistrut clamped to hanger rod.

F. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install round and flat-oval ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers as required by NFPA 90A. Comply with requirements in Section 233300 "Air Duct Accessories" for fire and smoke dampers.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 ADDITIONAL INSTALLATION REQUIREMENTS FOR KITCHEN HOOD EXHAUST DUCT

A. Ducts serving residential type range hoods in the building shall be constructed of stainless steel.

3.4 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":

1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
2. Outdoor, Supply-Air Ducts: Seal Class A.
3. Outdoor, Exhaust Ducts: Seal Class B.
4. Outdoor, Return-Air Ducts: Seal Class A.
5. Unconditioned Space, Supply-Air Ducts in Pressure Classes 1-Inch wg and Lower: Seal Class B.
6. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 1-Inch wg: Seal Class A.
7. Unconditioned Space, Exhaust Ducts: Seal Class B.
8. Unconditioned Space, Return-Air Ducts: Seal Class A.
9. Conditioned Space, Supply-Air Ducts in Pressure Classes 1-Inch wg and Lower: Seal Class B.
10. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 1-Inch wg: Seal Class A.
11. Conditioned Space, Exhaust Ducts: Seal Class A.
12. Conditioned Space, Return-Air Ducts: Seal Class A.

3.5 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
5. Do not use powder-actuated concrete fasteners for seismic restraints.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum interval of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.6 SEISMIC-RESTRAINT-DEVICE INSTALLATION

A. Install ducts with hangers and braces designed to support the duct and to restrain against seismic forces required by applicable building codes. Comply with OSHPD Preapproved Manufacturer’s Certification (OPM).

1. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
2. Brace a change of direction longer than 12 feet.

B. Select seismic-restraint devices with capacities adequate to carry present and future static and seismic loads.

C. Install cables so they do not bend across edges of adjacent equipment or building structure.

D. Install cable restraints on ducts that are suspended with vibration isolators.

E. Install seismic-restraint devices using methods approved by an evaluation service member of the ICC Evaluation Service.

3.7 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Leakage Tests:

1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
2. Test the following systems:

a. Ducts with a Pressure Class Higher Than 3-Inch wg: Test representative duct sections**,** selected by Engineer from sections installed**,** totaling no less than 25 percent of total installed duct area for each designated pressure class.

3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
4. Test for leaks before applying external insulation.
5. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.
6. Give seven days advance notice for testing.

C. Duct System Cleanliness Tests:

1. Visually inspect duct system to ensure that no visible contaminants are present.

D. Contractor shall develop and implement an IAQ Management Plan for the construction and preoccupancy phases of the building as follows:

1. During construction meet or exceed the recommended control measures of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings Under Construction, and Edition 2007, ANSI/SMACNA 008-2008 (Chapter 3).
2. Protect stored materials on-site and installed absorptive materials from moisture damage.
3. If permanently installed air handlers are used during construction, then filtration media with a minimum efficiency reporting value (MERV) of 8 must be used at each return air grille, as determined by ASHRAE Standard 52.2-2012 (with errata, but without addenda). Replace air filtration media immediately prior to occupancy.

E. Duct system will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

3.9 START UP

A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

3.10 DUCT SCHEDULE

A. Supply Ducts:

1. Ducts Connected to Fan Coil Units, Heat Pumps, and Terminal Units:

a. Pressure Class: Positive 1-inch wg.
b. Minimum SMACNA Seal Class: B.

c. SMACNA Leakage Class for Rectangular: 8.
d. SMACNA Leakage Class for Round and Flat Oval: 4.

2. Ducts Connected to Equipment Not Listed Above:

a. Pressure Class: Positive 2-inch wg.
b. Minimum SMACNA Seal Class: A.
c. SMACNA Leakage Class for Rectangular: 4.
d. SMACNA Leakage Class for Round and Flat Oval: 2.

B. Return Ducts:

1. Ducts Connected to Fan Coil Units, Heat Pumps, and Terminal Units:

a. Pressure Class: Positive or negative 1-inch wg.
b. Minimum SMACNA Seal Class: B.
c. SMACNA Leakage Class for Rectangular: 8.
d. SMACNA Leakage Class for Round and Flat Oval: 4.

2. Ducts Connected to Equipment Not Listed Above:

a. Pressure Class: Positive or negative 2-inch wg.
b. Minimum SMACNA Seal Class: A.
c. SMACNA Leakage Class for Rectangular: 4.
d. SMACNA Leakage Class for Round and Flat Oval: 2.

C. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:

a. Pressure Class: Negative 2-inch wg.
b. Minimum SMACNA Seal Class: B if negative pressure, and A if positive pressure.
c. SMACNA Leakage Class for Rectangular: 4.
d. SMACNA Leakage Class for Round and Flat Oval: 2.

2. Ducts Connected to Kitchen Hoods: Comply with NFPA 96.

a. Exposed to View: Type 304, stainless-steel sheet, No. 4 finish.
b. Concealed: Type 304, stainless-steel sheet, No. 2D finish.
c. Welded seams and joints.
d. Pressure Class: Positive or negative 4-inch wg.
e. Minimum SMACNA Seal Class: Welded seams, joints, and penetrations.
f. SMACNA Leakage Class: 3.

3. Ducts Connected to Equipment Not Listed Above:

a. Pressure Class: Positive or negative 3-inch wg.
b. Minimum SMACNA Seal Class: A if positive pressure.
c. SMACNA Leakage Class for Rectangular: 4.
d. SMACNA Leakage Class for Round and Flat Oval: 2.

D. Outdoor-Air (Not Filtered, Heated, or Cooled) Ducts:

1. Ducts Connected to Fan Coil Units, Heat Pumps, and Terminal Units:

a. Pressure Class: Positive or negative 2-inch wg.
b. Minimum SMACNA Seal Class: A.
c. SMACNA Leakage Class for Rectangular: 4.
d. SMACNA Leakage Class for Round and Flat Oval: 2.

2. Ducts Connected to Air-Handling Units:

a. Pressure Class: Positive or negative 2-inch wg.
b. Minimum SMACNA Seal Class: A.
c. SMACNA Leakage Class for Rectangular: 4.
d. SMACNA Leakage Class for Round and Flat Oval: 2.

3. Ducts Connected to Equipment Not Listed Above:

a. Pressure Class: Positive or negative 2-inch wg.
b. Minimum SMACNA Seal Class: A.
c. SMACNA Leakage Class for Rectangular: 4.
d. SMACNA Leakage Class for Round and Flat Oval: 2.

E. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel.
2. PVC-Coated Ducts:

a. Exposed to Airstream: Match duct material.
b. Not Exposed to Airstream: Match duct material.

3. Stainless-Steel Ducts:

a. Exposed to Airstream: Match duct material.
b. Not Exposed to Airstream: Match duct material.

4. Aluminum Ducts: Aluminum.

F. Liner:

1. Supply Air Ducts: [Fibrous glass, Type I], 1 inch thick.
2. Return Air Ducts: [Fibrous glass, Type I], 1 inch thick.
3. Supply Fan Plenums: [Fibrous glass, Type II], 1 inch thick.
4. Return Fan Plenums: [Fibrous glass, Type II], 1 inch thick.

G. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

a. Velocity 1000 fpm or Lower:

1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
2) Mitered Type RE 4 with single-thickness turning vanes.

b. Velocity 1000 to 1500 fpm:

1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and single-thickness turning vanes.
3) Mitered Type RE 2 with single-thickness vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

c. Velocity 1500 fpm or Higher:

1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
2) Radius Type RE 3 with minimum 1.5 radius-to-diameter ratio and single-thickness turning vanes.
3) Mitered Type RE 2 with single-thickness vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and single-thickness turning vanes.
c. Mitered Type RE 2 with single-thickness vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."

a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.

1) Velocity 1000 fpm or Lower: 1.0 radius-to-diameter ratio and three segments for 90-degree elbow.
2) Velocity 1000 to 1500 fpm: 1.5 radius-to-diameter ratio and four segments for 90-degree elbow.
3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
4) Radius-to Diameter Ratio: 1.5.

b. Round Elbows, 10 Inches and Smaller in Diameter: Stamped or pleated.
c. Round Elbows, 12 Inches and Larger in Diameter: Welded.

H. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."

    a. Rectangular Main to Rectangular Branch: 45-degree entry.
    b. Rectangular Main to Round Branch: Spin in.

2. Taps shall be the more stringent of what is shown on the mechanical drawings and the criteria listed below. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.

    a. Velocity 900 fpm or Lower: 90-degree tap.
    b. Velocity 901 to 1500 fpm: Conical tap.
    c. Velocity 1501 fpm or Higher: 45-degree lateral.

END OF SECTION

SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Backdraft and pressure relief dampers.
2. Barometric relief dampers.
3. Manual volume dampers.
4. Combination fire and smoke dampers.
5. Turning vanes.
6. Remote damper operators.
7. Duct-mounted access doors.
8. Flexible connectors.
9. Duct accessory hardware.

B. Related Requirements:

1. Section 233346 "Flexible Ducts" for insulated and non-insulated flexible ducts.

1.3 ACTION SUBMITTALS

A. Submittals shall be formatted per Section 230000 “General Mechanical Requirements”. The manufacturer shall resubmit the specification section showing compliance with each respective paragraphs and specified items and features in that particular specification section. All exceptions shall be clearly identified by referencing respective paragraph and other requirements. Next to each specification item, indicate the following:

1. “No Exception Taken”.
2. “Exception”. All exceptions shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.

B. Product Data: For each type of product.

1. For duct silencers, include pressure drop and dynamic insertion loss data. Include breakout noise calculations for high transmission loss casings.

C. Sustainable Design Submittals:

1. Product data showing compliance with ASHRAE 62.1.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted access panels and access doors required for access to duct accessories are shown and coordinated with each other, using input from Installers of the items involved.

B. Source quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fusible Links: Furnish quantity equal to 10 percent of amount installed.

PART 2 - PRODUCTS

2.1 BACKDRAFT AND PRESSURE RELIEF DAMPERS

A. Manufactures shall be Ruskin, Greenheck or equal.

B. Frame: 8 inches x minimum 0.125 inch 6063-T5 extruded aluminum channel with front flange and galvanized steel braces at mitered corners.

C. Blades:

1. Style: 2V.
2. Action: Parallel.
3. Orientation: Horizontal.
4. Material: Minimum 0.070 inch 6063-T5 extruded aluminum.
5. Width: Maximum 6 inches.

D. Bearings: Galvanized Steel Ball Axle Bearings.

E. Blade Seals: Extruded vinyl, mechanically attached to blade edge.

F. Linkage: External heavy duty type with steel clevis arms and plated steel tie bars & pivot pins with nylon pivot bearings.

G. Counterbalances: Adjustable externally mounted counterbalance weights mechanically attached to blade enabling damper to operate over wide range of pressures.

H. Finish: Mill aluminum.

I. Performance Data:

1. Temperature Rating: Withstand -20° to 180°F.
2. Capacity: Demonstrate capacity of damper to withstand HVAC system operating conditions.

   a. Closed Position: Maximum differential pressure of 5 inches w.g..
   b. Open Position: Maximum air velocity of 3,900 feet per minute.

3. Pressure Drop: Maximum 0.3 inch w.g. at 10,000 CFM through 36 inch x 36 inch damper.

2.2 BAROMETRIC RELIEF DAMPERS

A. Manufactures shall be Ruskin, Greenheck or equal.

B. Construction:

1. Frame: Damper frame shall be 16 ga. Galvanized steel. Aluminum or 304 stainless steel is an option.
2. Blades: Damper blades shall be a minimum 0.063 inch thick aluminum.
3. Blade Stops: Each blade stop (at top and bottom of damper frame) shall occupy no more than 3 1/2” of the damper opening area to allow for maximum free area and to minimize pressure loss across the damper.
4. Seals:
5. Blade Edge: Vinyl is standard. None is an option.
6. Jamb: None is standard. EPDM is an option.
7. Linkage: External, steel tie bars
8. Axles: Plated steel stub axles are standard. Stainless steel is optional.
9. Bearings: Galvanized steel press fit. Acetal with stainless steel ball is optional
10. Finish: Mill finish. Paint coatings are optional.
11. Counterbalance: Blade mounted with adjustable weights.

2.3 MANUAL VOLUME DAMPERS

A. Fabricate in accordance with SMACNA Low Pressure Duct Construction Standards, and as indicated.

B. Fabricate splitter dampers of material same gage as duct to 24 inches size in either direction, and two gages heavier for sizes over 24 inches.

C. Fabricate splitter dampers of single thickness sheet metal to streamline shape. Secure blade with continuous hinge or rod. Operate with minimum 1/4 inch diameter rod in self aligning, universal joint action flanged bushing with set screw.

D. Fabricate single blade dampers for duct sizes to 12 x 48 inch.

E. Fabricate multi-blade damper of opposed blade pattern with maximum blade sizes 12 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

F. Except in round ductwork 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.

G. Provide locking, indicating quadrant regulators on single and multi-blade dampers. Where rod lengths exceed 30 inches provide regulator at both ends.

H. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.

2.4 COMBINATION FIRE AND SMOKE DAMPERS

A. Manufacturers:

1. Greenheck Type FSD-212 or equal for 1500 feet per minute and below.
2. Greenheck Type FSD-311 or equal for above 1500 feet per minute.
3. Or equal by Ruskin or Pottoff.

B. Combination Smoke/Fire Dampers shall be furnished and installed at all locations shown on the plans and/or as described on the drawing details and suitable for closure against duct operating pressure up to Design Static Pressure class.

C. Damper shall meet the requirements of NFPA 90A, 92A, and 92B and further shall be tested, rated and labeled in accordance with the latest edition on UL Standard 555 and 555S. Dampers shall be UL rated per the CBC 717.3.1.

D. Damper shall be of low leakage design qualified to UL 555S Leakage Class II.

B. Damper actuator combination shall have a UL 555S elevated temperature rating of 350 degrees Fahrenheit minimum and shall be operational and dynamic rated to operate at maximum design airflow rate at its installed location.

C. Damper shall be supplied with an appropriate actuator installed by the damper manufacturer at the time of damper fabrication. Damper actuator shall be electric type for 120-volt operation.

D. Damper blades shall be 16-gauge galvanized steel 3 Vee type with three longitudinal grooves for reinforcement. Damper frame shall be galvanized steel formed into a structural hat channel shape with reinforced corners. Bearing shall be sintered bronze sleeve type rotating in extruded holes in the damper frame. Blade seals shall be silicone rubber designed to inflate and provide a tighter seal against leakage as pressure on either side of the damper increases. Jamb seals shall be stainless steel compression type with silicone rubber backing. Blades shall be completely symmetrical relative to their axle pivot point, presenting identical resistance to airflow in either direction or pressure on either side of the damper.

E. Damper must be rated for mounting vertically (with blades running horizontally) or horizontally and be UL 555S rated for leakage and airflow in either direction through the damper.

F. Damper shall be supplied with a 165-degree Fahrenheit fusible link. Provide access doors at either side of the combination smoke/fire damper for viewing of the fusible links.

G. The specified combination smoke/fire damper shall meet the requirements for fire dampers, smoke dampers and combination fire smoke dampers established by:

1. National Fire Protection Association NFPA Standard 90A, 92A, 92B and 101
2. Underwriters Laboratories Standard 555 Listing #R-13317
3. Underwriters Laboratories Standard 555S Listing #R-13447
4. California State Fire Marshall CSFM Fire Damper Listing #3225-0981:103
5. California State Fire Marshall CSFM Leakage Smoke Damper Listing #3230-0981:104

H. Smoke Detector will be provided by the electrical contractor to be compatible with the fire alarm system. Mechanical contractor shall install all duct-mounted smoke detectors. Electrical contractor shall connect smoke detector to smoke dampers and fire alarm panel. After installation is complete, electrical contractor shall test and verify that smoke detectors are active and functional.

2.5 TURNING VANES

A. Manufacturer shall be Ductmate, CL WARD, or equal.

B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."

D. Vane Construction: Single wall for ducts up to 48 inches wide and double wall for larger dimensions.

2.6 REMOTE DAMPER OPERATORS

A. Manufacturer shall be Young Regulator, Pottorff or equal.

B. Description: Cable system designed for remote manual damper adjustment.

C. Tubing: Brass.

D. Cable: Stainless steel.

E. Use for all locations where above-ceiling damper is not accessible via ceiling tile.

2.7 DUCT-MOUNTED ACCESS DOORS

A. Manufacturers shall be Ventfrabrics, Ductmate, Pottorf Company or equal.

B. Fabricate in accordance with SMACNA Low Pressure Duct Construction Standards and as indicated.

C. Review locations prior to fabrication.

D. Fabricate rigid and close-fitting doors of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ductwork, install minimum one inch thick insulation with sheet metal cover.

E. Access doors smaller than 12 inches square may be secured with sash locks.

F. Provide two hinges and two sash locks for sizes up to 18 inches square, three hinges and two compression latches with outside and inside handles for sizes up to 24 x 48 inches. Provide an additional hinge for larger sizes.

G. Access doors with sheet metal screw fasteners are not acceptable.

2.8 FLEXIBLE CONNECTORS

A. Manufacturer: Ventfrabrics, Duro Dyne or equal.

B. Materials: Flame-retardant or noncombustible fabrics.

C. Coatings and Adhesives: Comply with UL 181, Class 1.

D. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz./sq. yd.
2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F.

E. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.

1. Minimum Weight: 24 oz./sq. yd.
2. Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.
3. Service Temperature: Minus 50 to plus 250 deg F.

2.9 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Compliance with ASHRAE/IESNA 90.1-2004 includes Section 6.4.3.3.3 - "Shutoff Damper Controls," restricts the use of backdraft dampers, and requires control dampers for certain applications. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.

D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

1. Install steel volume dampers in steel ducts.
2. Install aluminum volume dampers in aluminum ducts.

E. Set dampers to fully open position before testing, adjusting, and balancing.

F. Install test holes at fan inlets and outlets and elsewhere as indicated.

G. Install fire and smoke dampers according to UL listing.

H. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. On both sides of duct coils.
2. Upstream from duct filters.
3. At outdoor-air intakes and mixed-air plenums.
4. At drain pans and seals.
5. Downstream from backdraft dampers.
6. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
7. At each change in direction and at maximum 50-foot spacing.
8. Upstream from turning vanes.
9. Upstream or downstream from duct silencers.
10. Control devices requiring inspection.
11. Elsewhere as indicated.

I. Install access doors with swing against duct static pressure.

J. Access Door Sizes:

1. One-Hand or Inspection Access: 8 by 5 inches
2. Two-Hand Access: 12 by 6 inches
3. Head and Hand Access: 18 by 10 inches
4. Head and Shoulders Access: 21 by 14 inches
5. Body Access: 25 by 14 inches
6. Body plus Ladder Access: 25 by 17 inches

K. Label access doors according to Section 230553 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

L. Install flexible connectors to connect ducts to equipment.

M. Connect flexible ducts to metal ducts with draw bands.

N. Install duct test holes where required for testing and balancing purposes.

O. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch movement during start and stop of fans.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation.
5. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION

SECTION 233346 - FLEXIBLE DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Insulated flexible ducts.

1.3 ACTION SUBMITTALS

A. Submittals shall be formatted per Section 230000 “General Mechanical Requirements”. The manufacturer shall resubmit the specification section showing compliance with each respective paragraphs and specified items and features in that particular specification section. All exceptions shall be clearly identified by referencing respective paragraph and other requirements. Next to each specification item, indicate the following:

   1. “No Exception Taken”.
   2. “Exception”. All exceptions shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.

B. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted access panels and access doors required for access to duct accessories are shown and coordinated with each other, using input from installers of the items involved.

PART 2 - PRODUCTS

2.1 INSULATED FLEXIBLE DUCTS

A. Manufacturers:

   1. Casco silentflex II
   2. Thermaflex
   3. Or submitted equal approved by the Engineer of Record.

B. Flexible Ductwork up to 16” ID:

1. UL 181, Class I Air Duct.
2. Minimum positive static pressure class: 2 inches w.c.
3. Minimum negative pressure class: 0.5 inch w.c.
4. Insulated to a minimum of R-8.

2.2 FLEXIBLE DUCT CONNECTORS

A. Clamps: Stainless-steel band with stainless steel hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches, to suit duct size.

B. For flexible duct connectors with metal collars, use minimum three sheet metal screws and duct sealer

PART 3 - EXECUTION

3.1 INSTALLATION

A. In locations where ceiling space does not allow for 90 degree flex elbow connections to diffusers, the low-profile installation option may be used, refer to project details.

B. Install in indoor applications only. Flexible ductwork should not be exposed to UV lighting.

C. Connect flexible ducts to metal ducts with bands.

D. Installation:

1. Install ducts fully extended.
2. Do not bend ducts across sharp corners.
3. Bends of flexible ducting shall not exceed a minimum of one duct diameter.
4. Avoid contact with metal fixtures, water lines, pipes, or conduits.

E. Supporting Flexible Ducts:

1. Suspend flexible ducts with bands 1-1/2 inches wide or wider and spaced a maximum of 48 inches apart. Maximum centerline sag between supports shall not exceed 1/2 inch per 12 inches.
2. Install extra supports at bends placed approximately one duct diameter from center line of the bend.
3. Ducts may rest on ceiling joists or truss supports. Spacing between supports shall not exceed the maximum spacing per manufacturer's written installation instructions.

END OF SECTION

SECTION 233423 - HVAC FANS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Centrifugal roof ventilators.
2. Ceiling-mounted ventilators.
3. Square in-line centrifugal fans.

1.3 ACTION SUBMITTALS

A. Submittals shall be formatted per Section 230000 “General Mechanical Requirements”. The manufacturer shall resubmit the specification section showing compliance with each respective paragraphs and specified items and features in that particular specification section. All exceptions shall be clearly identified by referencing respective paragraph and other requirements. Next to each specification item, indicate the following:

1. “No Exception Taken”.
2. “Exception”. All exceptions shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.

B. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Also include the following:

1. Certified fan performance curves with system operating conditions indicated.
2. Certified fan sound-power ratings.
3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
4. Material thickness and finishes, including color charts.
5. Dampers, including housings, linkages, and operators.
6. Roof curbs.
7. Fan speed controllers.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For HVAC fans to include in emergency, operation, and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Belts: One set(s) for each belt-driven unit.

1.7 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.

C. UL Standards: HVAC fans shall comply with UL 705. HVAC fans for use for restaurant kitchen exhaust shall also comply with UL 762.

1.8 COORDINATION

A. Coordinate size and location of structural-steel support members.

B. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

C. Provide access around equipment as specified on plans and/or according to manufacturer’s requirements.

1.9 WARRANTY

A. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents

B. The warranty of this equipment is to be free from defects in material and workmanship for a period of one year from the purchase date. Any units or parts which prove defective during the warranty period will be replaced at the Manufacturers option when returned to Manufacturer, transportation prepaid.

PART 2 - PRODUCTS

2.1 CEILING-MOUNTED VENTILATORS

A. Manufacturers:

1. Greenheck Fan Company.
2. Loren Cook Company.
3. PennBarry
4. Twin City Fans

B. Housing: Steel, lined with acoustical insulation.

C. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel removable for service.

D. Back-draft damper: Integral.

E. Grille: louvered grille with flange on intake and thumbscrew or spring retainer attachment to fan housing.

F. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.

2.2 CENTRIFUGAL VENTILATORS - ROOF UPBLAST

A. Manufacturers:

1. Greenheck CUE
2. Loren Cook Company.
3. Twin City Fans

B. Configuration: Centrifugal roof upblast

C. Housing: Removable spun-aluminum dome top and outlet baffle

1. Upblast Units: Provide spun-aluminum discharge baffle to direct discharge air upward, with rain and snow drains.

D. Fan Wheels: Aluminum hub and wheel with backward-inclined blades

E. Accessories:

1. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted outside fan housing, factory wired through an internal aluminum conduit.
2. Bird Screens: Removable, 1/2-inch mesh, aluminum or brass wire.
3. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base; factory set to close when fan stops.
4. Mounting Pedestal: Galvanized steel with removable access panel.

F. Prefabricated Roof Curbs: Galvanized steel; mitered and welded corners; 1-1/2-inch-thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to suit roof opening and fan base.

2.3 SQUARE IN-LINE CENTRIFUGAL FANS

A. Manufacturers:

1. Greenheck Fan Company.
2. Loren Cook Company.
3. PennBarry
4. Twin City Fans

B. Description: Square in-line centrifugal fans.

C. Housing:

1. Housing Construction: Side panels shall be easily removable for service. Include inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.

D. Direct-Drive Units: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing.

E. Fan Wheels: Aluminum airfoil blades welded to aluminum hub.

F. Accessories:

1. Access for Inspection, Cleaning, and Maintenance: Comply with requirements in ASHRAE 62.1.
2. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
3. Volume-Control Damper: Manually operated with quadrant lock, located in fan outlet.
4. Companion Flanges: For inlet and outlet duct connections.
5. Fan Guards: 1/2- by 1-inch mesh of galvanized steel in removable frame. Provide guard for inlet or outlet for units not connected to ductwork.
6. Motor and Drive Cover (Belt Guard): Epoxy-coated steel.
7. Side Discharge: Flange connector and attachment hardware to provide right-angle discharge on side of unit.

2.4 SOURCE QUALITY CONTROL

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

B. AMCA Certification: Fans shall comply with AMCA 11 and bear the AMCA-Certified Ratings Seal.

C. Fan Sound Ratings: Comply with AMCA 311, and label fans with the AMCA-Certified Ratings Seal. Sound ratings shall comply with AMCA 301. The fans shall be tested according to AMCA 300.

D. Fan Performance Ratings: Comply with AMCA 211 and label fans with AMCA-Certified Rating Seal. The fans shall be tested for air performance - flow rate, fan pressure, power, fan efficiency, air density, speed of rotation, and fan efficiency - according to AMCA 210/ASHRAE 51.

E. Operating Limits: Classify according to AMCA 99.

F. UL Standards: Power ventilators shall comply with UL 705. Power ventilators for use for restaurant kitchen exhaust shall also comply with UL 762.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install HVAC fans level and plumb.

B. Equipment Mounting:

1. Comply with requirements for vibration isolation and seismic control devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."
2. Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC."

C. Secure roof-mounted fans to roof curbs with cadmium-plated hardware. See Section 077200 "Roof Accessories" for installation of roof curbs.

D. Ceiling Units: Suspend units from structure per Drawings.

E. Support suspended units from structure using threaded steel rods and spring hangers having a static deflection of 1 inch. Vibration-control devices are specified in Section 230548 "Vibration and Seismic Controls for HVAC."

F. Install units with clearances for service and maintenance of fans, motors and all other components that may need access

G. Label units according to requirements specified in Section 230553 "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section 233300 "Air Duct Accessories."

B. Install ducts adjacent to HVAC fans to allow service and maintenance.

C. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that cleaning and adjusting are complete.
4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
5. Adjust belt tension.
6. Adjust damper linkages for proper damper operation.
7. Verify lubrication for bearings and other moving parts.
8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
10. Shut unit down and reconnect automatic temperature-control operators.
11. Remove and replace malfunctioning units and retest as specified above.

C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Prepare test and inspection reports.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

D. Replace fan and motor pulleys as required to achieve design airflow.

E. Lubricate bearings.

END OF SECTION

SECTION 233713 – DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Architectural plaque diffusers.
2. Perforated diffusers.
3. Adjustable blade face grilles.
4. Fixed face grilles.

B. Related Requirements:

1. Section 233300 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers.

1.3 ACTION SUBMITTALS

A. Submittals shall be formatted per Section 230000 “General Mechanical Requirements”. The manufacturer shall resubmit the specification section showing compliance with each respective paragraphs and specified items and features in that particular specification section. All exceptions shall be clearly identified by referencing respective paragraph and other requirements. Next to each specification item, indicate the following:

1. “No Exception Taken”.
2. “Exception”. All exceptions shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.

B. Product Data: For each type of product.

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Diffuser and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
2. Duct access panels.

B. Source quality-control reports.

PART 2 - PRODUCTS

2.1 ARCHITECTURAL PLAQUE DIFFUSERS (CD-1)

A. Manufacturers:

1. Titus OMNI
2. Price Industries SPD
3. Krueger

B. Material: Steel.

C. Finish: Baked enamel, white (or match ceiling at architectural direction)

D. Face Style: Plaque

E. Mounting: Surface and T-bar (refer to architectural RCP)

2.2 PERFORATED DIFFUSERS (EG-1, RG-1)

A. Manufacturers:

1. Titus PAR
2. Price Industries PDDR
3. Krueger

B. Material: Steel

C. Finish: Baked enamel, white.

D. Duct Inlet: Refer to Drawings for ducted connections where applicable. Return locations have large open square without neck to maximize return volume

E. Face Style: Perforated

F. Mounting: Surface and T-bar (refer to architectural RCP)

2.3 GRILLES

A. Manufacturers:

1. Titus 300 RS (supply), 350RL (return, exhaust)
2. Krueger
3. Price Industries

B. Adjustable Blade Face Grille (Supply SG-1)

1. Material: Steel.
2. Finish: Baked enamel, white.
3. Face Blade Arrangement: Vertical spaced 3/4 inch apart.
4. Rear-Blade Arrangement: Horizontal spaced 3/4 inch apart.
5. Frame: 1 inch wide.

C. Fixed Face Grille (EG-2, RG-2)

1. Material: Steel
2. Finish: Baked enamel, white.
3. Face Blade Arrangement: Horizontal; spaced 3/4 inch apart.
4. Face Arrangement: Perforated core.
5. Frame: 1 inch wide.

2.4 ACCESSORIES

A. Flexible Duct Support

1. Manufacturers: Titus FlexRight (no known equal)

a. Radius forming brace to support 4-inch through 16-inch diameter flexible air ducts.
b. Provide nylon cable ties to secure flex duct to FlexRight brace.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers are installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install diffusers level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

D. Install Titus FlexRight brace at all flexible duct-to-diffuser connections.

3.3 ADJUSTING

A. After installation, adjust diffusers to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION

SECTION 238113 - PACKAGED TERMINAL HEAT PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes packaged, terminal heat pumps

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For packaged, terminal air conditioners.

1. Include plans, elevations, sections, details for wall penetrations, and attachments to other work.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For packaged, terminal air conditioners, for tests performed by manufacturer and witnessed by a qualified testing agency.

B. Field quality-control reports.

C. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For packaged, terminal air conditioners to include in emergency, operation, and maintenance manuals.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of packaged, terminal air conditioners that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Sealed Refrigeration System: Manufacturer's standard, but not less than [five] years from date of Substantial Completion, including components and labor.
2. Warranty Period for Nonsealed System Parts: Manufacturer's standard, but not less than [five] years from date of Substantial Completion, including only components and excluding labor.
3. Warranty Period for Heat Exchangers: Manufacturer's standard, but not less than [five] years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Olimpia Maestro

B. Ephoca

2.2 MANUFACTURED UNITS

A. Description: Factory-assembled and -tested, self-contained, packaged, terminal air conditioner with room cabinet, electric refrigeration system, heating, and temperature controls; fully charged with refrigerant and filled with oil; with hardwired chassis.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - "Ventilation Rate Procedures," and Section 7 - "Construction and Startup."

D. ASHRAE/IES Compliance: Applicable requirements in ASHRAE/IES 90.1.

E. ASHRAE Thermal Comfort: Applicable requirements in ASHRAE 55.

F. UL listed and ETL performance certified.

2.3 CHASSIS

A. Cabinet:

1. Mounting: wall

2. Access Door: Hinged door in top of cabinet for access to controls.
3. Finish of Interior Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
4. Wall Sleeves:
5. Rectangular exterior adapter panel for wall sleeves.

B. Refrigeration System: Direct-expansion indoor coil with capillary restrictor and hermetically sealed scroll compressor with vibration isolation and overload protection.
1. Charge: R-410A.

C. Filters: Washable polyurethane in molded plastic frame.

D. Condensate Drain: Drain piping to direct condensate to building waste and vent piping.

1. Comply with ASHRAE 62.1 for drain pan construction and connections.

E. Outdoor Fan:

1. Indoor and Outdoor Fan Motors: Two speed; comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

a. Fan Motors: Permanently lubricated split capacitor.
b. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
c. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in electrical Sections.

2.4 CONTROLS

A. Control Module: Unit-mounted digital panel with touchpad temperature control and with touchpad for heating, cooling, and fan operation. Include the following features:

B. Provide wall-mounted BMS capable thermostat.

2.5 CAPACITIES AND CHARACTERISTICS

A. Refer to mechanical and electrical drawings.

2.6 SOURCE QUALITY CONTROL

A. Sound-Power Level Ratings: Factory test to comply with AHRI 300, "Sound Rating and Sound Transmission Loss of Packaged Terminal Equipment."

B. Unit Performance Ratings: Factory test to comply with AHRI 310/380/CSA C744, "Packaged Terminal Air-Conditioners and Heat Pumps."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb, maintaining manufacturer's recommended clearances and tolerances.

B. Install exterior louver in finished wall assembly; seal and weatherproof.

C. Install and anchor exterior louver to withstand, without damage to equipment and structure, seismic forces required by building code.

3.2 CONNECTIONS

A. Comply with requirements for piping specified in Section 232113 "Hydronic Piping" and Section 232116 "Hydronic Piping Specialties." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Comply with requirements for piping specified in Section 231123 "Facility Natural-Gas Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

C. Install piping adjacent to machine to allow service and maintenance.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform the following tests and inspections:

1. Inspect for and remove shipping bolts, blocks, and tie-down straps.
2. After installing packaged, terminal air conditioners and after electrical circuitry has been energized, test for compliance with requirements.
3. Unit is level on base and is flashed in exterior wall.
4. Unit casing has no visible damage.
5. Compressor, air-cooled condenser coil, and fans have no visible damage.
6. Labels are clearly visible.
7. Controls are connected and operable.
8. Shipping bolts, blocks, and tie-down straps are removed.
9. Filters are installed and clean.
10. Drain pan and drain line are installed correctly.
11. Electrical wiring installation complies with manufacturer's submittal and installation requirements in electrical Sections.
12. Installation: Perform startup checks according to manufacturer's written instructions, including the following:

a. Lubricate bearings on fan.
b. Check fan-wheel rotation for correct direction without vibration and binding.

13. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
14. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. After performance test, change filters.

E. Packaged, terminal air conditioners will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports.

3.4 ADJUSTING

A. Adjust initial temperature set points.

B. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

3.5 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain packaged, terminal air conditioners.

END OF SECTION

SECTION 238129 - VARIABLE-REFRIGERANT-FLOW HVAC SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes complete VRF HVAC system(s) including, but not limited to the following components to make a complete operating system(s) according to requirements indicated:

1. Indoor, exposed, wall-mounted units.
2. Indoor, suspended, ceiling-mounted units.
3. Indoor, dedicated outdoor air ventilation units.
4. Outdoor, air-source, heat-pump units.
5. Outdoor, air-source heat recovery units.
6. Heat recovery units.
7. System controls.
8. System refrigerant and oil.
9. System condensate drain piping.
10. System refrigerant piping.
11. Metal hangers and supports.
12. Metal framing systems.
13. Fastener systems.
14. Pipe stands.
15. Miscellaneous support materials.
16. Piping and tubing insulation.
17. System control cable and raceways.

1.3 DEFINITIONS

A. Air-Conditioning System Operation: System capable of operation with all zones in cooling only.

B. Heat-Pump System Operation: System capable of operation with all zones in either heating or cooling, but not with simultaneous heating and cooling zones that transfer heat between zones.

C. Heat Recovery System Operation: System capable of operation with simultaneous heating and cooling zones that transfer heat between zones.

D. HRU: Heat Recovery Unit. HRUs are used in heat recovery VRF HVAC systems to manage and control refrigerant between indoor units to provide simultaneous heating and cooling zones. "Heat Recovery Control Unit" is the term used by ASHRAE for what different manufacturers term as branch circuit controller, branch selector box, changeover box, flow selector unit, mode change unit, and other such terms.

E. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

F. Plenum: A space forming part of the air distribution system to which one or more air ducts are connected. An air duct is a passageway, other than a plenum, for transporting air to or from heating, ventilating, or air-conditioning equipment.

G. Three-Pipe System Design: One high pressure refrigerant vapor line, one low pressure refrigerant vapor line, and one refrigerant liquid line connect a single outdoor unit or multiple manifold outdoor units in a single system to associated system HRCUs. One liquid line and refrigerant vapor line connect HRCUs to associated indoor units.

H. Two-Pipe System Design: One refrigerant vapor line and one refrigerant liquid line connect a single outdoor unit or multiple manifold outdoor units in a single system to associated system HRCUs. One refrigerant liquid line and refrigerant vapor line connect HRCUs to associated indoor units. HRCUs used in two pipe systems act as an intermediate heat exchanger and include diverting valves and gas/liquid separators to move high and low pressure refrigerant between indoor units.

I. VRF: Variable refrigerant flow.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for indoor and outdoor units and for HRUs.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
3. Include operating performance at design conditions and at extreme maximum and minimum outdoor ambient conditions.
4. Include description of system controllers, dimensions, features, control interfaces and connections, power requirements, and connections.
5. Include system operating sequence of operation in narrative form for each unique indoor- and outdoor-unit and HRU control.
6. Include description of control software features.
7. Include total refrigerant required and a comprehensive breakdown of refrigerant required by each system installed.
8. Include refrigerant type and data sheets showing compliance with requirements indicated.
9. For system design software.
10. Indicate location and type of service access.

B. Shop Drawings: For VRF HVAC systems.

1. Include plans, elevations, sections, mounting, and attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
4. Include diagrams and details of refrigerant piping and tubing showing installation requirements for manufacturer-furnished divided flow fittings.
5. Include diagrams for power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, elevations, sections, and details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Suspended ceiling components.
2. Structural floors, roofs and associated members to which equipment, piping, ductwork**,** cables, and conduit will be attached.
3. Size and location of initial access modules for acoustical tile.
4. Wall-mounted controllers located in finished space showing relationship to light switches, fire-alarm devices, and other installed devices.
5. Size and location of access doors and panels installed behind walls and inaccessible ceilings for products installed behind walls and requiring access.
6. Items penetrating finished ceiling including the following:

    a. Luminaires.
    b. Air outlets and inlets.
    c. Speakers.
    d. Sprinklers.
    e. Service access panels.

B. Qualification Data:

1. For Installer: Certificate from VRF HVAC system manufacturer certifying that Installer has successfully completed prerequisite training administered by manufacturer for proper installation of systems, including but not limited to, equipment, piping, controls, and accessories indicated and furnished for installation.

    a. Retain copies of Installer certificates on-site and make available on request.

2. For VRF HVAC system manufacturer.
3. For VRF HVAC system provider.

C. Source quality-control reports.

D. Field quality-control reports.

E. Sample Warranties: For manufacturer's warranties.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For VRF HVAC systems to include in emergency, operation, and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters:

    a. One set(s) for each unit with replaceable filters.
    b. One set(s) for each unit type and unique size of washable filters.

2. Indoor Units: One for each unique size and type installed.
3. Controllers for Indoor Units: One for each unique controller type installed.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Nationally recognized manufacturer of VRF HVAC systems and products.
2. Shipped VRF HVAC systems with similar requirements to those indicated for a continuous period of five years within time of bid.
3. VRF HVAC systems and products that have been successfully tested and in use on at least **three**> completed projects.
4. Having complete published catalog literature, installation, and operation and maintenance manuals for all products intended for use.
5. Having full-time in-house employees for the following:

    a. Product research and development.
    b. Product and application engineering.
    c. Product manufacturing, testing, and quality control.
    d. Technical support for system installation training, startup, commissioning, and troubleshooting of installations.
    e. Owner training.

B. Factory-Authorized Service Representative Qualifications:

1. Authorized representative of, and trained by, VRF HVAC system manufacturer.
2. In-place facility located within 100 miles of Project.
3. Demonstrated past experience with products being installed for period within three consecutive years before time of bid.
4. Demonstrated past experience on five projects of similar complexity, scope, and value.

a. Each person assigned to Project shall have demonstrated past experience.

5. Staffing resources of competent and experienced full-time employees that are assigned to execute work according to schedule.
6. Service and maintenance staff assigned to support Project during warranty period.
7. Product parts inventory to support ongoing system operation for a period of not less than five years after Substantial Completion.
8. VRF HVAC system manufacturer's backing to take over execution of Work if necessary to comply with requirements indicated. Include Project-specific written letter, signed by manufacturer's corporate officer, if requested.

C. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by VRF HVAC system manufacturer.

1. Each employee shall be certified by manufacturer for proper installation of systems, including, but not limited to, equipment, piping, controls, and accessories indicated and furnished for installation.
2. Installer certification shall be valid and current for duration of Project.
3. Retain copies of Installer certificates on-site and make available on request.
4. Each person assigned to Project shall have demonstrated past experience.

a. Demonstrated past experience with products being installed for period within three consecutive years before time of bid.
b. Demonstrated past experience on five projects of similar complexity, scope, and value.

D. ISO Compliance: System equipment and components furnished by VRF HVAC system manufacturer shall be manufactured in an ISO 9001 and ISO 14001 facility.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in a clean and dry place.

B. Comply with manufacturer's written rigging and installation instructions for unloading and moving to final installed location.

C. Handle products carefully to prevent damage, breaking, denting, and scoring. Do not install damaged products.

D. Protect products from weather, dirt, dust, water, construction debris, and physical damage.

1. Retain factory-applied coverings on equipment to protect finishes during construction and remove just prior to operating unit.
2. Cover unit openings before installation to prevent dirt and dust from entering inside of units. If required to remover coverings during unit installation, reapply coverings over openings after unit installation and remove just prior to operating unit.

E. Replace installed products damaged during construction.

1.10 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace equipment and components that fail(s) in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures.
b. Faulty operation.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

2. Warranty Period:

a. For Compressor: Seven years from date of Substantial Completion.
b. For Parts, Including Controls: Two years from date of Substantial Completion.
c. For Labor: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. LG Multi-V

B. Daikin AC VRF

C. Mitsubishi VRF

D. Source Limitations: Obtain products from single source from single manufacturer including, but not limited to, the following:

1. Indoor and outdoor units, including accessories.
2. Controls and software.
3. HRCUs.
4. Refrigerant isolation valves.
5. Specialty refrigerant pipe fittings.

2.2 AIR-COOLED, COMPRESSOR-CONDENSER UNIT

A. General:
1. The air-conditioning system shall use R410A refrigerant.
2. Each system shall consist of one, two or three air source outdoor unit frame.
3. Dual and triple frame configurations shall be field piped together using manufacturer’s designed and supplied Y-branch kit in conjunction with field provided interconnecting pipe to form a common refrigerant circuit.

4. System shall employ self-diagnostics function to identify any malfunctions and provide type and location of malfunctions via fault alarms.
5. Refrigerant circuit configuration for unified Heat Pump systems:
   a. The refrigerant circuit shall be constructed using field provided ACR copper, de-hydrated, refrigerant rated copper pipe, piped together with manufacturer supplied Heat recovery unit(s) and Y- branches, as may be required, connected to multiple (ducted, non-ducted or mixed combination) indoor units to effectively and efficiently control the heat pump or Heat Recovery mode operations or simultaneous heating and cooling operation of the VRF system. Other pipe materials, if used, shall perform, at a minimum, as well as that specified above, shall not have any adverse reactions to any other components or materials also in use in the system and shall be installed per manufactures instructions. LG does not endorse, approve or recommend any mechanical fitting or pipe manufacture.
   b. All refrigerant pipe, y-branches, elbows and valves shall be individually insulated with no air gaps. Insulation R-value (thickness) shall not be less than the minimum called for by the local building code, local energy code or as a minimum per manufacture installation requirements. In no case shall the insulation be allowed to be compressed at any point in the system.
6. Factory installed microprocessor controls in the outdoor unit(s), heat recovery unit(s), and indoor unit(s) shall perform functions to optimize the operation of the VRF system and communicate in a daisy chain configuration between outdoor unit and heat recovery unit(s) and indoor unit(s) via RS485 network. Controls shall also be available to control other building systems as required from the VRF control system. DIO/AIO capabilities shall be available as well as a central controller to perform operation changes, schedules and other duties as required by this specification. Addition of separate building control system shall not be required. Other control devices and sequences shall be as specified in other sections of this project specification.
7. Cooling of the inverter PCB shall be conducted by way of high pressure, sub-cooled liquid refrigerant via heat exchanger attached to rear side of inverter PCB. The full capacity flow of refrigerant shall pass though the heat exchangers to maximize the cooling effect of the PCBs and to aid in the evaporation process and capacity of the outdoor coil during the heating mode. The recovered heat of the PCBs must be used to enhance the overall heating process, other uses or dissipation of heat to ambient shall not be permitted.
8. Fuzzy control logic shall establish and maintain target evaporating temperature (Te) to be constant on cooling mode and condensing temperature (Tc) constant on heating mode by Fuzzy control logic to ensure the stable system performance. Other compressor control capabilities shall be available via special function controls as noted elsewhere in this specification.
9. The system shall allow for up to 5 steps of flexible capacity control using an LG I/O controller or up to 8 steps of flexible capacity control using a BMS control by others. This FCC shall be employed when electrical demand limiting, night time noise reduction or any other flexible capacity control requirement based on any other requirement using contact closures or 0-10vdc to engage
10. The system shall be designed to accept connection up to 64 indoor units depending on the outdoor unit model selected.
11. The outdoor unit refrigerant circuit shall employ for safety a threaded fusible plug outdoor unit shall have a fusible plug.

12. The unit shall be shipped from the factory fully assembled including internal refrigerant piping, compressor, contacts, relay(s), power and communications wiring necessary.
13. Each refrigeration circuit shall have the following components:
    a. Refrigerant strainer(s)
    b. Check valve(s)
    c. Inverter driven, medium pressure vapor injection, high pressure shell compressors
    d. Liquid refrigerant cooled inverter PCB
    e. Accumulator – receiver(s)
    f. 4-way reversing valve
    g. Vapor injection valve
    h. Variable path heat exchanger valve
    i. Oil balancing control
    j. Oil Level sensor
    k. Electronic expansion valve(s)
    l. Sub-cooler
    m. High and low side Schrader valve service ports with caps.
    n. Service Valves

B. Unit Cabinet:
1. Outdoor unit cabinet shall be made of 20 gauge galvanized steel with an enamel finish.
2. Outdoor unit cabinet finish shall be tested in accordance with ASTM B-117 salt spray test procedure for a minimum of 1000 hours.
3. The front panels of the outdoor units shall be removable type for access to internal components.
4. A smaller service access panel, not larger than 6.25”x 6.67” and secured by a maximum of (2) screws shall be provided to access the following:
    a. Service tool connection
    b. DIP switches
    c. Auto addressing
    d. Error codes
5. The cabinet shall have piping knockouts to allow refrigerant piping to be connected at the front or through the bottom of the unit.

C. Fan:
1. Each 6 ton cabinet shall be equipped with one direct drive variable speed propeller fan with Brushless Digitally Controlled (BLDC) motor with a vertical air discharge.
2. Each 8 to 20 ton cabinet shall be equipped with two direct drive variable speed propeller fan(s) with BLDC motor(s) with a vertical air discharge.
3. The fan(s) blades shall be made of Acrylonitrile Butadiene Styrene (ABS) material.
4. The fan(s) motor shall be equipped with permanently lubricated bearings.
5. The fan motor shall be variable speed with a maximum operating speed of 1050 RPM.
6. The fan shall have a raised guard to help prevent contact with moving parts.
7. The cabinet shall have option to change the discharge air direction from vertical to horizontal using optional factory provided air guides.

8. The cabinet shall have DIP switch setting to raise external static pressure up to 0.32 in-wg.

D. Condenser Coil:
1. The outdoor unit shall have a factory built coil comprised of aluminum fins mechanically bonded on copper tubing.
2. The copper tubes shall have inner groves.
3. The aluminum fins shall have a factory applied Black Fin heat exchanger coating that is comprised of a highly corrosion resistant epoxy resin coating, 1.6-2.0 um thick, designed to perform in corrosive environments such as contaminated and humid conditions. The Black Fin heat exchanger protection shall include a Hydrophilic coating which minimizes moisture buildup on the fin heat exchanger. The “Black Fin” heat exchanger shall have been tested to the following conditions. 1) ASTM B-117 Salt spray test – 1500 hours with no corrosion, 2) Acid salt test – 900 hours .02% corrosion, 3) ASM corrosion test – 3,000 hours. The Black Fin coating shall be certified by underwriters Laboratories and per ISO 21207. The above conditions shall establish the minimum allowable performance which all alternates must comply. Shall have multiple circuits designed for path isolation and variable velocity control.
4. The outdoor unit coil shall be tested to a pressure of 551 psig.
5. The coil for each cabinet shall have 14 Fins per Inch (FPI).
6. All the outdoor units shall have a 3 rows heat exchanger.
7. The cabinet shall have a coil guard.

E. Compressor:
1. Each 6, 8, 10 ton cabinet shall be equipped with one hermetically sealed, inverter driven, High Side Shell (HSS) scroll compressor.
2. The 12 thru 20 ton cabinet shall be equipped with two hermetically sealed, inverter driven, HSS controlled scroll compressors.
3. Each inverter driven, HSS scroll compressor shall be capable of operating in a frequency range from 15 Hz to 150 Hz with control in 0.5 Hz increments.
4. The compressor(s) shall be equipped with a 60 Watt crankcase heater.
5. The compressor shall use a factory charge of Polyvinyl Ether (PVE) oil.
6. The compressor bearing(s) shall have Teflon™ coating.
7. The compressor(s) shall be protected with:
   a. High Pressure switch
   b. Over-current /under current protection
   c. Phase failure
   d. Phase reversal
8. Standard, non-inverter driven compressors shall not be permitted

F. Oil Management
1. The system shall have Hi-POR (High Pressure Oil Return) to ensure a consistent film of oil on all moving compressor parts at low speed. Oil is returned to compressor through a separate oil injection pipe.
   a) Oil return system shall maintain high side pressure return to the compressor.
2. The system shall be provided with a centrifugal oil separator designed to extract oil from the oil/refrigerant gas stream leaving the compressor and return the extracted oil to the compressor oil sump.

3. The system shall have an oil level sensor in the compressor to provide direct oil level sensing.
4. The system shall only initiate an oil return cycle if the oil level is too low.
5. Timed oil return operations or non-oil level sensing systems shall not be permitted.

G. Refrigerant Management
1. System shall have advanced refrigerant control functions that optimize operating efficiency at all ambient operating conditions. Advanced refrigerant control functions shall include:
2. Accumulator shall be equipped with controls that vary the amount of refrigerant charge being circulated based on operating mode.
3. Outdoor unit coil shall be equipped with controls that maximizes heat transfer. Controls shall vary the coil circuiting between parallel and series configurations and be able to change flow direction in response to multiple refrigerant monitoring parameters and operating conditions.
4. Compressors shall be equipped with an intermediary port that introduces additional refrigerant to the compression chamber based on multiple refrigerant system monitoring parameters. This feature increases heating capacity at low ambient conditions.
5. System shall have advanced refrigerant control functions that optimize operating efficiency at all ambient operating conditions.

H. Sound Levels
1. Each cabinet shall be rated with a sound level not to exceed 59.5 dB(A) when tested in an anechoic chamber under ISO3745 standard.

I. Sensors
1. Each single cabinet shall have
2. Suction temperature sensor
3. Discharge temperature sensor
4. High Pressure sensor
5. Low Pressure sensor
6. Outdoor temperature sensor
7. Outdoor unit heat exchanger temperature sensor

2.3 EVAPORATOR-FAN UNIT

A. General
1. Unit shall be factory assembled, wired, piped and run tested.
2. Unit shall be horizontal ducted or wall mount ductless as indicated on the plans
3. Unit shall be designed to be installed for indoor application.
4. The supply air shall be flanged for field installed ductwork that shall not exceed the external static pressure limitation of the unit.
5. Unit shall be capable to be installed with heat pump or heat recovery or cooling VRF system.

B. Casing/Panel
1. Unit case shall be manufactured using galvanized steel plate.

2. The cold surfaces of the unit shall be covered internally with a coated polystyrene insulating material.
3. The cold surfaces of the unit shall be covered externally with sheet insulation made of Ethylene Propylene Diene Monomer (M-Class) (EPDM)
4. The external insulation shall be plenum rated and conform to ASTM Standard D-1418.
5. Unit shall be provided with hanger brackets designed to support the unit weight on four corners.
6. Hanger brackets shall have pre-punched holes designed to accept field supplied, all thread rod hangers.
7. Wall mount ductless units shall manufactured using Acrylonitrile Butadiene Styrene (ABS) polymeric resin and has a morning fog finish.

C. Cabinet Assembly
1. Unit shall be equipped with factory installed temperature thermistors for
   a. Return air
   b. Refrigerant entering coil.
   c. Refrigerant leaving coil.
2. Unit shall have a factory assembled, piped and wired electronic expansion valve (EEV) for refrigerant control.
3. Unit shall have a built-in control panel to communicate with other indoor units and to the outdoor unit.
4. Unit shall have the following functions as standard
   a. Self-diagnostic function
   b. Auto restart function
   c. Auto changeover function (Heat Recovery system only)
   d. Auto operation function
   e. Child lock function
   f. Forced operation
   g. Dual thermistor control
   h. Sleep mode
   i. External static pressure (ESP) control

D. Fan Assembly
1. The unit shall have two direct driven Sirocco fans.
2. The fan shall be made of high strength ABS GP-2200 polymeric resin.
3. The fans shall be mounted on a common shaft.
4. The fan motor shall be Brushless Digitally controlled (BLDC) with permanently lubricated and sealed ball bearings.
5. The fan/motor assembly shall be mounted on vibration attenuating rubber grommets.
6. The fan speed shall be controlled using microprocessor based direct digitally controlled algorithm.
7. In cooling mode, the indoor fan shall have the following settings: Low, Med, High and Auto.
8. In heating mode, the indoor fan shall have the following settings: Low, Med, High and Auto.
9. The Auto fan setting shall adjust the fan speed to most effectively achieve the set-point.
10. Each of the settings can be field adjusted from the factory setting (RPM/ESP).

11. Unit shall be designed for high speed air volume against an external static pressure of up to 1.0” water gauge.

E. Filter Assembly
1. Horizontal ducted units shall be provided with a field mounted return filter box. Filter shall be high-efficiency 2” MERV 13 not to exceed external static pressure limitation of the high static ducted indoor unit.
2. Ductless wall mount units shall have a factory supplied removable, washable filter.
3.

F. Coil Assembly
1. Unit shall have a factory built coil comprised of aluminum fins mechanically bonded on copper tubing.
2. Unit shall have minimum of 2 rows of coils.
3. Unit shall have a factory supplied condensate drain pan below the coil.
4. Horizontal unit shall be installed and wired condensate drain pump capable of providing minimum 27.5 inch lift from bottom surface of the unit.
5. Vertical unit shall be designed for gravity drain.
6. Unit drain pan shall be provided with a secondary drain port/plug allowing pan to be drained for service.
7. The drain pump shall have a safety switch to shut off the unit if condensate rises too high in the drain pan.
8. Unit shall have provision of 45° flare refrigerant pipe connections
9. The coil shall be factory pressure tested at a minimum of 551 psig.
10. All refrigerant piping from outdoor unit or Heat Recovery (HR) unit to indoor unit shall be field insulated.

G. Microprocessor Control
1. The unit shall have a factory installed microprocessor controller capable of performing functions necessary to operate the system.
2. The unit shall be able to communicate with other indoor units and the outdoor unit using a field supplied minimum of 18 AWG, 2 core, stranded and shielded communication cable.
3. The unit controls shall operate the indoor unit using one of the five operating modes:
    a. Auto changeover (Heat Recovery System only)
    b. Heating
    c. Cooling
    d. Dry
    e. Fan only

H. Electrical
1. The unit electrical power shall be 208-230/1/60 (V/Ph/Hz)
2. The unit shall be capable of operating within voltage limits of +/- 10% of the rated voltage.

I. Controls
1. Unit shall use controls provided by the manufacturer to perform all functions necessary to operate the system effectively and efficiently and communicate with the outdoor unit over an RS485 daisy chain.

2.4 HEAT RECOVERY UNIT (HRU) FOR HEAT RECOVERY SYSTEM

A. General
1. HR unit shall be designed and manufactured by the same manufacturer of VRF indoor unit(s) and outdoor unit(s).
2. HR unit casing shall be made with galvanized steel.
3. HR unit shall require 208-230V/1-phase/60Hz power supply.
4. HR Unit shall be an intermediate refrigerant control device between the air source outdoor unit and the indoor units to control the systems simultaneous cooling and heating operation.
5. HR unit shall be engineered to work with a three pipe VRF system comprising of
   a. High Pressure Vapor Pipe
   b. Low Pressure Vapor Pipe
   c. Liquid Pipe
6. HR unit shall be designed to be piped in series or parallel.
7. HR unit shall have 2, 3, 4, 6 or 8 ports.
8. Each port shall be capable of operating in cooling or heating independently regardless of the operating mode of any other port on the HR unit or in the system.
9. Each port shall be capable of connecting from 1 to 8 indoor units to a maximum nominal capacity of 54MBh.
10. Maximum nominal capacity per HR unit shall not exceed 230 MBh.
11. Indoor units greater than 54MBh nominal capacity shall be twinned using a reverse Y-branch.
12. HR unit shall be internally piped, wired, assembled and run tested at the factory.
13. HR unit shall be designed for installation in a conditioned environment.
14. HR unit shall have a liquid bypass valve.
15. HR unit shall have (2) electronic expansion valves per port.
16. HR unit shall have a balancing valve to control the pressure between the high pressure and low pressure pipe during mode switching.
17. HR unit shall have an electronic expansion valve for sub-cooling.
18. HR unit shall not require a condensate drain.
19. HR unit shall be internally insulated.
20. All field refrigerant lines between outdoor unit and HR unit and from HR unit to indoor unit shall be field insulated.
21. The HR unit shall not exceed a net weight of 49 lbs.
22. The system shall be designed to accommodate 16 HR units connected to Heat Recovery units piped in single series string.
23. A single series pipe string of 1 to 16 HR units shall be capable of serving indoor units with a total nominal capacity of 230 MBH per HR unit.

B. Piping Capabilities
1. The elevation difference between indoor units on heat pump systems shall be 131 feet.
2. The elevation differences for heat recovery systems shall be:
   a. Heat recovery unit (HRU) to connected indoor unit shall be 49 feet
   b. HRU to HRU shall be 49 feet
   c. Indoor unit to indoor unit connected to same HRU shall be 49 feet
   d. Indoor unit to indoor unit connected to separate parallel HRU’s shall be 131 feet.

3. The acceptable elevation difference between two series connected HR units shall be 16 feet.

C. Controls
1. HR unit(s) shall have factory installed unit mounted control boards and integral microprocessor to communicate with other devices in the VRF system.
2. HR unit shall communicate with the air source unit via the air source/indoor unit 2-conductor shielded communications cable terminated using a daisy chain configuration.
3. The VRF manufacturer shall provide published documentation that specifically allows the installation of field provided isolation valves on all pipes connected to the Heat Recovery unit to allow the servicing of HR units refrigerant circuit or the replacement of HR unit without evacuating the balance of the piping system

2.5 CENTRAL CONTROLLER

A. The LG AC Smart V Central Controller shall be capable of monitoring and control of up to 128 indoor units or 130 Input/Outputs points through its touchscreen interface and embedded web browser. The LG AC Smart V shall provide multiple energy management schemes and control of third-party equipment when paired with associated I/O controllers. Additionally, the LG AC Smart IV Central Controller shall be capable of providing daily, weekly, yearly, and holiday programmable scheduling of Occupied/Unoccupied settings, On/Off, Mode of Operation, set point and fan speed based on the available functions of the connected system.

B. The LG AC Smart V Central Controller shall communicate to the LG Multi V™ VRF indoor unit via the VRF RS-485 daisy-chain communication protocol. The LG AC Smart V Central Controller shall have a 10.2” backlit touchscreen LCD display screen. The LG AC Smart V Central Controller shall have web access with user control. The LG AC Smart V Central Controller shall be able to generate an operation and error history log with reporting capabilities. The LG AC Smart V Central Controller shall be able to control up to 128 indoor units in a group or as a single zone. The LG AC Smart V Central Controller shall support two digital input and two digital outputs for device interlock. The LG AC Smart V Central Controller shall have two set point auto changeover. The LG AC Smart V Central Controller shall have occupied/unoccupied set point control. The LG AC Smart V Central Controller shall have remote controller lock (All, Setpoint, Mode, and Fan Speed). The LG AC Smart V Central Controller shall have error e-mail notification. The LG AC Smart V Central Controller shall have visual floor plan navigation.

C. The LG AC Smart V Central controller shall be powered via 24 VAC or 12 VDC

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine products before installation. Reject products that are wet, moisture damaged, or mold damaged.

C. Examine roughing-in for piping and tubing to verify actual locations of connections before equipment installation.

D. Examine roughing-in for ductwork to verify actual locations of connections before equipment installation.

E. Examine roughing-in for wiring and conduit to verify actual locations of connections before equipment installation.

F. Examine walls, floors, roofs, and outdoor pads for suitable conditions where equipment will be installed.

G. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

H. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EQUIPMENT INSTALLATION, GENERAL

A. Clearance:

1. Maintain manufacturer's recommended clearances for service and maintenance.
2. Maintain clearances required by governing code.

B. Loose Components: Install components, devices, and accessories furnished by manufacturer, with equipment, that are not factory mounted.

C. Equipment Restraint Installation: Install equipment with seismic-restraint device. Comply with requirements for seismic-restraint devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."

3.3 INSTALLATION OF INDOOR UNITS

A. Install units to be level and plumb while providing a neat and finished appearance.

B. Unless otherwise required by VRF HVAC system manufacturer, support ceiling-mounted units from structure above using threaded rods; minimum rod size of 3/8 inch.

C. Adjust supports of exposed and recessed units to draw units tight to adjoining surfaces.

D. Protect finished surfaces of ceilings, floors, and walls that come in direct contact with units. Refinish or replaced damaged areas after units are installed.

E. In rooms with ceilings, conceal piping and tubing, controls, and electrical power serving units above ceilings.

F. In rooms without ceiling, arrange piping and tubing, controls, and electrical power serving units to provide a neat and finished appearance.

G. Provide lateral bracing if needed to limit movement of suspended units to not more than 0.25 inch.

H. For wall-mounted units that are exposed, conceal piping and tubing, controls, and electrical power serving units within walls.

3.4 INSTALLATION OF OUTDOOR UNITS

A. Install units to be level and plumb while providing a neat and finished appearance.

B. Install outdoor units on support structures indicated on Drawings.

3.5 GENERAL REQUIREMENTS FOR PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping and tubing systems. Install piping and tubing as indicated unless deviations to layout are approved on coordination drawings.

B. Install piping and tubing in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping and tubing at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping and tubing above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping and tubing to permit valve servicing.

F. Install piping and tubing at indicated slopes.

G. Install piping and tubing free of sags.

H. Install fittings for changes in direction and branch connections.

I. Install piping and tubing to allow application of insulation.

J. Install groups of pipes and tubing parallel to each other, spaced to permit applying insulation with service access between insulated piping and tubing.

K. Install sleeves for piping and tubing penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

3.6 INSTALLATION OF SYSTEM CONDENSATE DRAIN PIPING

A. General Requirements for Drain Piping and Tubing:

1. Install a union in piping at each threaded unit connection.
2. Install an adjustable stainless-steel hose clamp with adjustable gear operator on unit hose connections. Tighten clamp to provide a leak-free installation.
3. If required for unit installation, provide a trap assembly in drain piping to prevent air circulated through unit from passing through drain piping. Comply with more stringent of the following:

    a. Details indicated on Drawings.
    b. Manufacturer's requirements.
    c. Governing codes.
    d. In the absence of requirements, comply with requirements of ASHRAE handbooks.

4. Extend drain piping from units with drain connections to drain receptors as indicated on Drawings. If not indicated on Drawings, terminate drain connection at nearest accessible location that is not exposed to view by occupants.
5. Provide each 90-degree change in direction with a Y- or T-fitting. Install a threaded plug connection in the dormant side of fitting or future use as a service cleanout.

B. Gravity Drains:

1. Slope piping from unit connection toward drain termination at a constant slope of not less than one percent.

C. Pumped Drains:

1. If unit condensate pump or lift mechanism is not included with an integral check valve, install a full-size check valve in each branch pipe near unit connection to prevent backflow into unit.

3.7 INSTALLATION OF REFRIGERANT PIPING

A. Refrigerant Tubing Kits:

1. Unroll and straighten tubing to suit installation. Deviations in straightness of exposed tubing shall be unnoticeable to observer.
2. Support tubing using hangers and supports indicated at intervals not to exceed 5 feet. Minimum rod size, 1/4 inch.
3. Prepare tubing ends and make mating connections to provide a pressure tight and leak-free installation.

B. Install refrigerant piping according to ASHRAE 15 and governing codes.

C. Select system components with pressure rating equal to or greater than system operating pressure.

D. Install piping as short and direct as possible, with a minimum number of joints and fittings.

E. Arrange piping to allow inspection and service of equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Section 083113 "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.

F. Install refrigerant piping and tubing in protective conduit where installed belowground.

G. Install refrigerant piping and tubing in rigid or flexible conduit in locations where exposed to mechanical damage.

H. Unless otherwise required by VRF HVAC system manufacturer, slope refrigerant piping and tubing as follows:

1. Install horizontal hot-gas discharge piping and tubing with a uniform slope downward away from compressor.
2. Install horizontal suction lines with a uniform slope downward to compressor.
3. Install traps to entrain oil in vertical runs.
4. Liquid lines may be installed level.

I. When brazing, remove or protect components that could be damaged by heat.

J. Before installation, clean piping, tubing, and fittings to cleanliness level required by VRF HVAC system manufacturer.

K. Joint Construction:

1. Ream ends of tubes and remove burrs.
2. Remove scale, slag, dirt, and debris from inside and outside of tube and fittings before assembly.
3. Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.

    a. Use Type BCuP (copper-phosphorus) alloy for joining copper fittings with copper tubing.
    b. Use Type BAg (cadmium-free silver) alloy for joining copper with bronze.

L. Consult manufacturer’s long line set application guide for piping lengths that exceed 80 feet. Provide the following accessories for long line applications:
1. Liquid Line solenoid valve at outdoor unit.
2. Thermal expansion valve.
3. Crank case heater.
4. Start capacitor and relay.

3.8 INSTALLATION OF METAL HANGERS AND SUPPORTS

A. Comply with requirements in Section 230548 "Vibration and Seismic Controls for HVAC" for seismic restraints.

B. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.

D. Comply with MFMA-103 for metal framing system selections and applications that are not specified.

E. Fastener System Installation:

1. Install powder-actuated fasteners, for use in lightweight concrete or concrete slabs less than 4 inches thick, in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
3. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

F. Pipe Stand Installation:

1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. See Section 077200 "Roof Accessories" for curbs.

G. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

I. Install lateral bracing with pipe hangers and supports to prevent swaying.

J. Install building attachments within concrete slabs or attach to structural steel.

1. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

K. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

M. Piping and Tubing Insulation:

1. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
2. Shield Dimensions for Pipe: Not less than the following:

    a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.

N. Horizontal-Piping Hangers and Supports: Install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
3. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
4. Multiple horizontal pipes located indoors may use metal framing systems with split clamp attachment for each pipe in lieu if individual clevis hangers.
5. Pipe stands for horizontal pipes located outdoors.
6. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
7. On plastic pipe, install pads or cushions on bearing surfaces to prevent hanger from scratching pipe.

O. Plastic Pipe Hanger and Support Spacing:

1. Space hangers and supports according to pipe manufacturer's written instructions for service conditions.
2. Maximum spacing, 5 feet; minimum rod size, 1/4 inch.

P. Vertical-Piping Clamps: Install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8).
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): If longer ends are required for riser clamps.

Q. Support vertical runs at roof, at each floor, and at midpoint intervals between floors, not to exceed 5 feet.

R. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified.

S. Use hangers, supports, and attachments with galvanized coatings unless otherwise indicated.

T. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

U. Trim excess length of continuous-thread hanger and support rods to 1 inch.

V. Hanger-Rod Attachments: Install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
4. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

W. Building Attachments: Install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

3.9 INSTALLATION OF PIPING AND TUBING INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated. Installation to maintain a continuous vapor barrier.

B. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are unavailable, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

E. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.10 INSTALLATION OF DUCT, ACCESSORIES, AND AIR OUTLETS

A. Where installing ductwork adjacent to equipment, allow space for service and maintenance.

B. Comply with requirements for metal ducts specified in Section 233113 "Metal Ducts."

C. Comply with requirements for air duct accessories specified in Section 233300 "Air Duct Accessories."

D. Comply with requirements for flexible ducts specified in Section 233346 "Flexible Ducts."

E. Comply with requirements for air diffusers, registers, and grilles specified in Section 233713 "Diffusers, Registers, and Grilles."

3.11 ELECTRICAL INSTALLATION

A. Comply with requirements indicated on Drawings and in applicable Division 26 Sections.

B. To extent electrical power is required for system equipment, components, and controls, and is not indicated on Drawings and addressed in the Specifications, the design for such electrical power shall be delegated to VRF HVAC system provider.

1. Delegated design of electrical power to equipment, components and controls, and associated installation shall be included at no additional cost to Owner.

C. Connect field electrical power source to each separate electrical device requiring field electrical power. Coordinate termination point and connection type with Installer.

D. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

E. Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems" for grounding connections.

F. Install nameplate or acrylic label with self-adhesive back for each electrical connection indicating electrical equipment designation and circuit number feeding connection.

1. Nameplate shall be laminated phenolic layers of black with engraved white letters. Letters at least 1/2 inch high.
2. Locate nameplate or label where easily visible.

G. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems" for raceway selection and installation requirements for boxes, conduits, and wireways as supplemented or revised in this Section.

1. Outlet boxes shall be no smaller than required by NFPA 70 for the number of conductors enclosed in the box.
2. Flexible metal conduit shall not be used.

H. Comply with TIA-569-D for pull-box sizing and length of conduit and number of bends between pull points.

I. Install manufactured conduit sweeps and long-radius elbows if possible.

J. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

3.12 SOFTWARE

A. Cybersecurity:

1. Software:

a. Coordinate security requirements with IT department.
b. Ensure that latest stable software release is installed and properly operating.
c. Disable or change default passwords to password using a combination of uppercase and lower letters, numbers, and symbols at least eight characters in length. Record passwords and turn over to party responsible for system operation and administration.

2. Hardware:

a. Coordinate location and access requirements with IT department.
b. Enable highest level of wireless encryption that is compatible with Owner's ICT network.
c. Disable dual network connections.

3.13 INSTALLATION OF SYSTEM CONTROL CABLE

A. Comply with NECA 1.

B. Installation Method:

1. Install cables in raceways except as follows:

a. Within equipment and associated control enclosures.
b. In gypsum board partitions where cable may be enclosed within wall cavity.

2. Conceal raceway and cables except in unfinished spaces.

C. General Requirements for Cabling:

1. Comply with TIA-568-C Series of standards.
2. Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems."
3. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
4. Cables may not be spliced and shall be continuous from terminal to terminal. Do not splice cable.
5. Cables serving a common system may be grouped in a common raceway. Install control cable in separate raceway from power wiring. Do not group conductors from different systems or different voltages.
6. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
7. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in

BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems." Install lacing bars and distribution spools.

8. Do not install bruised, kinked, scored, deformed, or abraded cable. Remove and discard cable if damaged during installation and replace it with new cable.
9. Cold-Weather Installation: Bring cable to room temperature before dereeling. Do not use heat lamps for heating.
10. Pulling Cable: Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems." Monitor cable pull tensions.
11. Support: Do not allow cables to lie on removable ceiling tiles or access panels.
12. Secure: Fasten securely in place with hardware specifically designed and installed so as to not damage cables.
13. Provide strain relief.
14. Keep runs short. Allow extra length for connecting to terminals.
15. Do not bend cables in a radius less than 10 times the cable OD.
16. Use sleeves or grommets to protect cables from vibration at points where they pass around sharp corners and through penetrations.
17. Ground wire shall be copper, and grounding methods shall comply with IEEE C2. Demonstrate ground resistance.

D. Balanced Twisted-Pair Cable Installation:

1. Comply with TIA-568-C.2.
2. Do not untwist balanced twisted-pair cables more than 1/2 inch at the point of termination to maintain cable geometry.

E. Open-Cable Installation:

1. Suspend copper cable not in a wireway or pathway a minimum of 8 inches above ceilings by cable supports not more than 30 inches apart.
2. Cable shall not be run through or on structural members or in contact with pipes, ducts, or other potentially damaging items. Do not run cables between structural members and corrugated panels.

F. Separation from EMI Sources: Comply with BICSI TDMM and TIA-569-D recommendations for separating unshielded cable from potential EMI sources including electrical power wiring and equipment.

3.14 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping."

B. Comply with TIA-569-D, Annex A, "Firestopping."

C. Comply with BICSI TDMM, "Firestopping" Chapter.

3.15 GROUNDING INSTALLATION

A. For low-voltage control cabling, comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

3.16 IDENTIFICATION

A. Identify system equipment, piping, tubing, and valves. Comply with requirements for identification specified in Section 230553 "Identification for HVAC Piping and Equipment."

B. Identify system electrical and controls components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

1. Identify each control cable on each end and at each terminal with a number-coded identification tag. Each cable shall have a unique tag.

3.17 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage VRF HVAC system manufacturer's service representative to advise and assist installers; witness testing; and observe and inspect components, assemblies, and equipment installations, including controls and connections.

1. Field service shall be performed by a factory-trained and -authorized service representative of VRF HVAC system manufacturer whose primary job responsibilities are to provide direct technical support of its products.

2. Manufacturer shall provide on-site visits during the course of construction at installation milestones indicated. System Installer shall coordinate each visit in advance to give manufacturer sufficient notice to plan the visit.

   a. First Visit: Kick-off meeting.
   b. Second Visit: At approximately 25 percent completion of system(s).
   c. Third Visit: At approximately 50 percent completion of system(s).
   d. Fourth Visit: At approximately 75 percent completion of system(s).
   e. Fifth Visit: Final inspection before system startup.

3. Kick-off Meeting:

   a. Meeting shall include system Installer and other related trades with sole purpose of reviewing VRF HVAC system installation requirements and close coordination required to make a successful installation.
   b. Meeting shall be held at Project site and scheduled at a mutually agreed to time that occurs before the start of any part of system installation.
   c. Meeting shall cover the following as a minimum requirement:

      1) Review of latest issue of Contract Documents, Drawings, and Specifications, relevant to VRF HVAC systems.
      2) Manufacturer's installation requirements specific to systems being installed.
      3) Review of all relevant VRF HVAC system submittals, including delegated-design submittals.
      4) Required field activities related installation of VRF HVAC system.

5) Project team communication protocol, contact information, and exchange of responsibilities for each party involved, including manufacturer, supplier, system Installer, and other related trades.

4. Site Visits: Activities for each site visit shall include the following:

a. Meet with VRF HVAC system Installer to discuss field activities, issues, and suggested methods to result in a successful installation.
b. Offer technical support to Installer and related trades as related to VRF system(s) being installed.
c. Review progress of VRF HVAC system(s) installation for strict compliance with manufacturer's requirements.
d. Advise and if necessary assist Installer with updating related refrigerant calculations and system documentation.
e. Issue a report for each visit, documenting the visit.

1) Report to include name and contact information of individual making the visit.
2) Date(s) and time frames while on-site.
3) Names and contact information of people meeting with while on-site.
4) Clearly identify and list each separate issue that requires resolution. For each issue, provide a unique identification number, relevant importance, specific location or equipment identification, description of issue, recommended corrective action, and follow-up requirements needed. Include a digital photo for clarification if deemed to be beneficial.

5. Final Inspection before Startup:

a. Before inspection, Installer to provide written request to manufacturer stating the system is fully installed according manufacturer's requirements and ready for final inspection.
b. All system equipment and operating components shall be inspected. If components are inaccessible for inspection, they shall be made accessible before the final inspection can be completed.
c. Manufacturer shall provide a comprehensive inspection of all equipment and each operating component that comprise the complete system(s). Inspection shall follow a detailed checklist specific to each equipment and operating component.
d. Inspection reports for indoor units shall include, but not be limited to, the following:

1) Unit designation on Drawings.
2) Manufacturer model number.
3) Serial number.
4) Network address, if applicable.
5) Each equipment setting.
6) Mounting, supports, and restraints properly installed.
7) Proper service clearance provided.
8) Wiring and power connections correct.
9) Line-voltage reading(s) within acceptable range.

10) Wiring and controls connections correct.
11) Low-voltage reading(s) within an acceptable range.
12) Controller type and model controlling unit.
13) Controller location.
14) Temperature settings and readings within an acceptable range.
15) Humidity settings and readings within an acceptable range.
16) Condensate removal acceptable.
17) Fan settings and readings within an acceptable range.
18) Unit airflow direction within an acceptable range.
19) If applicable, fan external static pressure setting.
20) Filter type and condition acceptable.
21) Noise level within an acceptable range.
22) Refrigerant piping properly connected and insulated.
23) Condensate drain piping properly connected and insulated.
24) If applicable, ductwork properly connected.
25) If applicable, external interlocks properly connected.
26) Remarks.

e. Inspection reports for outdoor units shall include, but not be limited to, the following:

1) Unit designation on Drawings.
2) Manufacturer model number.
3) Serial number.
4) Network address, if applicable.
5) Each equipment setting.
6) Mounting, supports, and restraints properly installed.
7) Proper service clearance provided.
8) Wiring and power connections correct.
9) Line-voltage reading(s) within acceptable range.
10) Wiring and controls connections correct.
11) Low-voltage reading(s) within an acceptable range.
12) Condensate removal acceptable.
13) Noise level within an acceptable range.
14) Refrigerant piping properly connected and insulated.
15) Condensate drain piping properly connected and insulated.
16) Remarks.

f. Inspection reports for indoor, dedicated outdoor air ventilation units shall include, but not be limited to, the following:

1) Unit designation on Drawings.
2) Manufacturer model number.
3) Serial number.
4) Network address, if applicable.
5) Each equipment setting.
6) Mounting, supports, and restraints properly installed.
7) Proper service clearance provided.
8) Wiring and power connections correct.
9) Line-voltage reading(s) within acceptable range.
10) Wiring and controls connections correct.

11) Low-voltage reading(s) within an acceptable range.
12) Controller type and model controlling unit.
13) Controller location.
14) Temperature settings and readings within an acceptable range.
15) Humidity settings and readings within an acceptable range.
16) Condensate removal acceptable.
17) Fan settings and readings within an acceptable range.
18) Fan external static pressure setting.
19) Filter type and condition acceptable.
20) Noise level within an acceptable range.
21) Refrigerant piping properly connected and insulated.
22) Condensate drain piping properly connected and insulated.
23) Automatic dampers properly installed and operating.
24) Ductwork properly connected.
25) If applicable, external interlocks properly connected.
26) Remarks.

g. Installer shall provide manufacturer with the requested documentation and technical support during inspection.
h. Installer shall correct observed deficiencies found by the inspection.
i. Upon completing the on-site inspection, manufacturer shall provide a written report with complete documentation describing each inspection step, the result, and any corrective action required.
j. If corrective action is required by Installer that cannot be completed during the same visit, provide additional visits, as required, until deficiencies are resolved and systems are deemed ready for startup.
k. Final report shall indicate the system(s) inspected are installed according to manufacturer's requirements and are ready for startup.

B. Perform the following tests and inspections with the assistance of manufacturer's service representative:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Refrigerant Tubing Positive Pressure Testing:

1. Comply with more stringent of VRF HVAC system manufacturer's requirements and requirements indicated.
2. After completion of tubing installation, pressurize tubing systems to a test pressure of not less than 1.5 times VRF HVAC system operating pressure, but not less than 600 psig, using dry nitrogen.
3. Successful testing shall maintain a test pressure for a continuous and uninterrupted period of 24 hours. Allowance for pressure changes attributed to changes in ambient temperature are acceptable.

4. Prepare test report to record the following information for each test:

    a. Name of person starting test, company name, phone number, and e-mail address.
    b. Name of manufacturer's service representative witnessing test, company name, phone number, and e-mail address.
    c. Detailed description of extent of tubing tested.
    d. Date and time at start of test.
    e. Test pressure at start of test.
    f. Outdoor temperature at start of test.
    g. Name of person ending test, company name, phone number, and e-mail address.
    h. Date and time at end of test.
    i. Test pressure at end of test.
    j. Outdoor temperature at end of test.
    k. Remarks:

5. Submit test reports for Project record.

D. Refrigerant Tubing Evacuation Testing:

1. Comply with more stringent of VRF HVAC system manufacturer's requirements and requirements indicated.
2. After completion of tubing positive-pressure testing, evacuate tubing systems to a pressure of 500 microns.
3. Successful testing shall maintain a test pressure for a continuous and uninterrupted period of one hour(s) with no change.
4. Prepare test report to record the following information for each test:

    a. Name of person starting test, company name, phone number, and e-mail address.
    b. Name of manufacturer's service representative witnessing test, company name, phone number, and e-mail address.
    c. Detailed description of extent of tubing tested.
    d. Date and time at start of test.
    e. Test pressure at start of test.
    f. Outdoor temperature at start of test.
    g. Name of person ending test, company name, phone number, and e-mail address.
    h. Date and time at end of test.
    i. Test pressure at end of test.
    j. Outdoor temperature at end of test.
    k. Remarks:

5. Submit test reports for Project record.
6. Upon successful completion of evacuation testing, system shall be charged with refrigerant.

E. System Refrigerant Charge:

1. Using information collected from the refrigerant tubing evacuation testing, system Installer shall consult variable refrigerant system manufacturer to determine the correct system refrigerant charge.
2. Installer shall charge system following VRF HVAC system manufacturer's written instructions.
3. System refrigerant charging shall be witnessed by system manufacturer's representative.
4. Total refrigerant charge shall be recorded and permanently displayed at the system's outdoor unit.

F. Products will be considered defective if they do not pass tests and inspections.

G. Prepare test and inspection reports.

3.18 STARTUP SERVICE

A. Engage a VRF HVAC system manufacturer's service representative to perform system(s) startup service.

1. Service representative shall be a factory-trained and authorized service representative]of VRF HVAC system manufacturer.
2. Complete startup service of each separate system.
3. Complete system startup service according to manufacturer's written instructions.

B. Startup checks shall include, but not be limited to, the following:

1. Check control communications of equipment and each operating component in system(s).
2. Check each indoor unit's response to demand for cooling and heating.
3. Check each indoor unit's response to changes in airflow settings.
4. Check each indoor unit**,** HRU**,** and outdoor unit for proper condensate removal.
5. Check sound levels of each indoor and outdoor unit.

C. Installer shall accompany manufacturer's service representative during startup service and provide manufacturer's service representative with requested documentation and technical support during startup service.

1. Installer shall correct deficiencies found during startup service for reverification.

D. System Operation Report:

1. After completion of startup service, manufacturer shall issue a report for each separate system.
2. Report shall include complete documentation describing each startup check, the result, and any corrective action required.
3. Manufacturer shall electronically record not less than two hours of continuous operation of each system and submit with report for historical reference.

a. All available system operating parameters shall be included in the information submitted.

E. Witness:

1. Invite Commissioning Agent to witness startup service procedures.
2. Provide written notice not less than 20 business days before start of startup service.

3.19 ADJUSTING

A. Adjust equipment and components to function smoothly, and lubricate as recommended by manufacturer.

B. Adjust initial temperature and humidity set points. Adjust initial airflow settings and discharge airflow patterns.

C. Set field-adjustable switches and circuit-breaker trip ranges according to VRF HVAC system manufacturer's written instructions, and as indicated.

D. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.20 PROTECTION

A. Protect products from moisture and water damage. Remove and replace products that are wet, moisture damaged, or mold damaged.

B. Protect equipment from physical damage. Replace equipment with physical damage that cannot be repaired to new condition. Observable surface imperfections shall be grounds for removal and replacement.

C. Protect equipment from electrical damage. Replace equipment suffering electrical damage.

D. Cover and seal openings of equipment to keep inside of equipment clean. Do not remove covers until finish work is complete.

3.21 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by manufacturer's authorized service representative. Include two service visits for preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper equipment and system operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

3.22 SOFTWARE SERVICE AGREEMENT

A. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for two years.

B. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.

1. Upgrade Notice: At least 30 days to allow Owner to schedule and access the system and to upgrade computer equipment if necessary.

3.23 DEMONSTRATION

A. Engage a VRF HVAC system manufacturer's factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain entire system.

B. Instructor:

1. Instructor shall be factory trained and certified by VRF HVAC system manufacturer with current training on the system(s), equipment, and controls that are installed.
2. Instructor's credentials shall be submitted for review by Architect scheduling training.
3. Instructor(s) primary job responsibility shall be Owner training.
4. Instructor(s) shall have not less than three years of training experience with VRF HVAC system manufacturer and past training experience on at least three projects of comparable size and complexity.

C. Schedule and Duration:

1. Schedule training with Owner at least 20 business days before first training session.
2. Training shall occur before Owner occupancy.
3. Training shall be held at mutually agreed date and time during normal business hours.
4. Each training day shall not exceed eight hours of training. Daily training schedule shall allow time for one-hour lunch period and 15-minute break after every two hours of training.
5. Perform not less than eight total hours of training.

D. Location: Owner shall provide a suitable on-site location to host classroom training.

E. Training Attendees: Assume three people.

F. Training Attendance: For record purposes, document training attendees at the start of each new training session. Record attendee's name, signature, phone number, and e-mail address.

G. Training Format: Individual training modules shall include classroom training followed by hands-on field demonstration and training.

H. Training Materials: Provide training materials in electronic format to each attendee.

1. Include instructional videos showing general operation and maintenance that are coordinated with operation and maintenance manuals.
2. Video record each classroom training session and submit an electronic copy to Owner before requesting Owner acceptance of training.

I. Acceptance: Obtain Owner written acceptance that training is complete and requirements indicated have been satisfied.

END OF SECTION

SECTION 260000 - GENERAL ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SCOPE

A. Basic electrical requirements specifically applicable to Division 26 Sections.

B. Work includes but is not necessarily limited to the following:

1. Labor, materials, services, equipment, and appliances required for completion of tasks as indicated on drawing or in specification or as inherently necessary to provide complete and operational electrical systems including:

    a. All temporary construction power including test power, temporary heat and lighting;
    b. Incidental items not indicated on the drawings nor mentioned in the Specifications that belong to the work described, or are required to provide complete and operable systems, as though called out here in every detail;
    c. Cleaning, cutting, patching, repairing and painting;
    d. Testing and commissioning;
    e. The Contractor shall coordinate this Section with all other Sections of the Specification.

1.3 DRAWINGS AND SPECIFICATIONS

A. Drawings accompanying these Specifications show intent of Work to be done. Specifications shall identify quality and grade of installation and where equipment and hardware is not particularly specified, Contractor shall provide submittals for all products and install them per manufacturers' recommendations, and in a workmanlike manner.

B. Examine Drawings and Specifications for elements in connection with this Work; determine existing and new general construction conditions and be familiar with all limitations caused by such conditions.

C. In the event of a conflict or inconsistency between items indicated on the plans and/or specifications or with code requirements, the note, specification or code which prescribes and establishes the more complete job or the higher standard prevail.

D. Plans are intended to show general arrangement and extent of Work contemplated. Exact location and arrangement of parts shall be determined after the Owner has

reviewed equipment, as Work progresses, to conform in best possible manner with surroundings, and as directed by the Owner's Representative.

E. For purposes of clearness and legibility, the electrical drawings are essentially diagrammatic. The size and location of equipment is shown to scale where possible. The contractor shall verify all conditions, data information as indicated on the drawings and in the specification sections where electrical work interfaces with other trades.

F. Contract Documents are intended to show the scope and general arrangement of the Work under this Contract. Drawings are not intended to be scaled for roughing in measurements or to serve as shop drawings. Where job conditions require minor changes or adjustments in the indicated locations or arrangement of the Work, such changes shall be made without change in the Contract amount.

G. The contractor shall maintain as built drawings to reflect all changes made during construction and any deviations from the electrical drawings. This includes deviations from circuit numbers and any addition, deletion or relocation of fixtures/outlets shown on working drawings.

1.4 UTILITIES

A. Location and sizes of electrical, mechanical and plumbing service facilities are shown in accordance with data secured from existing record drawings and site observations. Data shown are offered as an estimating guide without guarantee of accuracy. Check and verify all data given, and verify exact location of all utility services pertaining to Work prior to excavation or performing Work.

1.5 APPLICABLE REFERENCE STANDARDS, CODES AND REGULATIONS

A. Meet requirements of all state codes having jurisdiction.

B. State of California Code of Regulations:

1. Title 8, Chapter 4. Division of Industrial Safety, Subchapter 5. Electrical Safety Orders (Cal/OSHA):

    a. Low-Voltage Electrical Safety Orders (Sections 2299 - 2599)
    b. High-Voltage Electrical Safety Orders (Sections 2700 - 2989)

2. Title 19, State Fire Marshal Regulations
3. Current California Building Code (CBC), Title 24, Part 2
4. Current California Electrical Code, Title 24, Part 3
5. Current California Mechanical Code, Title 24, Part 4
6. Current California Plumbing Code, Title 24, Part 5
7. Current California Energy Code, Title 24, Part 6
8. Current California Fire Code, Title 24, Part 9
9. Current California Standards Code, Title 24, Part 12

C. Additional Referenced Standards:

1. ANSI American National Standards Institute
2. IEEE Institute of Electrical and Electronic Engineers
3. NEMA National Electrical Manufacturer's Association
4. NFPA National Fire Protection Association Standards
5. UL Underwriters Laboratories

D. Codes and ordinances having jurisdiction over Work are minimum requirements; but, if Contract Documents indicate requirements, which are in excess of those minimum requirements, then requirements of the Contract Documents shall be followed. Nothing in these drawings and specifications shall be construed to permit work not conforming to governing codes or regulations. Should there be any conflicts between Contract Documents or codes or any ordinances having jurisdiction, report these to the Owner's Representative.

E. Obtain permits, and request inspections from authority having jurisdiction.

1.6 PROJECT AND SITE CONDITIONS

A. The arrangement of and connection to equipment shown on the Drawings is based upon information available and is not intended to show exact dimensions peculiar to a specific manufacturer. The Drawings are, in part, diagrammatic and some features of the illustrated equipment installations may require revision to meet actual equipment installation requirements. Structural supports, housekeeping pads, piping connections and adjacent equipment may have to be altered to accommodate the equipment provided. No additional payment will be made for such revisions or alterations.

B. Examine all Drawings and Specifications to be fully cognizant of all work required under this Division.

C. Examine site related work and surfaces before starting work of any Section.

D. Install Work in locations shown on approved Drawings, unless prevented by Project conditions.

E. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission from the Owner's Representative before proceeding.

1.7 COOPERATION WITH WORK UNDER OTHER DIVISIONS

A. Cooperate with other trades to facilitate general progress of Work. Allow all other trades every reasonable opportunity for installation of their work.

B. Work under this Division shall follow general building construction closely. Set pipe sleeves and inserts and verify that openings for chases and pipes are provided.

C. Work with other trades in determining exact location of outlets, conduits, pipes, and pieces of equipment to avoid interference with lines required to maintain proper installation of Work.

D. Make such progress in the Work to not delay work of other trades.

1.8 DISCREPANCIES

A. The contractor shall check all drawings furnished to him immediately upon their receipt and shall promptly notify the owner of any discrepancies. Figures marked on drawings shall in general be followed in preference to scale measurements. Large scale drawings in general govern small scale drawings. The contractor shall compare all drawings and verify the figures before laying out the work and will be responsible for any errors which might have been avoided thereby. Where no figures or notations are given, the plans shall be followed

B. Omissions from the Drawings or Specifications or the erroneous description of details of work which are manifestly necessary to carry out the intent of the Drawings and Specifications, or which are customarily performed, shall not relieve the Contractor from performing such omitted or erroneously described details of the work but they shall be performed as if fully and correctly set forth and described in the drawings and specifications.

C. If any part of the Specifications or Drawings appears unclear or contradictory, apply to Owner’s Representative for interpretation and decision as early as possible, including during bidding period. Do not proceed with such work without Owner Representatives decision. Beginning work of any Section constitutes acceptance of conditions.

1.9 CHANGES

A. The Contractor shall be responsible to make and obtain approval from the Owner’s Representative for all necessary adjustments in piping and equipment layouts as required to accommodate the relocations of equipment and/or devices, which are affected by any approved authorized changes or Product substitutions. All changes shall be clearly indicated on the "Record" drawings.

1.10 SUBMITTALS

A. Refer to Division 01 for additional requirements.

B. The manufacturer, contractor or supplier shall include a written statement that the submitted equipment, hardware or accessory complies with the requirement of that particular specification section.

C. The manufacturer shall resubmit the specification section showing compliance with each respective paragraphs and specified items and features in that particular specification section.

D. All exceptions shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.

E. Note that prior to acceptance of submittals for review, a submittal schedule shall be submitted to the Owner's Representative.

F. Submit all Division 26 shop drawings and product data grouped and referenced by the specification technical section number in one complete submittal package.

G. Shop Drawings:

1. Include installation details of equipment indicating proposed location, layout and arrangement, accessories, piping, and other items that must be shown to assure a coordinated installation.
2. Indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices.
3. If equipment is rejected, revise drawings to show acceptable equipment and resubmit.
4. Whenever more than one (1) manufacturer's product is specified, the first named product is the basis of design used in the Drawings and the use of alternate-named manufacturer's products or substitutes may require modifications to the design.
5. The Contractor shall be responsible for all equipment ordered and/or installed prior to receipt of shop drawings returned from the Owner's Representative bearing the Owner's Representative stamp of "Reviewed". All corrections or modifications to the equipment as noted on the shop drawings shall be performed and equipment removed from the job site at the request of the Owner's Representative without additional compensation.
6. Manufacturer's Data: For each manufactured item, provide current manufacturer's descriptive literature of cataloged products, certified equipment drawings, diagrams, performance and characteristic curves if applicable, and catalog cuts.
7. Standard Compliance: When materials or equipment provided by the Contractor must conform to the standards of organizations such as American National Standards Institute (ANSI) or UL, submit proof of such conformance to the Owner Representative for approval. If an organization uses a label or listing to indicate compliance with a particular standard, the label or listing will be acceptable evidence, unless otherwise specified. In lieu of the label or listing, submit a certificate from an independent testing organization, which is competent to perform acceptance testing and is approved by the Owner Representative. The certificate shall state that the item has been tested in accordance with the specified organization's test methods and that the item conforms to the specified organization's standard.
8. Certified Test Reports: Before delivery of materials and equipment, certified copies of all test reports specified in individual sections shall be submitted for approval.
9. Certificates of Compliance or Conformance: Submit manufacturer's certifications as required on products, materials, finish, and equipment indicated in the technical sections. Certifications shall be documents prepared specifically for this Contract. Pre-printed certifications and copies of previously submitted documents will not be acceptable. The manufacturer's certifications shall name the appropriate products, equipment, or materials and the publication specified as controlling the quality of that item. Certification shall not contain statements to imply that the item does not meet requirements specified, such as "as good as"; or "achieve the same end use and results as materials formulated in accordance with the referenced

publications"; or "equal or exceed the service and performance of the specified material." Certifications shall simply state that the item conforms to the requirements specified. Certificates shall be printed on the manufacturer's letterhead and shall be signed by the manufacturer's official authorized to sign certificates of compliance or conformance.

H. The Contractor shall submit all passcodes and passwords for any hardware and software required for the operations and troubleshooting in all systems and components no less than fourteen (14) calendar days prior to Final Completion.

1.11 PROJECT RECORD DOCUMENTS

A. Refer to Division 01 for additional requirements.

1. All changes, deviations and information recorded on the “Project Record Drawings” set during Construction shall be redrafted using the latest version of AutoCAD or Revit, where applicable.
2. Submit completed shop drawings to the Owner prior to completion in digital format.
3. Contractor hand-marked or drafted redlined “Project Record Drawings” will not be accepted.

1.12 PRODUCT ALTERNATIVES OR SUBSTITUTIONS

A. Refer to General Conditions and Division 01 for additional requirements.

1.13 OPERATING INSTRUCTIONS

A. Furnish approved operating instructions for systems and equipment indicated in the technical sections for use by operation and maintenance personnel.

1.14 MANUFACTURER'S RECOMMENDATIONS

A. Where installation procedures or any part thereof are required to be in accordance with manufacturer's recommendations, furnish printed copies of the recommendations prior to installation. Installation of the item shall not proceed until recommendations are received. Failure to furnish recommendations shall be cause for rejection of the equipment or material.

1.15 DELIVERY AND STORAGE

A. Refer to Division 01 for additional requirements.

B. Handle, store, and protect equipment and materials in accordance with the manufacturer's recommendations and with the requirements of NFPA 70B P, Appendix I, titled "Equipment Storage and Maintenance During Construction." Replace damaged or defective items with new items.

1.16 GUARANTEE

A. Except as may be specified under other sections in the Specifications, guarantee all equipment furnished under the Specifications for a period of one year from date of project acceptance against defective workmanship and material and improper installation. Upon notification of failure, correct deficiency immediately and without cost to the Owner.

B. Standard warranty of manufacturer shall apply for replacement of parts after expiration of the above period. Manufacturer shall furnish replacement parts to the Owner for their service agency as directed.

PART 2 - PRODUCTS

2.1 COMPETITIVE PRODUCTS

A. Unless otherwise noted, any reference in the Specification to any article, device, product, material, fixture, form, or type of construction by name, make, or catalog number shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition. The Contractor may at his option propose substitutions for such material in accordance with the substitution procedure outlined in the Contract Documents.

2.2 MATERIALS

A. Provide all new materials and equipment, free from any defects, in first-class condition, and suitable for the space provided. Provide materials and equipment approved by UL authority having jurisdiction approved testing agency, wherever standards have been established by that agency.

B. Where two or more units of the same class of material or equipment are required, provide products of a single manufacturer. Component parts of units or equipment need not be products of the same manufacturer.

C. Unless otherwise indicated, provide materials and equipment which are the standard products of manufacturers regularly engaged in the production of such materials and equipment. Provide the manufacturers' latest standard design that conforms to these Specifications.

D. Provide materials and equipment with manufacturers' standard finish system, except where otherwise specified. Provide manufacturers' standard finish color, except where specific color is indicated. If manufacturer has no standard color, finish equipment with ANSI Number 61, light gray color.

E. Environmental and Seismic Conditions: Material and Equipment shall be designed to insure satisfactory operation and operational life in the environmental and seismic conditions which will prevail where they are being installed. Electrical equipment and enclosures shall be designed, constructed and certified to withstand external loading conditions as prescribed by the California Building Code for the locations of the equipment. Supplied equipment shall either be shake table tested and certified or

comprehensive seismic calculations shall be provided. All seismic calculations and structural drawings shall bear the seal of a Structural Professional Engineer currently licensed in the State of California. Earthquake design shall be based on the equivalent lateral force analysis procedure per ASCE 7-05 Section 12.8.

PART 3 - EXECUTION

3.1 GENERAL

A. Obtain and pay for all permits and inspections, including any independent testing required to verify standard compliance, and deliver certificates for same to the Owner's Representative.

3.2 WORK RESPONSIBILITIES

A. The drawings indicate diagrammatically the desired locations or arrangement of piping, equipment, etc., and are to be followed as closely as possible. Proper judgment must be exercised in executing the work to secure the best possible installation in the available space and to overcome local difficulties due to space limitations or interference with structural conditions.

B. The Contractor is responsible for the correct placing of Work and the proper location and connection of Work in relation to the work of other trades. Advise appropriate trade as to locations of access panels.

C. In the event changes in the indicated locations or arrangements are necessary, due to developed conditions in the construction or rearrangement of furnishings or equipment, such changes shall be made without extra cost, providing the change is ordered before the conduit runs, etc. and work directly connected to same is installed and no extra materials are required.

D. Where equipment is furnished by others, verify dimensions and the correct locations of this equipment before proceeding with the roughing-in of connections.

E. All scaled and figured dimensions are approximate of typical equipment of the class indicated. Before proceeding with any work, carefully check and verify all dimensions, sizes, etc. with the drawings to see that the equipment will fit into the spaces provided without violation of applicable codes.

F. Should any changes to the Work indicated on the Drawings or described in the Specifications be necessary in order to comply with the above requirements, notify the Owner immediately and cease work on all parts of the contract, which are affected until approval for any required modifications to the construction has been obtained from the Owner.

G. Be responsible for any cooperative work, which must be altered due to lack of proper supervision or failure to make proper provisions in time. Such changes shall be under

direction of the Owner and shall be made to his satisfaction. Perform all Work with competent and skilled personnel.

H. The electrical drawings do not indicate all fittings, hardware, or appurtenances required for a complete operating installation.

I. Wiring diagrams are not intended to indicate the exact course of raceways.

J. One-line and riser diagrams are only schematics and do not show physical arrangements of equipment.

K. All workmanship, including aesthetic as well as electrical aspects of the Work, shall be of the highest quality consistent with the best practices of the trade.

L. Replace or repair, without additional compensation, any Work, which, in the opinion of the Owner, does not comply with these requirements.

3.3 CLEANING & PAINTING OF EQUIPMENT

A. Refer to Division 09 for additional requirements.

B. Factory Applied:

1. Electrical equipment shall have factory-applied painting systems, which shall, as a minimum, meet the requirements of NEMA ICS 6 corrosion-resistance test, except equipment specified to meet requirements of ANSI C37.20 shall have a finish as specified in ANSI C37.20.
2. Refer to individual sections of this Division for more stringent requirements.

C. Field Applied: Paint electrical equipment as required to touch up, to match finish on other equipment in adjacent spaces, or to meet safety criteria.

D. After installation, all metal finishes shall be polished and cleaned of all dirt, rust, cement, plaster, grease, and paint.

END OF SECTION

SECTION 260160 - ELECTRICAL DEMOLITION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Removal of existing power distribution equipment, transformers, light fixtures, fixture support brackets, electrical conduits /conductors and all other associated accessories as noted on drawings.

B. Contractor shall provide electrical demolition required for work noted on drawings.

C. The Contractor shall dispose of demolished electrical equipment as directed by the University. University has first right of refusal for all equipment.

1.2 APPLICABLE PUBLICATIONS: THE PUBLICATIONS LISTED BELOW FORM A PART OF THIS SPECIFICATION TO THE EXTENT REFERENCED. THE PUBLICATIONS ARE REFERRED TO IN THE TEXT BY THE BASIC DESIGNATION ONLY.

A. Environmental Protection Agency (EPA) Regulations:

1. 40 CFR 261 Regulations Identifying Hazardous Waste
2. 40 CFR 263 Regulations for Hazardous Waste Transporters
3. Hazardous Waste Facilities

B. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) Regulation:

1. 29 CFR 1910.94 Subpart G, Occupational Health and Environmental Control

C. Department of Transportation (DOT):

1. 49 CFR 178 Regulations for Shipping Container Specifications

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work: As specified in individual Sections, if applicable.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify field measurements and circuiting arrangements are as shown on Drawings.

B. Verify that abandoned wiring and equipment serve only abandoned facilities.

C. Demolition drawings are based on field observation and existing record documents. Report discrepancies to Engineer before disturbing existing installation.

D. Beginning of demolition means installer accepts existing conditions.

3.2 PREPARATION

A. Disconnect electrical systems in and under walls, concrete, and structures scheduled for removal.

B. Coordinate electrical outages with the College.

C. Provide temporary wiring and connections to maintain existing systems in-service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

D. All work shall be carried out in accordance with SCA process.

3.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK.

A. Demolish existing electrical work under provisions of this Section and as indicated on the drawings.

B. Remove abandoned wiring to source of supply unless otherwise indicated.

C. Remove exposed abandoned conduit. Cut conduit flush with walls and floors, and patch surfaces, if required by Architectural drawings.

D. Disconnect and remove abandoned distribution equipment.

E. Repair adjacent construction and finishes damaged during demolition and extension work.

F. Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.

3.4 CLEANING AND REPAIR

A. Clean and repair existing materials and equipment which remain or are to be reused.

END OF SECTION

SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Electrical equipment coordination and installation.
2. Sleeves for raceways and cables.
3. Sleeve seals.
4. Grout.
5. Common electrical installation requirements.

1.3 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. General: Submittals shall be furnished by Contractor for each device, equipment, conduits, conductors and cables, light fixtures, controls intended to be used on the project. Submit material list within 2 weeks of Notice to Proceed and obtain review, prior to submission of manufacturer’s data and shop drawings.

B. Submittals: Piecemeal submittals will not be acceptable. Submit in brochure form with all listings referenced to applicable sections and paragraphs in the specifications. Listing items "as specified" without both name of manufacturer and model number or type (designation) is not acceptable.

C. Material List: Contractor shall submit a complete list of materials and equipment proposed for the project including those which are exactly as specified. List to contain only one (1) manufacturer's name and reference to applicable sections and paragraphs of the specifications. List shall be submitted within two (2) weeks of issue of Notice to Proceed. Any material or equipment installed without written approval shall be subject to immediate removal.

D. Equipment Layout Drawings: 1/4" = 1'-0" scale "equipment layout drawings" shall be provided for each equipment item furnished under Division 26. Drawings shall show projected outline of each equipment proposed to be installed, working clearance around the equipment including all clearances for removal of equipment. Indicate any conflicts with other work.

E. Qualification Data: For qualified Installer.

1.5 QUALITY ASSURANCE AND STANDARDS

A. Comply with latest editions of applicable codes, ordinances, regulations and standards of:

1. Insulated Cable Engineers Association (ICEA).
2. Institute of Electrical and Electronics Engineers (IEEE).
3. National Electrical Manufacturers Association (NEMA).
4. American National Standards Institute (ANSI).
5. National Bureau of Standards (NBS).
6. Certified Ballast Manufacturers (CBM).
7. American Society for Testing and Materials (ASTM).
8. Underwriter's Laboratories (UL).
9. California Code of Regulations (Titles 8, 19, 22, 24).
10. National Electrical Code (NEC).
11. National Electrical Safety Code (NECS).
12. National Electrical Testing Agency (NETA).

B. Where requirements differ, the more stringent shall apply. Should any change in drawings or specifications be required to comply with governing regulations, notify the University’s Representative prior to submitting bid.

1. Proof of compliance shall be submitted to the University's Representative for approval.

C. Installer Qualifications: A qualified Installer certified by the State of California

D. All materials and equipment shall be of new and manufactured within twelve (12) months of installation unless otherwise indicated and supplied by manufacturer's authorized distributors. Reconditioned or used equipment shall not be permitted.

E. All materials and equipment shall bear the inspection label of the Underwriter's Laboratories (UL) where applicable. Materials and equipment shall be the latest standard product and shall be of the grade indicated by the trade names given.

F. If a material and equipment with UL listing is not available from any manufacturer, Contractor shall furnish materials and equipment tested and listed by a reputable independent testing organization acceptable to the University.

G. If alternate manufacturer of products other than what are specified in this section are submitted, all necessary documents not limited to cut sheets, technical information, test

reports from recognized testing labs and factory test reports shall be submitted to the satisfaction of the owner/engineer to ensure quality and conformance to the specifications. Additional testing shall be undertaken if it is concluded by the owner/engineer that the submitted test reports are either insufficient or do not include all tests necessary for product acceptance. The tests shall be conducted by a recognized lab acceptable to the owner/engineer and all tests shall be witnessed by owner's/engineer's personnel. All testing procedures and test results shall be satisfactory to the owner/engineer. Contractor shall be responsible for arranging the tests, for transportation, food and lodging for minimum of one owner's/engineer's representative to witness the test at the testing lab. Include all costs for the above in the bid.

1.6 COORDINATION

A. Coordinate arrangement, mounting, and support of electrical equipment:

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
3. To allow right of way for piping and conduit installed at required slope.
4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

C. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames."

D. Coordinate sleeve selection and application with selection and application of firestopping.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 INSTALLATION

A. General

1. The drawings show general arrangement of equipment and appurtenances. Follow these drawings as closely as the actual construction will permit. Provide all offsets, fittings, and accessories required but not shown on drawings
2. The locations of fixtures, outlets, duct banks and electrical equipment indicated on drawings are approximate location only. Revision and coordination may be

necessary at the time the equipment is installed in order to meet field conditions or other coordination. Such revisions will be done with no additional cost to the University and with the approval of University's Representative.

3. Verify location and mounting height of equipment not dimensionally shown on the plans with University's Representative prior to rough-ins.
4. Examine and compare the contract drawings with contract specifications and report any discrepancies to University's Representative. Obtain written approval from the University prior to start of work.

B. Underground Construction:

1. The work shall proceed in a systematic manner so that a minimum of inconvenience to facility operations and traffic flow will result during the course of construction. Work crews shall confine operations to as small a length of work area per crew as practical. Entire closing of streets and intersections shall not be permitted. All parking lots and fire lanes shall be accessible at all times. As part of the construction schedule to be submitted, the Contractor shall submit a schedule that includes when and where work will occur in each street and street segments.
2. Existing manholes and new cable trenches shall be ventilated to keep out harmful gases and dust during work and inspection. As part of the bid, the Contractor shall provide OSHA approved gasoline driven blowers for ventilation of manholes and trenches during work and inspections.

C. Electrical Service outages:

1. There shall be no interruption of existing electrical service without prior approval by the University's Representative. Written notice of proposed utility outages shall be delivered to the University's Representative at least fourteen (14) days prior to the start of the proposed outage.
2. To allow the University to coordinate the scheduling of critical procedures and manpower for transferring of loads, the contractor shall deliver to the University, through the University Representative, for review, a list of all outages that he needs during the construction period:

    a. The listing shall include, but not be limited to, the following:

        1) Facility to be de-energized.
        2) Time and duration of outage.
        3) Date requested.
        4) Alternate dates.

    b. The timing of outages will be entirely at the direction of the University's Representative.

3.2 SEISMIC ANCHORAGE

A. All free standing electrical equipments shall be anchored to withstand seismic forces in this area.

B. Conduit supports shall be adequately sized and braced to comply with seismic criteria.

3.3 CLEANING AND REPAIR

A. Vacuum clean the interiors of all switchboards, substations, panelboards and transformers upon completion of all work to remove dust and debris. After cleaning, cover all equipment to prevent any construction dust from recurring. Before equipment is energized, vacuum all interiors a second time to assure clean equipment.

END OF SECTION

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

B. Related Requirements:

1. Section 260553 "Identification for Electrical Systems."

1.3 DEFINITIONS

A. ASTM: American Society of Testing Materials.

B. ICEA: Insulated Cable Engineers Association.

C. IEEE: Institute of Electrical & Electronics Engineers.

D. NEMA: National Electrical Manufacturers Association.

E. NETA ATS: InterNational Electrical Testing Association - Acceptance Testing Specification.

F. VFD: Variable frequency drive.

1.4 ACTION SUBMITTALS

A. Product Data: Submit manufacturer’s technical data for each type of product, indicating conductor/cable construction, insulation material, thickness of insulation, jacket, cable stranding, and voltage rating of each type of conductor/cable specified, splices and terminations. Indicate date and place of manufacture for each conductor/cable, cable, splice and termination.

B. Manufacturer’s ISO certification.

C. Section Not Used

D. Product Cable Schedule: Indicate type, use, location, and termination locations.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Independent Testing Agency.

B. Field quality-control reports. Perform field testing of cables per para 3.8. Submit six (6) copies of field test reports to owner's representative within two (2) weeks of completion of test.

1.6 QUALITY ASSURANCE

A. General Requirements: The low voltage power conductors and cable shall be copper, minimum 600V rated unless otherwise indicated. Aluminum conductors and cables shall not be accepted unless otherwise indicated.

B. Materials and installation shall meet or exceed requirements in the following referenced standards and shall be listed and labelled by UL.

1. ICEA S-95-658/ NEMA WC 70.
2. AEIC CS8 is a medium voltage cable standard.
3. UL 1072.
4. IEEE.
5. ASTM.
6. NEMA.

C. Conductors and cables shall be of the same manufacturer and shipped to the job site in original unbroken reels.

D. Conductors and cables shall be manufactured with in twelve (12) months of installation. Date of manufacture shall be clearly marked on conductors or conductor reels.

E. Manufacturer shall have minimum ten (10) years experience in the manufacturer of conductors and cables similar to those specified on this project.

F. Manufacturer shall have ISO 9001 and ISO 9002 certification.

G. All conductors and cables shall be new and supplied by a local distributor.

H. If alternate manufacturer of products other than what are specified in this section are submitted, all necessary documents not limited to cut sheets, technical information, test reports from recognized testing labs and factory test reports shall be submitted to the satisfaction of the owner/engineer to ensure quality and conformance to the specifications. Additional testing shall be undertaken if it is concluded by the owner/engineer that the submitted test reports are either insufficient or do not include all tests necessary for product acceptance. The tests shall be conducted by a recognized lab acceptable to the owner/engineer and all tests shall be witnessed by owner's/engineer's personnel. All testing procedures and test results shall be satisfactory to the owner/engineer. Contractor shall be responsible for arranging the tests, for transportation, food and lodging for

minimum of one owner's/engineer's representative to witness the test at the testing lab. Include all costs for the above in the bid.

I. Testing: Provide the services of an independent qualified testing laboratory to perform the specified field tests. Notify the University's Representative fourteen (14) days in advance of performance of work requiring testing.

J. Conductors, cables, splices and terminations shall be manufactured within twelve (12) months of installation. Each item shall have a permanent marking on the product or the original manufacturers' package indicating the date of manufacture unless otherwise noted.

K. Testing Agency Qualifications:

1. Testing agency shall be an independent company; shall have been a member of NETA for a minimum of last ten (10) years and has permanent in-house testing engineers and technicians involved with testing of low voltage electrical power conductors and cables similar to those specified on this project.
2. Testing company shall be located with 50 miles radius of the project.
3. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.
4. Field Testing technician and supervisor shall have minimum ten (10) years' experience in field testing of low voltage power conductors and cables of the type and rating similar to the conductors and cables to be tested on this project.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers:

B. Basis-of-Design Product:

1. General Cable Technologies Corporation.
2. Southwire Incorporated
3. Alpha Wire.
4. Belden Inc.
5. Encore Wire Corporation..

C. Conductor Material: Electrical grade, soft drawn annealed copper, 98 percent conductivity, and fabricated in accordance with ASTM and ICEA standards. Minimum size is number 12 for branch circuits, number 14 stranded for control wiring. Aluminum conductors are not permitted. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.

D. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN-2-THWN-2, and Type XHHW-2 for underground and damp/wet/corrosive environments (including pool pump machine rooms).

E. VFD Cable:

1. Comply with UL 1277, UL 1685, and NFPA 70 for Type TC-ER cable.
2. Type TC-ER with oversized crosslinked polyethylene insulation, dual spirally wrapped copper tape shields and three bare symmetrically applied ground wires, and sunlight- and oil-resistant outer PVC jacket.
3. Comply with UL requirements for cables in Classes I and II, Division 2 hazardous location applications.

F. Provide separate neutral with each branch circuit serving outlets. When dedicated neutrals are provided, use color spiral to match associated phase.

2.2 CONNECTORS AND SPLICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers:

1. Ideal Industries, Inc.
2. Ilsco
3. NSi Industries LLC.
4. O-Z/Gedney; a brand of Emerson Industrial Automation.
5. 3M; Electrical Markets Division.
6. TE Connectivity - Raychem.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

C. Copper conductors shall be terminated in copper or bronze mechanical connectors or lugs or tool applied compression connections made of copper for all connections except those on wiring devices.

D. Splices in wires No. 10 and smaller shall be made with twist-on splicing connector in accordance with UL486-C. Connections in wires No. 8 and larger shall be made with compression type connectors in accordance with UL486-A and wrapped with insulated tape in accordance with UL501. Insulating tape shall be applied in a minimum of two layers of half wrap or built to match the overall insulation of the wire.

E. Splices in underground pull boxes or corrosive environments shall be made submersible type and made using “3M” Scotch-cast epoxy kits.

F. Pressure type connectors are not permitted.

2.3 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: UL Listed and labeled as defined in NFPA 70 and CEC Article 310, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 12 AWG and smaller; stranded for No. 10 AWG and larger, except VFD cable, which shall be extra flexible stranded.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type XHHW-2, single conductors in raceway

B. Exposed Feeders: Type THHN-2-THWN-2, single conductors in raceway; Type XHHW-2, for wet/damp/corrosive environments.

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN-2-THWN-2, single conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway

E. Feeders in Cable Tray: TC rated, Type THHN-2-THWN-2, single conductors in raceway, ;Type XHHW-2, single conductors in raceway larger than No. 1/0 AWG for wet/damp/corrosive environments.

F. Exposed Branch Circuits, Including in Crawlspaces: Type THHN-2-THWN-2, single conductors in raceway; Type XHHW-2, single conductors in raceway for wet/damp/corrosive environments.

G. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-2-THWN-2, MC Cable.

H. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, MC Cable.

I. Branch Circuits in Cable Tray: TC rated Type THHN-2-THWN-2, MC Cable; Type XHHW-2, single conductors in raceway for wet/damp/corrosive environments

J. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

K. VFD Output Circuits: Type XHHW-2 in metal conduit with braided shield with dual tape shield.

L. Any serving to or through corrosive environments including pool pump machine rooms: Type XHHW-2 in metal conduit with braided shield with dual tape shield.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. All conductors and cables shall be installed in a raceway.

B. Before installing conductors and cables in existing conduits, verify the continuity of each conduit; each surface conduit is properly supported per code and clear of any debris.

C. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

D. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

E. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

F. Install exposed cables parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.

G. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors].

1. Use oxide inhibitor in each splice, termination, and tap for any aluminum equipment terminals.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

3.5 IDENTIFICATION

A. Each conductor shall be factory color coded by conductor manufacturer. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems." Wires shall be identified by surface markings indicating manufacturer's identification, conductor size and metal, voltage rating, UL symbol, type designations and optional rating. Indentations for lettering is not permitted.

B. Identify each spare conductor at each end with identity number and location of other end of conductor and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078410 "Penetration Firestopping."

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Engage an independent qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform the following tests and inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance conductors, feeder conductors and the conductors feeding the following critical equipment and services for compliance with requirements.
2. Perform each visual and mechanical inspection and electrical tests stated in latest NETA Acceptance Testing Specification section 7.3.2 (Inspection and Test Procedures-Cables, Low Voltage-600V Maximum). Certify compliance with test parameters per NETA tables.
3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner. Correct deficiencies determined during the scan.

    a. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.
    b. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
    c. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

D. Test and Inspection Reports: Prepare a written report to record the following:

1. Procedures used.
2. Results that comply with requirements. Include color scan images.

3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

E. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes: Grounding systems and equipment.

B. Section includes grounding systems and equipment, plus the following special applications:

1. Underground distribution grounding.
2. Ground bonding common with lightning protection system.

1.3 DEFINITIONS:

A. NETA ATS: InterNational Electrical Testing Association - Acceptance Testing Specification.

B. NETA MTS: InterNational Electrical Testing Association - Maintenance Testing Specification.

C. NFPA : National Fire Protection Association.

D. IEEE: Institute of Electrical and Electronics Engineers

1.4 ACTION SUBMITTALS

A. Product Data: Submit manufacturer’s technical catalog cuts for each type of product indicated.

B. Shop Drawings: Site drawings to scale including details showing location and size of each field connection of grounding system.

1. Wiring Diagrams: Differentiate between manufacturer installed and field installed wiring.

C. Sustainable Design Submittals:

1. Product Data: For each conductor and cable indicating lead content.

1.5 INFORMATIONAL SUBMITTALS

A. Informational Submittals: Plans drawn to scale (1/4”=1’-0”) showing dimensioned locations of grounding features specified in "Field Quality Control" Article, including the following:

1. Test wells.
2. Ground rods.
3. Ground rings.
4. Grounding conductors, connectors.
5. Grounding arrangements and connections for separately derived systems.
6. Grounding for sensitive electronic equipment.

B. Qualification Data: For qualified independent testing agency and testing agency's field supervisor.

C. Field quality-control reports. Submit written test reports including the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Instructions for periodic testing and inspection of grounding features at test wells grounding connections for separately derived systems based on NFPA 70 / CECB.

    a. Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
    b. Include recommended testing intervals.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications:

1. Testing agency shall be an independent company; shall have been a member of NETA for a minimum of last ten (10) years and has permanent in-house testing engineers and technicians involved with testing of grounding systems similar to those specified on this project.
2. Testing company shall be located with 50 miles radius of the project.
3. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

4. Field Testing technician and supervisor shall have minimum ten (10) years' experience in field testing of rounding systems of the type and rating similar to the systems to be tested on this project.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70 / CEC, by a qualified testing agency, and marked for intended location and application.

C. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 GROUNDING ELECTRODES, CONDUCTORS, CONNECTOR, BUS:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or equal:

1. Grounding Connectors, Bars and Rods:

   a. Erico - Pentair Electrical Fastening Solutions
   b. Burndy – A Hubbell Company.
   c. Ideal Industries, Inc.
   d. O-Z/Gedney Co. - A brand of Emerson Industrial Automation.
   e. Thomas & Betts - A Member of the ABB Group.

2. Grounding Conductors and cables:

   a. Southwire
   b. American Insulated Wire
   c. Okonite

2.2 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

C. Bare Grounding Conductor and Conductor Protector for Wood Poles:

1. No. 4 AWG minimum, soft-drawn copper.
2. Conductor Protector: Half-round PVC or wood molding; if wood, use pressure-treated fir, cypress, or cedar.

D. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches (6.3 by 100 mm) in cross section, with 9/32-inch (7.14-mm) holes spaced 1-1/8 inches (28 mm) apart. Stand-off insulators for mounting shall comply with UL 891 for use in switch-boards, 600 V. Lexan or PVC, impulse tested at 5000 V.

E. Lead Content: Less than 300 parts per million

2.3 CONNECTORS

A. Listed and labeled by UL for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors, Rods and Pipes: Copper or copper alloy, pressure type with at least two bolts.

1. Pipe Connectors: Clamp type, sized for pipe.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

D. Bus-bar Connectors: Mechanical type, cast silicon bronze, solderless compression or exothermic-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

E. Lead Content: Less than 300 parts per million

2.4 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad; 3/4 inch by 10 feet (19 mm by 3 min diameter.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 10 AWG and smaller, and stranded conductors for No. 8 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2/0 AWG minimum.

1. Bury at least 24 inches (600 mm) below grade.

2. Duct-Bank Grounding Conductor: Bury 12 inches (300 mm) above duct bank when indicated as part of duct-bank installation.

C. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment or IT rooms, and elsewhere as indicated.

1. Install bus on insulated spacers 2 inches (50 mm) minimum from wall, 6 inches (150 mm) above finished floor unless otherwise indicated.
2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down to specified height above floor; connect to horizontal bus.

D. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

B. Pad-Mounted Transformers: Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than No. 1/0 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches (150 mm) from the foundation.

3.3 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits in the same conduit containing phase and neutral conductors. Comply with NFPA 70 / CEC, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 / CEC are indicated.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70 / CEC. :

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Armored and metal-clad cable runs.

8. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
9. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.

C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

D. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

E. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

F. Signal and Communication Equipment: In addition to grounding and bonding required by NFPA 70 / CEC, provide a separate grounding system complying with requirements in TIA/ATIS J-STD-607-A.

1. For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
2. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-4-by-12-inch (6.3-by-100-by-300-mm) grounding bus.
3. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.
4. All metallic conduits and cable tray shall be continuously bonded to maintain low resistance ground path and bonded back to the central equipment by the use of bonding jumpers where needed.

G. Metallic Fences or Other Metal Structures: Comply with requirements of IEEE C2. Bond metallic fences and other metal structures located within 8 feet (2.5 m) vertically or 16 feet (5 m) horizontally of exposed conductors or equipment.

1. Grounding Conductor: Bare**, tinned**-copper, not less than **No. 8** AWG.
2. Gates: Shall be bonded to the gate support post with a flexible bonding jumper. Bond each gate support post to the grounding electrode system in the area.
3. Provide bond across fence openings with 2 AWG bonding jumper buried 18 inches (460 mm) minimum below finished grade. Extend local grounding electrode system to cover swing of gates.
4. Barbed Wire: Strands shall be bonded to the grounding conductor.

3.4 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade using exothermic welds, except at test wells and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
2. For grounding electrode system, install ground rods at least three rods (unless otherwise indicated on the drawings), spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

C. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Section 260543 "Underground Ducts and Raceways for Electrical Systems," and shall be at least 12 inches (300 mm) deep, with cover.

1. Test Wells: Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.
2. Test Wells near light poles: Coordinate location with landscape drawings and install one at each pole. Test well shall be open bottom and installed on a 12”H bed of gravel or crushed stone (1” size).

D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

E. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Separately Derived System (SDS): All multiple branch metal water piping laterals originating from outside the area being served by the SDS and which serve the same area being served by the SDS shall be bonded to the common grounding

electrode (GE) or the common grounding electrode conductor (GEC). The bonding connection shall be made at each level that the metal water piping serves. When multiple SDS's are installed or an SDS serves multiple levels of a structure, a copper common GEC shall be installed for the SDS as permitted in NFPA 70 / CEC article 250.30 (D)3 and sized per article 250.30 (A) and (B).

3. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
4. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

F. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.

G. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet (18 m) apart.

H. Ground Ring: Install a grounding conductor, electrically connected to each building structure ground rod and to each steel column, extending around the perimeter of building. Refer to pool plans and specifications for additional bonding to system.

1. Install tinned-copper conductor not less than No. 4/0 AWG for ground ring and for taps to building steel.
2. Bury ground ring not less than 24 inches (600 mm) from building's foundation.

3.5 LABELING

A. Comply with requirements in Section 260553 "Identification for Electrical Systems" for instruction signs. The label or its text shall be green.

B. Install labels at the telecommunications bonding conductor and grounding equalizer and at the grounding electrode conductor where exposed.

1. Label Text: "If this connector or cable is loose or if it must be removed for any reason, notify the facility manager."

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Engage an independent qualified testing agency to perform tests and inspections. Refer to section

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.

    a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by fall-of-potential method according to IEEE 81.

4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

E. Grounding system will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

G. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 1 ohms.
2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 1 ohms.
3. Power Distribution Units or Panelboards Serving Electronic Equipment: 1 ohm(s).
4. Substations and Pad-Mounted Equipment: 5 ohms.
5. Manhole Grounds: 10 ohms.

H. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

C. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.5 ACTION SUBMITTALS

A. Product Data: For the following:

1. Steel slotted support systems.
2. Nonmetallic slotted support systems.

B. Shop Drawings: Signed and sealed by a qualified structural engineer. Show fabrication and installation details and include calculations for the following:

1. Trapeze hangers. Include Product Data for components.
2. Steel slotted channel systems. Include Product Data for components.
3. Nonmetallic slotted channel systems. Include Product Data for components.
4. Equipment supports.

1.6 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.7 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Comply with NFPA 70/CEC.

1.8 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified together with concrete Specifications.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Section 077200 "Roof Accessories."

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allied Tube & Conduit: Part of Atkore International
b. Cooper B-Line, Inc.; a division of Eaton Inc.
c. ERICO International Corporation.
d. GS Metals Corp.
e. Thomas & Betts Corporation: A Member of the ABB Group.

f. Unistrut; Part of Atkore International,
g. Wesanco, Inc.

3. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
5. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Hilti Inc.
2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
3) MKT Fastening, LLC.
4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.

2. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Cooper B-Line, Inc.; a division of Cooper Industries.
2) Empire Tool and Manufacturing Co., Inc.
3) Hilti Inc.
4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
5) MKT Fastening, LLC.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by scheduled in NECA 1, where its Table 1 lists maximum spacings less than stated in NFPA 70/CEC. Minimum rod size shall be 1/4 inch in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with two-bolt conduit clamps.

D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT and RMC may be supported by openings through structure members, as permitted in NFPA 70/CEC.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code. See structural drawings for equipment mounting and anchorage.

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.
7. To Light Steel: Sheet metal screws.
8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base. See structural details for thickness and reinforcing requirements.

B. Use 4000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section 033000 "Cast-in-Place Concrete."

C. Anchor equipment to concrete base.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions and structural details provided.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Touchup: Comply with requirements in Section 099111 "Exterior Painting" Section 099123 "Interior Painting" and Section 099600 "High Performance Coatings" for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. All wiring shall be installed in concealed conduit unless indicated otherwise in these specifications. Surface raceways shall be used in exposed locations in finished areas where conduits cannot be concealed. All surface installation will require College approval.

B. Separate conduit shall be used for the following wiring:

1. Emergency Power System Wiring.
2. Fire Alarm System.
3. Public Address System.
4. Security System.
5. Telephone/Data Outlets (See Telecom/Data Section).

C. Boxes shall include:

1. Boxes
2. Cabinets and Enclosures
3. Safety Switches

1.2 SUMMARY

A. Section Includes:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

B. Related Requirements:

1. Section 260513 "Medium-Voltage Cables" for single-conductor and multiconductor cables, cable splices, and terminations for electrical distribution systems with 2001 to 35,000 V.
2. Section 260553 "Identification for Electrical Systems."

PART 2 - PRODUCTS

2.1 MATERIALS

A. Rigid Steel Conduit: Provide standard weight steel that is hot-dipped galvanized, and sherardized both inside and out after threading, with threaded connectors and couplings.

Electro galvanizing is not permitted. Intermediate Metal Conduit, IMC, will not be permitted.

B. Rigid Steel Conduit Fittings: Fitting shall be zinc coated, ferrous metal and threaded type in accordance with ANSI C80.4.

C. Electric Metallic Tubing (EMT): Provide tubing of high-grade cold rolled steel electrically welded with exterior protective coating of hot galvanized zinc, applied by the electro galvanized process. Interior of surface coated with aluminum lacquer or enamel. Manufactured by Allied Tube and Conduit, Triangle, Republic, Torrance Tubing, Western, Wheatland or equal.

D. EMT Fittings: Fitting shall be watertight, gland ring compression type (no set screw type), wrench tightened connectors and coupling. Indenture and Die Cast will not be acceptable. Manufactured by O-Z Gedney, Raco, Appleton, or Steel City.

E. Aluminum Conduit: No aluminum conduits.

F. Flexible Steel Conduit: Provide conduit manufactured from single strip, standard weight steel hot-dipped galvanized on all four sides prior to conduit fabrication or aluminum strips.

G. Flexible Conduit Connectors and Couplings: Provide die cast fittings of the type that screw into the inside of the conduit with threaded edges at 90 degrees to the fitting body to insure a force fit. Binding screw type will not be acceptable. Manufactured by O-Z Gedney, T&B, Steel City or equal.

H. Flexible Liquidtight Steel Conduit: Liquid-tight conduit shall be manufactured from single strip standard weight steel, hot dipped galvanized on all four sides prior to conduit fabrication and shall be provided with an extruded polyvinyl chloride cover. Liquidtight conduit and fittings shall provide positive ground continuity. Include a separate ground conductor for each circuit. Manufacturer "Sealtite Flexible" Type "UA," "Flex-Seal Type "XL," or equal.

I. Flexible Liquidtight Fittings: Fittings shall be malleable iron, zinc plated, with locknut and o ring seal and slim diameter with small turning radius. Manufactured by O-Z Gedney-4Q series, T&B- 5200 series or Appleton Flexible Fittings-ST series.

J. Rigid Plastic Conduit: Provide heavy wall, virgin polyvinyl chloride Schedule 40 and Schedule 80 with solvent welded joints, conforming to Underwriters Laboratories, Inc. (UL 651) and ANSI C33.91 requirements, listed for exposed and direct burial application.

K. Rigid PVC Fittings: fittings and cement shall be provided by same manufacturer. All joint shall be solvent welded in accordance with the manufacturer's recommendations.

L. No conduit shall be smaller than 3/4-inch unless noted otherwise.

M. Sleeves shall be zinc coated galvanized steel pipe or 16 gauge galvanized sheet metal.

N. Sealant: Fire rated equal to wall or ceiling penetrated. Silicon foam Dow-Corning #2001, 3M, "Pensil #851," or approved equal. Sealant compound for exterior wall shall be moisture-resistant material made by 3M, GE, Dow-Corning or equal.

O. Anchors not cast into concrete shall be expansion shield type, Phillips "Red Head," Hilti, or equal.

P. Conduit seals shall be Crouse-Hinds Type "EYS" or EZS," Appleton Type "ESUF" or "ESUM," or approved equal, with sealing compound as recommended by the manufacturer for hazardous or refrigerated areas.

Q. Expansion couplings shall be OZ Type "AX" or "DX," Crouse-Hinds Type "XJ" or "SD" or equal, complete with bonding jumper.

R. Conduit unions shall be "Erickson" couplings manufactured by Thomas and Betts, Type 4-Series manufactured by O-Z/Gedney or equal.

2.2 MINIMUM SIZE:

A. Metal Conduit: 3/4 inch except 1/2 inch may be used for switch legs

B. Non-metallic conduit: 1 inch.

2.3 CONDUIT SLEEVES:

A. Sleeves shall be zinc coated galvanized steel pipe or 18 gauge galvanized sheet steel.

2.4 OUTLET BOXES

A. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1, galvanized steel.

1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 1/2 inch male fixture studs where required.

B. Nonmetallic Outlet Boxes: ANSI/NEMA OS 2.

C. Cast Boxes: NEMA FB 1, Type FD, cast feralloy. Provide gasketed cover and threaded hubs by box manufacturer.

2.5 CABINETS: UL 50.

A. Cabinets for same type of use shall be the product of a single manufacturer.

B. Construct of cold-rolled drawing quality steel, with metal gages and construction methods conforming to National Electrical Code requirements, and Underwriters Laboratories' standards. Provide 12 gauge G-90 grade galvanized steel minimum, unless otherwise noted.

C. Finish doors, trims, and back boxes for surface-mounted cabinets in finished areas by applying a rust-resistant treatment, prime coat, and a final coat of manufacturers standard enamel or lacquer finish. Galvanize all other sheet metal components of cabinets including back boxes for flush cabinets, excepting non-ferrous metal parts, or steel parts provided with cadmium plating or equivalent protective plating.

D. Equip doors with concealed or semi-concealed hinges and with flush or semi-flush spring catch type flush cylinder locks. Key cabinet doors of similar use alike, and provide two keys with each lock.

E. Equip cabinets for use with telephone, alarm or signal systems with a 0.5" thick fire treated plywood backboard. Equip cabinets with terminal strips where so specified. Equip cabinets with nameplates.

F. Surface cabinets shall be furnished without knockouts. Punch or drill required openings during installation. Equip flush back boxes with manufacturer's standard pattern of knockouts.

G. Equip cabinet doors exceeding 40" in height with vertical bolt three point locking mechanisms.

H. Acceptable manufacturers: Products of the following manufacturers are acceptable.

1. Cabinets for general use: Hoffman Engineering Co., Square D, or Columbia Manufacturing Co.
2. Cabinets for systems and/or products, use cabinets furnished by manufacturer with system or product. Where system or product cabinets do not comply with these Specifications, submit cabinet shop drawings, indicating deviations, and obtain approval for their use.

2.6 JUNCTION BOXES AND PULL BOXES: UL 50.

A. Provide pull and junction boxes of Code gauge steel sized as indicated or required. Provide 16 gauge steel minimum, unless otherwise noted. Indoor enclosures shall conform to NEMA ICS 6 for the Type 12, unless otherwise noted.

B. Size junction and pull boxes to not less than minimum Code requirements. Increase size above Code requirements where necessary to provide space for pulling, racking or splicing enclosed conductors, or where specified or indicated dimensions exceed Code requirements.

C. Fabricate sheet metal junction and pull boxes of galvanized, Code gauge, sheet steel. Include angle iron framing where required for rigidity. Boxes shall not deflect or deform visibly when covers are removed after conduit and conductors are installed, and any deflection occurring shall not prevent the easy installation and removal of cover attachment screws.

D. Do not use single covers for junction and pull boxes having cover length or width dimension exceeding three feet unless so specified, indicated, or approved. Sectionalize covers that exceed three feet in either dimension into two or more sections.

E. Equip metal junction and pull boxes exposed to weather (and not installed in or below grade) with raintight or weatherproof removable covers. Enclosures shall conform to NEMA ICS 6 for the Type 4, unless otherwise noted. Rain tight or weatherproof boxes shall be used threaded watertight hubs for top or side entry and may use knockout for bottom entry only. For exterior pull boxes, use a minimum of 14 gage galvanized G-90 grade sheet steel.

F. Use concrete junction and pull boxes for exterior underground conduit unless otherwise specified or indicated. Use steel plate or cast iron covers and rims in no traffic areas, and cast iron covers and rims designed for AASHTO Class H20 wheel loading wherever vehicular traffic will occur.

G. For interior junction and pull boxes located in concrete floors, and 24" square or smaller, use cast iron boxes with integral cast tapped conduit hubs, and having recessed cover flush in the box trim placing all elements of the face of the box flush in the plane of the surrounding floor. Equip boxes with watertight covers where so indicated.

H. For interior pull boxes located in concrete floors and larger than 24" square, use precast concrete boxes or form these boxes at the job site. Equip with angle iron cover rim, and with reinforced steel cover plate set flush with the finish floor plans. Specific plan details shall supersede these general requirements.

I. Equip grade level exterior pull boxes with a sump, and with knockouts for conduit on sides and ends. Coordinate requirements for conduit openings with underground conduit requirements. Identify the covers of exterior grade level junction and pull boxes with the work "ELECTRIC" cast into or otherwise permanently inscribed in the metal of the cover. Equip exterior grade level pull boxes with pull irons where so indicated.

J. Equip surface sheet metal junction and pull boxes with covers aligning with the sides of the boxes and equip flush boxes with covers extending 3/4" all around the perimeter of the back box. Provide sufficient cover attachment screws to ensure that box covers will contact the surface of the box for the entire perimeter of the enclosure. Use galvanized or cadmium-plated screws, or brass screws to attach covers to boxes.

K. Use brass screws to attach junction and pull box covers to interior floor boxes or to boxes located where moisture may be present.

L. Acceptable manufacturers:

1. Sheet steel junction and pull boxes: Columbia Electric Co., .Hoffman Engineering Co., Pico Metal Products Co.
2. Cast iron junction and pull boxes: O.Z. Electric Manufacturing Co., Alhambra Foundry Co., Ltd., Crouse Hinds Co.
3. Concrete junction and pull boxes: Brooks Products Inc., Quickset Co.

2.7 SAFETY SWITCHES

A. NEMA KS 1. Switches serving as motor-disconnect shall be horsepower rated. Provide heavy-duty type switches. Fused switches shall utilize Class R fuseholders and fuses unless indicated otherwise. Unless otherwise indicated, provide indoor switches in

NEMA Type 12 enclosure, per NEMA ICS 6. Provide outdoor switches in NEMA Type 4 enclosure, per NEMA ICS 6.

B. Unless otherwise indicated or required, use only unfused type for motor or equipment disconnects. Provide switches for the number of poles and the voltage, current and horsepower ratings as required.

C. Provide each switch with laminated plastic nameplate indicating panel designation and circuit number of the feeder and equipment controlled.

2.8 WIRE CONNECTORS AND TERMINALS:

A. For use with copper conductors. UL 486A.

2.9 INSULATING TAPES:

A. UL 510.

2.10 NAMEPLATES:

A. Provide as specified in Section 260553, "Identification for Electrical Systems."

PART 3 - EXECUTION

3.1 CONDUIT

A. Size of conduit shall be as indicated on the drawings but not less than that required by California Electrical Code.

B. Rigid Steel Conduit:

1. Use permitted for following applications only:

a. All outdoor locations including locations exposed to outside air.
b. Feeders.
c. Electrical and mechanical equipment rooms.
d. Indoor exposed locations where subject to mechanical damage and installed within 8 feet above finished floor.
e. Recessed in concrete walls and columns.
f. All other locations permitted by code.

C. Electric Metallic Tubing (EMT):

1. Use permitted for following applications only:

a. For all sizes up to 4 inches maximum.

b. In dry locations as in stud-wall partitions and in suspended ceiling spaces only. Do not use outdoors.

D. Flexible Metal Conduit:

1. Use permitted for following applications only:

a. Final connections to vibrating or noise-generating equipment including transformers.
b. Final connections to light fixtures in lay-in type accessible ceiling construction.

E. Liquid Tight Flexible Conduit:

1. Use permitted for following applications only:

a. For final connections to vibrating or noise-generating equipment in damp and wet locations in mechanical rooms.
b. For other power and control equipment requiring adjustments or removal for service in damp and wet locations.

F. Rigid Plastic Conduit PVC Schedule 40:

1. Use permitted for underground wiring only.
2. Make all fittings in plastic conduit watertight with solvent-weld cement recommended by conduit manufacturer and specifically manufactured for the purpose. Use a spring mandrel as required to assure full inside diameter at all bends.
3. Minimum size shall be 1 inch.

G. Conduit Placement:

1. Support conduits 1-inch and larger with pipe clamps either suspended from structural slabs with a rod at least 3/8 -inch diameter with adjustable pipe ring, or mounted on wall from channel supports. Attach to concrete with drilled anchors. Where two or more conduits 1-1/2-inch and larger are suspended from ceiling, use trapeze type hanger suspended from rods.
2. Where rigid metal conduits and electrical metallic tubing are supported from Building members, supports shall be installed as follows:

Conduit Sizes:	
3/4" to 1-1/4"	Within 18" of each outlet inclusive: and on either side of couplings and fittings and at a spacing not to exceed 8 feet. Coordinate spacing with details provided.
1-1/2" and larger:	Within 3 feet of each junction or pullbox and terminal cabinet and at a spacing not to exceed 8 feet. Coordinate spacing with details provided.

3. When rigid conduits are supported form trapezes, the supports shall be spaced not more than 8 feet apart.
4. Conduit trapezes shall consist of suitable Unistrut or Kindorf fittings, or equal, in accordance with the manufacturer's printed recommendation.

H. Provide independent support for all conduit rising from floor for motor connection if over 18 inches above floor. Do not support to motor, to ductwork or mechanical equipment.

I. Keep bends and offsets in conduit runs to an absolute minimum. Replace all deformed, flattened or kinked conduit, at Contractor's expense.

J. Ream the ends of all conduits. Conduits shall not be installed in the slab.

K. Paint fire alarm conduits with a 1-inch wide red band every 5 feet of run. Separate conduits to be provided for fire alarm system.

L. Install conduit seals on all conduit entering or leaving low temperature area (65 degrees Fahrenheit or less) hazardous areas, refrigerated rooms and clean rooms.

M. Seal all conduit from exterior outlets at first interior junction box to prevent moisture from entering the building through the conduit.

N. All exposed conduits shall be installed parallel to and perpendicular to the building structure.

O. Vertical Supports:

1. Supports shall be provided in strict compliance with National Electrical Code.

P. Where bends or risers from underground PVC Schedule 40 conduit terminate above grade or floor or in areas where subject to physical damage during or after construction, use rigid steel factory ells. If additional riser or nipple is required, they also shall be rigid steel. The rigid steel ells and risers shall be taped with Slipknot #100 pipe wrapping tape, or equal (no know equal).

Q. Pull Wires. Provide a 1/8" size polypropylene pull wire in all empty conduits, including those for signal and telephone systems. Pull cords in telephone/data service conduits (4" and larger) shall be 3/16" size. Identify conduits at exposed ends with tags. Tags shall identify location of other end of conduit. The pull wires shall be left with more than 5 feet in length at both ends for future use.

R. Joints and Connections. Cut conduit squarely and ream ends to remove burrs. Close open ends of conduits, unless in a closed box or cabinet, with approved conduit caps or closures as soon as installed and keep closed until ready to pull in conductors.

S. Steel conduit must be clear from contact with building reinforcing steel or other conductors in the building. Each conduit should run no more than two 90 degree bends. If more than two 90 degree bends are necessary, insert an accessible pull-box in the run. Terminate underground conduit inside the building, 2" above the floor below a backboard, or flush with the inside of a cabinet. Terminate overhead conduit 2 feet below floor slab, or flush with the inside of a cabinet.

T. Where conduits pass through exterior concrete or masonry walls below grade, or through floor slab on fill below grade, make entrance watertight. Install pipe sleeves in concrete with 1/2" minimum clearance around conduit and caulk with oakum and mastic, or use gland type conduit entrance seal.

U. Underground conduits, which terminate inside building below grade, or which slope so that water might flow into building, shall be sealed at termination after installation of conductors. Install plugs or caps on all spare (empty) conduits.

V. Do not install conduits in any isolated floor slab. Where it is necessary to cross such area, install conduit below isolated slab, in supporting structural slab or below it. Stub-ups to equipment located on isolated slab shall be through openings at least 1/2" larger in diameter than outside diameter of conduit. Fill space between conduit and opening in slab with mastic.

W. Expansion Joints

1. Where embedded conduits cross building expansion or seismic joints, provide sliding conduit expansion joints with bonding strap and clamps.
2. Where exposed conduits or conduits in furred spaces cross building expansion or seismic joints, use offset flexible conduit or sliding conduit expansion joint.

X. Terminate conduits of 1" size and larger with insulated bushings with grounding lugs where required, O.Z. Type Bldg., or equal (no known equal).

Y. Bends and sweeps for conduits used for telephone systems shall be long radius and factory made with the radius marked on them.

Z. Flashings. Where conduits extend through roof, provide flashings as required by Division 7.

AA. Penetration in Fire Rated Structures: Provide 3M or Dow Corning No. 3-6548, RTV Silicone form for making fire rated seals around penetrations through floors, walls, elevator shafts as minimum or mechanical fire stop fittings with UL listed fire rating or equal to wall or floor ratings, whichever is larger.

BB. A separate conduit shall be installed for each homerun indicated on the Drawings.

CC. Encase all nonmetallic feeder conduit installed underground in a 3-inch concrete envelope. Extend concrete envelopes a minimum of 3 inches beyond all external sides of all outermost conduits. Space the external surfaces of all conduit within a bank, a minimum of 3 inches apart, except that all sound, telephone, and data communication circuits contained within nonmetallic conduit shall have a minimum separation of 12 inches from any light or power circuits that parallel them within a bank. All underground conduits and duct banks containing high voltage feeders shall be encased in red concrete. Concrete shall be pre-mixed at the factory. Sprinkling red oxide in field is not acceptable. All underground conduits to be installed a minimum 36" below grade. Use manufactured concrete or plastic spacers to insure required concrete coverage. Concrete shall be minimum 2500 psi.

DD. Provide a plastic warning tape in the backfill over the ductlines and approximately 12 inches below grade. Tape shall be run continuously along the entire length of the underground utility lines. Tape shall be polyethylene plastic manufactured specifically for warning and identification of all buried utility lines. Tape shall be of the type provided in rolls, 6-inches minimum width, color coded for electric lines (red) and for communication lines (orange), with warning and identification imprinted in bold black letters continuously and repeatedly over entire tape length. Warning and identification shall be "CAUTION - BURIED ELECTRIC (or COMMUNICATION) LINE BELOW", or similar wording. Code and letter coloring shall be permanent, unaffected by moisture and other substances contained in trench backfill material.

EE. During construction, partially completed duct lines shall be protected from the entrance of debris such as mud, sand and dirt by means of suitable conduit plugs. As each section of a duct line is completed from manhole to vault, a testing mandrel not less than 12 inches long with a diameter 1/4-inch less than the size of the conduit, shall be drawn through each conduit, after which a brush having the diameter of the duct, and have stiff bristles shall be drawn through until the conduit is clear of all particles of earth, sand, gravel and other foreign materials. Conduit plugs shall then be immediately installed.

FF. Maintain minimum 6-inch clearance between conduit and piping. Maintain 12-inch clearance between conduit and heat sources such as flues, steampipes, hot water pipes, and heating appliances.

GG. Tag all empty conduits at each accessible end with a permanent tag identifying the purpose of the conduit and the location of the other end. In wet, corrosive outdoor or underground locations, use brass, bronze, or copper 16 gauge tags or lead tags secured to conduit ends with #16 or larger galvanized wire. Inscribe on the tags, with steel punch dies, clear and complete identifying information.

HH. Provide expansion and deflection fittings where two rigidly supported conduits may move in relation to each other at expansion joint crossings.

II. From each panel which is flush mounted in a wall, stub from top of the panel, a minimum of 4-3/4-inch conduits to the nearest ceiling space or other accessible location and cap for future use.

JJ. Conduits which are installed above dry type suspended ceilings shall not be secured to ceiling support wires. Support such conduit independent of ceiling suspension systems.

KK. Underground duct-banks shall have continuous slope downward toward manholes and away from buildings with a pitch of not less than 4 inches in 100 feet. Changes in direction of runs exceeding a total of 10 degrees, either vertical or horizontal, shall be accomplished by longsweep bends having a minimum radius of curvature of 25 feet, except that manufactured bends may be used at ends of short runs of 100 feet or less, and then only at or close to the end of run.

LL. Exposed conduit larger than 1 inch shall be suspended with pipe hangers. Hangers and racks shall be attached to concrete with insets, set at the time the concrete is poured, and to steel members with beam clamps or matching bolts. See structural details provided.

MM. Conduit 1-inch and smaller, in metal and stud partitions, shall be tied to the furring channels with No. 12 gauge galvanized tie wire space not more than 5 feet apart. Conduits above metal channel lath and plaster ceilings for other services and lighting home runs shall be supported independently to the slab.

NN. Wherever conduits pass through concrete walls, suspended slabs or metal deck floors, furnish and install sleeves of ample size to permit installation of conduit. Sleeves shall be installed prior to pouring of concrete and shall have ends flush with the wall or extend 2 inches above floor surfaces. Verify location with the College's Representative.

OO. Except as otherwise indicated on the Drawings, bends in conduit 2 inches or larger shall have a radius of curvature of the inner edge, equal to not less than ten (10) times the internal diameter of the conduit. Any deviations from this radius shall be approved by the College's Representative. Wire or cable bends in junction or pull boxes shall be made with a long radius. Bends for 600-volt cable shall have a radius of not less than five (5) times the diameter of the cable. Nesting of conduits shall be made when two or more conduits are run in parallel. High voltage feeder conduit runs (above 600 volts), telephone and closed-circuit television conduit runs shall not have more than two 90-degree long radius bends. All other conduit runs (below 600 volts) shall not have more than three 90-degree long radius bends between pull boxes, junction boxes or terminal cabinets.

PP. Conduit shall not be run closer than 6 inches on the top of light fixtures and cable trays. Do not install conduit on the sides of the cable tray or within 6 inches below the tray.

QQ. All control apparatus, outlet boxes, junction and pull boxes, and other similar equipment shall be installed and maintained in accessible positions and locations.

RR. Conduits in furred spaces shall be routed to clear access openings.

SS. Where steel conduits enter a concrete floor below a surface mounted panelboard, they shall be encased in a concrete curb of sufficient height to match the height of the finished base file.

TT. Holes for conduits through existing concrete walls or floors shall be made by the "core-drill" method. Core drilling time shall be coordinated with College's Representative to avoid noise problem.

UU. Upon completing the installation of any run of conduit, the runs shall be tested to see that they are free from all obstructions and have a smooth interior. Each end of each conduit run shall be plugged with "pennies" and bushings and left plugged until ready to pull circuit wires.

VV. A 6-inch square by 2 foot deep concrete block with an embedded brass nameplate shall be installed over the ends of all spare conduits stubbed out of the Building, indicating the origin of the conduits. Verify location with College's Representative prior to rough-in.

WW. Telephone and signal conduits placed in the same trench with power service conduit must be separated by no less than 12" of well packed earth or 3" of concrete.

XX. Underground conduits for branch circuits without concrete encasement shall have 6-inch thick envelope of sand all around. Conduit installed in unpaved or planted areas shall have 6 inches of sand below and 2-inch thick cap of lean concrete on top.

YY. Avoid installing conduits underneath the building.

ZZ. The ends of all underground conduits entering pullboxes, manholes, etc. shall terminate in end bells and shall be capped or sealed with an approved compound, Crouse Hinds "Chico A", or equal (no known equal) after installation of wire. Cap empty conduit stubouts at both ends. In landscaped areas, terminate in a waterproof J-box. Junction boxes located above grade in the landscaped areas shall have factory made gaskets, stainless steel screws and factory painting.

AAA. Limit to a minimum the routing of conduits within the planting areas of parking lot dividers. Do not run conduit within the planting area parallel to the long dimension of the divider. Coordinate the routing of service conduits to lighting standards and landscape lighting fixtures to avoid conflict with trees and major shrubs.

BBB. Underground conduits containing wiring for irrigation system shall not be permitted inside the high voltage (600V & above) manholes or pullboxes.

CCC. Branch circuit conduits from the panelboard to the loads shall be installed on the same floor above the accessible ceiling.

DDD. A green ground conductor shall be run in all conduits.

3.2 BOXES, OUTLETS AND SUPPORTS:

A. Provide boxes in wiring or raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures. Boxes for metallic raceways shall be cast-metal, hub-type when located in wet locations, when surface mounted on outside of exterior surfaces, when installed exposed up to 7 feet above interior floors, when installed under raised floor or when installed in hazardous areas. Boxes in other areas shall be sheet steel. Each box shall have volume required by NFPA 70 for number of conductors enclosed in the box. Provide gaskets for cast-metal boxes installed in wet locations.

3.3 JUNCTION AND PULL BOXES

A. Wherever possible use outlet boxes for junction and pull boxes.

B. Locate interior junction and pull boxes in machine rooms, equipment rooms, storage rooms, electrical rooms and similar utility spaces unless otherwise indicated or approved. Where junction or pull boxes must be used in finished areas, use flush boxes only equipped with prime finished sheet metal plates. Fasten plates to boxes with countersunk flat head screws. Provide plates with 3/4" trim all around.

C. Do not use sectionalized boxes except where indicated. Do not mix feeder and branch circuit conductors in a common pull or junction box.

D. Where more than one circuit passes through a common junction or pull box, tag conductors to indicate circuit number and panel designation.

END OF SECTION

SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

B. Related Requirements:

1. Section 078413 – Penetration Firestopping for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

D. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

E. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

F. Sleeves for Rectangular Openings:

1. Material: Galvanized sheet steel.
2. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and with no side larger than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
b. For sleeve cross-section rectangle perimeter 50 inches (1270 mm) or more and one or more sides larger than 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers:

a. Advance Products & Systems, Inc.
b. CALPICO, Inc.
c. Metraflex Company (The).
d. Pipeline Seal and Insulator, Inc.
e. Proco Products, Inc.
f. 3M

2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Carbon steel, Plastic, Stainless steel where designated.
4. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, Stainless steel of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers:

    a. Presealed Systems.
    b. Metraflex

2.4 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.
2. Sealant shall have VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
4. Confirm VOC compliance with AQMD Rule 1168. Coordinate with requirements of Section 079200 – Joint Sealants

B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

    a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
    b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
3. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

G. Underground, Exterior-Wall and Floor Penetrations: Install PVC Coated cast-iron pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Underground-line warning tape.
5. Warning labels and signs.
6. Instruction signs.
7. Equipment identification labels.
8. Miscellaneous identification products.

1.3 ACTION SUBMITTALS

A. Product Data: For each electrical identification product indicated.

B. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.

C. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

1.4 QUALITY ASSURANCE

A. Comply with ANSI A13.1.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.5 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 POWER AND CONTROL RACEWAY IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.

B. Colors for Raceways Carrying Circuits at 600 V or Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage and system or service type.

C. Colors for Raceways Carrying Circuits at More Than 600 V:

1. Black letters on an orange field.
2. Legend: "DANGER CONCEALED HIGH VOLTAGE WIRING."

D. Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.

E. Snap-Around Labels for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

F. Snap-Around, Color-Coding Bands for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches (50 mm) long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

G. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch (50 by 50 by 1.3 mm), with stamped legend, punched for use with self-locking cable tie fastener.

2.2 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each cable size.

B. Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.

C. Self-Adhesive, Self-Laminating Polyester Labels: Preprinted, 3-mil- (0.08-mm-) thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the cable diameter such that the clear shield overlaps the entire printed legend.

D. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tube with machine-printed identification label. Sized to suit diameter of and shrinks to fit firmly around cable it identifies. Full shrink recovery at a maximum of 200 deg F (93 deg C). Comply with UL 224.

E. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of cable it identifies and to stay in place by gripping action.

F. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches (50 mm) long, with diameter sized to suit diameter of cable it identifies and to stay in place by gripping action.

2.3 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.

B. Self-Adhesive, Self-Laminating Polyester Labels: Preprinted, 3-mil- (0.08-mm-) thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the conductor diameter such that the clear shield overlaps the entire printed legend.

C. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of conductor it identifies and to stay in place by gripping action.

D. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve with diameter sized to suit diameter of conductor it identifies and to stay in place by gripping action.

E. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tube with machine-printed identification label. Sized to suit diameter of and shrinks to fit firmly around conductor it identifies. Full shrink recovery at a maximum of 200 deg F (93 deg C). Comply with UL 224.

F. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

2.4 FLOOR MARKING TAPE

A. 2-inch- (50-mm-) wide, 5-mil (0.125-mm) pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.

2.5 UNDERGROUND-LINE WARNING TAPE

A. Tape:

1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical utility lines.
2. Printing on tape shall be permanent and shall not be damaged by burial operations.
3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:

1. Comply with ANSI Z535.1 through ANSI Z535.5.
2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE.

C. Tag: Type I:

1. Pigmented polyolefin, bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
2. Thickness: 4 mils (0.1 mm).
3. Weight: 18.5 lb/1000 sq. ft. (9.0 kg/100 sq. m).
4. 3-Inch (75-mm) Tensile According to ASTM D 882: 30 lbf (133.4 N), and 2500 psi (17.2 MPa).

2.6 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

C. Baked-Enamel Warning Signs:

1. Preprinted aluminum signs punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch (6.4-mm) grommets in corners for mounting.
3. Nominal size, 7 by 10 inches (180 by 250 mm).

D. Metal-Backed, Butyrate Warning Signs:

1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1-mm) galvanized-steel backing; and with colors, legend, and size required for application.
2. 1/4-inch (6.4-mm) grommets in corners for mounting.
3. Nominal size, 10 by 14 inches (250 by 360 mm).

E. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."

2.7 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic: minimum 1/16 inch (1.6 mm) thick for signs up to 20 sq. inches (129 sq. cm) and 1/8 inch (3.2 mm) thick for larger sizes, coordinate with General Electrical specification section 26 00 00.

1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.
3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

B. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm).

C. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and UV-resistant seal for label.

2.8 EQUIPMENT IDENTIFICATION LABELS

A. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm).

B. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and UV-resistant seal for label.

C. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

D. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

2.9 CABLE TIES

A. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self extinguishing, one piece, self locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 12,000 psi (82.7 MPa).
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black.

B. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 7000 psi (48.2 MPa).
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F (Minus 46 to plus 140 deg C).
5. Color: Black.

2.10 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

F. Attach plastic raceway and cable labels that are not self-adhesive type with clear vinyl tape with adhesive appropriate to the location and substrate.

G. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.

H. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

I. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

J. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches (400 mm) overall.

K. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

A. Concealed Raceways, Duct Banks, More Than 600 V, within Buildings: Tape and stencil 4-inch- (100-mm-) wide black stripes on 10-inch (250-mm) centers over orange background that extends full length of raceway or duct and is 12 inches (300 mm) wide. Stencil legend "DANGER CONCEALED HIGH VOLTAGE WIRING" with 3-inch- (75-mm-) high black letters on 20-inch (500-mm) centers. Stop stripes at legends. Apply to the following finished surfaces:

1. Floor surface directly above conduits running beneath and within 12 inches (300 mm) of a floor that is in contact with earth or is framed above unexcavated space.
2. Wall surfaces directly external to raceways concealed within wall.
3. Accessible surfaces of concrete envelope around raceways in vertical shafts, exposed in the building, or concealed above suspended ceilings.

B. Accessible Raceways, Armored and Metal-Clad Cables, More Than 600 V: Self-adhesive vinyl labels. Install labels at 10-foot (3-m) maximum intervals.

C. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:

1. Emergency Power.
2. Power.

D. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.

1. Color-Coding for Phase Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder, and branch-circuit conductors.

a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
b. Colors for 208/120-V Circuits:

1) Phase A: Black.
2) Phase B: Red.
3) Phase C: Blue.

c. Colors for 480/277-V Circuits:

1) Phase A: Brown.
2) Phase B: Orange.
3) Phase C: Yellow.

d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

E. Power-Circuit Conductor Identification, More than 600 V: For conductors in vaults, pull and junction boxes, manholes, and handholes, use nonmetallic plastic tag holder with adhesive-backed phase tags, and a separate tag with the circuit designation.

F. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.

G. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive, self-laminating polyester labels with the conductor or cable designation, origin, and destination.

H. Control-Circuit Conductor Termination Identification: For identification at terminations provide heat-shrink preprinted tubes with the conductor designation.

I. Conductors to Be Extended in the Future: Attach marker tape to conductors and list source.

J. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.

K. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.

1. Limit use of underground-line warning tape to direct-buried cables.
2. Install underground-line warning tape for both direct-buried cables and cables in raceway.

L. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

M. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.

1. Comply with 29 CFR 1910.145.
2. Identify system voltage with black letters on an orange background.
3. Apply to exterior of door, cover, or other access.
4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:

    a. Controls with external control power connections.

N. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

O. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

    a. Indoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.
    b. Outdoor Equipment: Engraved, laminated acrylic or melamine label. Stenciled legend 4 inches (100 mm) high.

c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

2. Equipment to Be Labeled:

a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be engraved, laminated acrylic or melamine label.
b. Enclosures and electrical cabinets.
c. Access doors and panels for concealed electrical items.
d. Switchgear.
e. Switchboards.
f. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
g. Substations.
h. Emergency system boxes and enclosures.
i. Enclosed switches.
j. Enclosed circuit breakers.
k. Variable-speed controllers.
l. Push-button stations.
m. Battery-inverter units.
n. Battery racks.
o. Monitoring and control equipment.
p. Cover plates and pull box covers.

END OF SECTION

SECTION 260573 - SHORT CIRCUIT, COORDINATION AND ARC FLASH STUDIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes computer-based, fault-current, overcurrent protective device coordination studies and arc flash study. Protective devices shall be set based on results of the protective device coordination study.

1. Coordination of series-rated devices is permitted where indicated on Drawings.

1.3 DEFINITIONS

A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled. Existing to remain items shall remain functional throughout the construction period.

B. Field Adjusting Agency: An independent electrical testing agency with full-time employees and the capability to adjust devices and conduct testing indicated and that is a member company of NETA.

C. One-Line Diagram: A diagram that shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

D. Power System Analysis Software Developer: An entity that commercially develops, maintains, and distributes computer software used for power system studies.

E. Power System Analysis Specialist: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located.

F. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion of the circuit from the system.

G. SCCR: Short-circuit current rating.

H. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

I. Single-Line Diagram: See "One-Line Diagram."

1.4 ACTION SUBMITTALS

A. COORDINATION STUDIES

1. Product Data: For computer software program to be used for studies.
2. Other Action Submittals: The following submittals shall be made after the approval process for system protective devices has been completed. Submittals may be in digital form if requested by the architect/engineer.
3. Coordination-study input data, including completed computer program input data sheets.
4. Study and Equipment Evaluation Reports.
5. Coordination-Study Report.

B. SHORT CURCUIT STUDIES

1. For computer software program to be used for studies.
2. Submit the following after the approval of system protective devices submittals. Submittals shall be in digital form.

    a. Short-circuit study input data, including completed computer program input data sheets.
    b. Short-circuit study and equipment evaluation report; signed, dated, and sealed by a qualified professional engineer.
    c. Revised one-line diagram, reflecting field investigation results and results of short-circuit study.

C. ARC FLASH STUDIES

1. Product Data: For computer software program to be used for studies.
2. Study Submittals: Submit the following submittals after the approval of system protective devices submittals. Submittals shall be in digital form:
3. Arc-flash study input data, including completed computer program input data sheets.
4. Arc-flash study report; signed, dated, and sealed by Power Systems Analysis Specialist.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For power systems analysis specialist.

B. Product Certificates: For coordination-study, fault-current-study computer software programs, certifying compliance with IEEE 399.

C. Product Certificates: For arc-flash hazard analysis software, certifying compliance with IEEE 1584 and NFPA 70E.

D. Power Systems Analysis Software Developer

E. Qualification Data: For Field Adjusting Agency

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For overcurrent protective devices to include in emergency, operation, and maintenance manuals.

1. The following are from the Coordination Study Report:

a. Final one-line diagram.
b. Final protective device coordination study.
c. Coordination study data files.
d. List of all protective device settings.
e. Time-current coordination curves.
f. Power system data.

2. The following are from the Short-Circuit Study Report:

a. Final one-line diagram.
b. Final Short-Circuit Study Report.
c. Short-circuit study data files.
d. Power system data

3. The following are from the Arc Flash Hazard Report:

a. Provide maintenance procedures in equipment manuals according to requirements in NFPA 70E.
b. Operation and Maintenance Procedures: In addition to items specified in Section 017823 "Operation and Maintenance Data," provide maintenance procedures for use by Owner's personnel that comply with requirements in NFPA 70E.

1.7 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are not acceptable.

B. Power Systems Analysis Specialist Qualifications: An entity experienced in the application of computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.

1. Professional engineer, licensed in the state where Project is located, shall be responsible for the study. All elements of the study shall be performed under the direct supervision and control of engineer.

C. Comply with IEEE 242 for short-circuit currents and coordination time intervals.

D. Comply with IEEE 399 for general study procedures.

E. Field Adjusting Agency Qualifications:

1. Employer of a NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification responsible for all field adjusting of the Work.
2. A member company of NETA.
3. Acceptable to authorities having jurisdiction

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

A. Computer Software Developers: Subject to compliance with requirements, provide products by one of the following:

1. Operation Technology, Inc. (ETAP)
2. SKM Systems Analysis, Inc.(Power Tools)

2.2 COMPUTER SOFTWARE PROGRAM REQUIREMENTS

A. Comply with IEEE 399, IEEE 1584 and NFPA 70E.

B. Analytical features of fault-current-study, device coordination study and arc flash study computer software program shall include "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

C. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output. Computer software program shall report device settings and ratings of all overcurrent protective devices and shall demonstrate selective coordination by computer-generated, time-current coordination plots.

1. Optional Features:

a. Arcing faults.
b. Simultaneous faults.
c. Explicit negative sequence.
d. Mutual coupling in zero sequence.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Project overcurrent protective device submittals for compliance with electrical distribution system coordination requirements and other conditions affecting performance. Devices to be coordinated are indicated on Drawings.

1. Proceed with coordination study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to coordination study may not be used in study.

3.2 POWER SYSTEM DATA

A. Gather and tabulate the following input data to support coordination study:

1. Product Data for overcurrent protective devices specified in other electrical Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Impedance of utility service entrance.
3. Electrical Distribution System Diagram: In hard-copy and electronic-copy formats, showing the following:

    a. Circuit-breaker and fuse-current ratings and types.
    b. Relays and associated power and current transformer ratings and ratios.
    c. Transformer kilovolt amperes, primary and secondary voltages, connection type, impedance, and X/R ratios.
    d. Generator kilovolt amperes, size, voltage, and source impedance.
    e. Cables: Indicate conduit material, sizes of conductors, conductor material, insulation, and length.
    f. Busway ampacity and impedance.
    g. Motor horsepower and code letter designation according to NEMA MG 1.

4. Data sheets to supplement electrical distribution system diagram, cross-referenced with tag numbers on diagram, showing the following:

    a. Special load considerations, including starting inrush currents and frequent starting and stopping.
    b. Transformer characteristics, including primary protective device, magnetic inrush current, and overload capability.
    c. Motor full-load current, locked rotor current, service factor, starting time, type of start, and thermal-damage curve.
    d. Generator thermal-damage curve.
    e. Ratings, types, and settings of utility company's overcurrent protective devices.
    f. Special overcurrent protective device settings or types stipulated by utility company.
    g. Time-current-characteristic curves of devices indicated to be coordinated.
    h. Manufacturer, frame size, interrupting rating in amperes rms symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers.
    i. Manufacturer and type, ampere-tap adjustment range, time-delay adjustment range, instantaneous attachment adjustment range, and current transformer ratio for overcurrent relays.

j. Panelboards, switchboards, motor-control center ampacity, and interrupting rating in amperes rms symmetrical.

3.3 FAULT-CURRENT STUDY

A. Calculate the maximum available short-circuit current in amperes rms symmetrical at circuit-breaker positions of the electrical power distribution system. The calculation shall be for a current immediately after initiation and for a three-phase bolted short circuit at each of the following:

1. Switchgear and switchboard bus.
2. Medium-voltage controller.
3. Motor-control center.
4. Distribution panelboard.
5. Branch circuit panelboard.

B. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Include studies of system-switching configurations and alternate operations that could result in maximum fault conditions.

C. Calculate momentary and interrupting duties on the basis of maximum available fault current according to IEEE 551.

D. Calculations to verify interrupting ratings of overcurrent protective devices shall comply with IEEE 141 and IEEE 242.

1. Transformers:

a. ANSI C57.12.10.
b. ANSI C57.12.22.
c. ANSI C57.12.40.
d. IEEE C57.12.00.
e. IEEE C57.96.

2. Medium-Voltage Circuit Breakers: IEEE C37.010.
3. Low-Voltage Circuit Breakers: IEEE 1015 and IEEE C37.20.1.
4. Low-Voltage Fuses: IEEE C37.46.

E. Study Report:

1. Show calculated X/R ratios and equipment interrupting rating (1/2-cycle) fault currents on electrical distribution system diagram.
2. Show interrupting (5-cycle) and time-delayed currents (6 cycles and above) on medium-voltage breakers as needed to set relays and assess the sensitivity of overcurrent relays.

F. Equipment Evaluation Report:

1. For 600-V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.

2. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in the standards to 1/2-cycle symmetrical fault current.
3. Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that short-circuit withstand ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.

3.4 COORDINATION STUDY

A. Perform coordination study using approved computer software program. Prepare a written report using results of fault-current study. Comply with IEEE 399.

1. Calculate the maximum and minimum 1/2-cycle short-circuit currents.
2. Calculate the maximum and minimum interrupting duty (5 cycles to 2 seconds) short-circuit currents.
3. Calculate the maximum and minimum ground-fault currents.

B. Comply with IEEE 141 recommendations for fault currents and time intervals.

C. Transformer Primary Overcurrent Protective Devices:

1. Device shall not operate in response to the following:

a. Inrush current when first energized.
b. Self-cooled, full-load current or forced-air-cooled, full-load current, whichever is specified for that transformer.
c. Permissible transformer overloads according to IEEE C57.96 if required by unusual loading or emergency conditions.

2. Device settings shall protect transformers according to IEEE C57.12.00, for fault currents.

D. Motors served by voltages more than 600 V shall be protected according to IEEE 620.

E. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and conductor melting curves in IEEE 242. Demonstrate that equipment withstands the maximum short-circuit current for a time equivalent to the tripping time of the primary relay protection or total clearing time of the fuse. To determine temperatures that damage insulation, use curves from cable manufacturers or from listed standards indicating conductor size and short-circuit current.

F. Coordination-Study Report: Prepare a written report indicating the following results of coordination study:

1. Tabular Format of Settings Selected for Overcurrent Protective Devices:

a. Device tag.

b. Relay-current transformer ratios; and tap, time-dial, and instantaneous-pickup values.
c. Circuit-breaker sensor rating; and long-time, short-time, and instantaneous settings.
d. Fuse-current rating and type.
e. Ground-fault relay-pickup and time-delay settings.

2. Coordination Curves: Prepared to determine settings of overcurrent protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exists between devices installed in series, including power utility company's upstream devices. Prepare separate sets of curves for the switching schemes and for emergency periods where the power source is local generation. Show the following information:

a. Device tag.
b. Voltage and current ratio for curves.
c. Three-phase and single-phase damage points for each transformer.
d. No damage, melting, and clearing curves for fuses.
e. Cable damage curves.
f. Transformer inrush points.
g. Maximum fault-current cutoff point.

G. Completed data sheets for setting of overcurrent protective devices.

3.5 ARC-FLASH HAZARD ANALYSIS

A. Comply with NFPA 70E and its Annex D for hazard analysis study.

B. Preparatory Studies: Perform the Short-Circuit and Protective Device Coordination studies prior to starting the Arc-Flash Hazard Analysis.

1. Short-Circuit Study Output: As specified in "Short-Circuit Study Output Reports" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260573.
2. Coordination Study Report Contents: As specified in "Coordination Study Report Contents" Article in Section 260573.

C. Calculate maximum and minimum contributions of fault-current size.

1. Maximum calculation shall assume a maximum contribution from the utility and shall assume motors to be operating under full-load conditions.
2. Calculate arc-flash energy at 85 percent of maximum short-circuit current according to IEEE 1584 recommendations.
3. Calculate arc-flash energy at 38 percent of maximum short-circuit current according to NFPA 70E recommendations.
4. Calculate arc-flash energy with the utility contribution at a minimum and assume no motor contribution.

D. Calculate the arc-flash protection boundary and incident energy at locations in electrical distribution system where personnel could perform work on energized parts.

E. Include medium-and low-voltage equipment locations, except equipment rated 240 V ac or less fed from transformers less than 125 kVA.

F. Calculate the limited, restricted, and prohibited approach boundaries for each location.

G. Incident energy calculations shall consider the accumulation of energy over time when performing arc-flash calculations on buses with multiple sources. Iterative calculations shall take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors and generators shall be decremented as follows:

1. Fault contribution from induction motors shall not be considered beyond three to five cycles.
2. Fault contribution from synchronous motors and generators shall be decayed to match the actual decrement of each as closely as possible (for example, contributions from permanent magnet generators will typically decay from 10 per unit to three per unit after 10 cycles).

H. Arc-flash energy shall generally be reported for the maximum of line or load side of a circuit breaker. However, arc-flash computation shall be performed and reported for both line and load side of a circuit breaker as follows:

1. When the circuit breaker is in a separate enclosure.
2. When the line terminals of the circuit breaker are separate from the work location.

I. Base arc-flash calculations on actual overcurrent protective device clearing time. Cap maximum clearing time at two seconds based on IEEE 1584, Section B.1.2.

3.6 ARC-FLASH STUDY REPORT CONTENT

A. Executive summary of study findings.

B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.

C. One-line diagram, showing the following:

1. Protective device designations and ampere ratings.
2. Conductor types, sizes, and lengths.
3. Transformer kilovolt ampere (kVA) and voltage ratings, including derating factors and environmental conditions.
4. Motor and generator designations and kVA ratings.
5. Switchgear, switchboard, motor-control center, panelboard designations, and ratings.

D. Study Input Data: As described in "Power System Data" Article.

E. Short-Circuit Study Output Data: As specified in "Short-Circuit Study Output Reports" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260573.13 "Short-Circuit Studies."

F. Protective Device Coordination Study Report Contents: As specified in "Coordination Study Report Contents" Article in Section 260573.16 "Coordination Studies."

G. Arc-Flash Study Output Reports:

1. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each equipment location included in the report:

    a. Voltage.
    b. Calculated symmetrical fault-current magnitude and angle.
    c. Fault-point X/R ratio.
    d. No AC Decrement (NACD) ratio.
    e. Equivalent impedance.
    f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
    g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

H. Incident Energy and Flash Protection Boundary Calculations:

1. Arcing fault magnitude.
2. Protective device clearing time.
3. Duration of arc.
4. Arc-flash boundary.
5. Restricted approach boundary.
6. Limited approach boundary.
7. Working distance.
8. Incident energy.
9. Hazard risk category.
10. Recommendations for arc-flash energy reduction.

I. Fault study input data, case descriptions, and fault-current calculations including a definition of terms and guide for interpretation of computer printout.

3.7 ARC-FLASH WARNING LABELS

A. Comply with requirements in Section 260553 "Identification for Electrical Systems" for self-adhesive equipment labels. Produce a 3.5-by-5-inch (76-by-127-mm) self-adhesive equipment label for each work location included in the analysis.

B. Label shall have an orange header with the wording, "WARNING, ARC-FLASH HAZARD," and shall include the following information taken directly from the arc-flash hazard analysis:

1. Location designation.
2. Nominal voltage.
3. Protection boundaries.

    a. Arc-flash boundary.

b. Restricted approach boundary.
c. Limited approach boundary.

4. Arc flash PPE category.
5. Required minimum arc rating of PPE in Cal/cm squared.
6. Available incident energy.
7. Working distance.
8. Available fault current
9. Engineering report number, revision number, and issue date.

C. Labels shall be machine printed, with no field-applied markings.

D. Apply a label to each piece of equipment addresses by the study.

END OF SECTION

SECTION 260913 - ELECTRICAL POWER MONITORING AND CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes the following for monitoring of electrical power system:

1. PC-based workstation(s) and software.
2. Communication network and interface modules for RS-485, Modbus TCP/IP data transmission protocols.

1.3 DEFINITIONS

A. Ethernet: Local area network based on IEEE 802.3 standards.

B. Firmware: Software (programs or data) that has been written onto read-only memory (ROM). Firmware is a combination of software and hardware. Storage media with ROMs that have data or programs recorded on them are firmware.

C. HTML: Hypertext markup language.

D. I/O: Input/output.

E. KY Pulse: A term used by the metering industry to describe a method of measuring consumption of electricity that is based on a relay changing status in response to the rotation of the disk in the meter.

F. LAN: Local area network; sometimes plural as "LANs."

G. LCD: Liquid crystal display.

H. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or remote-control, signaling and power-limited circuits.

I. Modbus TCP/IP: An open protocol for exchange of process data.

J. Monitoring: Acquisition, processing, communication, and display of equipment status data, metered electrical parameter values, power quality evaluation data, event and alarm signals, tabulated reports, and event logs.

K. PC: Personal computer; sometimes plural as "PCs."

L. rms: Root-mean-square value of alternating voltage, which is the square root of the mean value of the square of the voltage values during a complete cycle.

M. RS-232: A TIA standard for asynchronous serial data communications between terminal devices.

N. RS-485: A TIA standard for multipoint communications using two twisted-pairs.

O. TCP/IP: Transport control protocol/Internet protocol incorporated into Microsoft Windows.

P. THD: Total harmonic distortion.

Q. UPS: Uninterruptible power supply; used both in singular and plural context.

R. WAN: Wide area network.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1. Attach copies of approved Product Data submittals for products (such as switchboards and switchgear) that describe power monitoring and control features to illustrate coordination among related equipment and power monitoring and control.

B. Shop Drawings: For power monitoring and control equipment. Include plans, elevations, sections, details, and attachments to other work.

1. Outline Drawings: Indicate arrangement of components and clearance and access requirements.
2. Block Diagram: Show interconnections between components specified in this Section and devices furnished with power distribution system components. Indicate data communication paths and identify networks, data buses, data gateways, concentrators, and other devices to be used. Describe characteristics of network and other data communication lines.
3. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
4. Wiring Diagrams: For power, signal, and control wiring. Coordinate nomenclature and presentation with a block diagram.
5. UPS sizing calculations for workstation.
6. Surge Suppressors: Data for each device used and where applied.

C. Sustainable Design Submittals:

1. Product Data: Indicating that computers used by the system are certified by ENERGY STAR.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified manufacturer.

B. Field quality-control reports.

C. Other Informational Submittals:

1. Manufacturer's system installation and setup guides, with data forms to plan and record options and setup decisions.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For power monitoring and control units, to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Operating and applications software documentation.
2. Software licenses.
3. Software service agreement.
4. PC installation and operating documentation, manuals, and software for the PC and all installed peripherals. Software shall include system restore, emergency boot diskettes, and drivers for all installed hardware. Provide separately for each PC.
5. Hard copies of manufacturer's specification sheets, operating specifications, design guides, user's guides for software and hardware, and PDF files on CD-ROM of the hard-copy submittal.

B. Software and Firmware Operational Documentation:

1. Self-study guide describing the process for setting equipment's network address; setting Owner's options; procedures to ensure data access from any PC on the network, using a standard Web browser; and recommended firewall setup.
2. Software operating and upgrade manuals.
3. Software Backup: On a magnetic media or compact disc, complete with Owner-selected options.
4. Device address list and the set point of each device and operator option, as set in applications software.
5. Graphic file and print out of graphic screens and related icons, with legend.

C. Software Upgrade Kit: For Owner to use in modifying software to suit future power system revisions or power monitoring and control revisions.

D. Software licenses and upgrades required by and installed for operating and programming digital and analog devices.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Addressable Relays: One for every 10 installed. Furnish at least one of each type.
2. Data Line Surge Suppressors: One for every 10 of each type installed. Furnish at least one of each type.
3. I/O Protection Fuses: One for every 10 of each type installed. Furnish at least one of each type.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Manufacturer Qualifications: A firm experienced in manufacturing power monitoring and control equipment similar to that indicated for this Project and with a record of successful in-service performance.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.9 COORDINATION

A. Coordinate features of distribution equipment and power monitoring and control components to form an integrated interconnection of compatible components.

1. Match components and interconnections for optimum performance of specified functions.

B. Coordinate Work of this Section with those in Sections specifying distribution components that are monitored or controlled by power monitoring and control equipment.

1.10 SOFTWARE SERVICE AGREEMENT

A. Technical Support: Beginning with Substantial Completion, provide software support for two years.

B. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include the operating systems. Upgrade shall include new or revised licenses for use of software.

1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Accuvim IIR Revenue Grade Digital Meter.

2.2 FUNCTIONAL DESCRIPTION

A. Instrumentation and Recording Devices: Monitor and record load profiles and chart energy consumption patterns.

1. Calculate and Record the Following:

a. Load factor.
b. Peak demand periods.

2. Measure and Record Metering Data for the Following:

a. Electricity.

B. Software: Calculate allocation of utility costs.

C. Power Quality Monitoring: Identify power system anomalies and measure, display, and record trends and alarms of the following power quality parameters:

1. Voltage regulation and unbalance.
2. Continuous three-phase rms voltage.
3. Periodic max./min./avg. voltage samples.
4. Harmonics.
5. Voltage excursions.

D. System: Report equipment status and power system control.

2.3 SYSTEM REQUIREMENTS

A. Monitoring and Control System: Include multiple PC-based workstations with graphics capability and Web access, with its operating system and application software, connected to data transmission network.

B. Surge Protection: For external wiring of each conductor entry connection to components to protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads.

1. Minimum Protection for Power Lines 120 V and More: Auxiliary panel suppressors
2. Minimum Protection for Communication, Signal, Control, and Low-Voltage Power Lines: Comply with requirements as recommended by manufacturer for type of line being protected.

C. Addressable Devices: All transmitters and receivers shall communicate unique device identification and status reports to monitoring and control clients.

D. DDC Interface: Provide factory-installed hardware and software to enable the DDC to monitor, display, and record data for use in processing reports.

1. Hardwired Monitoring Points: Electrical power demand (kilowatts), electrical power consumption (kilowatt-hours), power factor.
2. ASHRAE 135 (BACnet), or Industry-accepted, open-protocol communication interface with the DDC shall enable the DDC operator to remotely monitor meter information from a DDC operator workstation. Control features and monitoring points displayed locally at metering panel shall be available through the DDC BAS.

2.4 OPERATING SYSTEM

A. Software: Configured for a server and multiple client PCs, each with capability for accessing multiple devices simultaneously. Software shall include interactive graphics client and shall be Web enabled. Workstations and portable computers shall not require any software except for an Internet browser to provide connectivity and full functionality. Include a firewall recommended by manufacturer. 100 Base-T Ethernet, Modbus TCP/IP RS-232, and RS-485 digital communications.

B. Operating System Software: Based on 64-bit, Microsoft Windows workstation operating system. Software shall have the following features:

1. Multiuser and multitasking to allow independent activities and monitoring to occur simultaneously at different workstations.
2. Graphical user interface to show pull-down menus and a menu tree format.
3. Capability for future additions within the indicated system size limits.

C. Peer Computer Control Software: Shall detect a failure of workstation and associated server and shall cause other workstation and associated server to assume control of all system functions without interruption of operation. Drivers shall be provided in both central computers to support this mode of operation.

2.5 APPLICATIONS SOFTWARE

A. Basic Requirements:

1. Fully compatible with and based on the approved operating system.
2. Password-protected operator login and access; three levels, minimum.
3. Password-protected setup functions.
4. Context-sensitive online help.

5. Capability of creating, deleting, and copying files; and automatically maintaining a directory of all files, including size and location of each sequential and random-ordered record.
6. Capability for importing custom icons into graphic views to represent alarms and I/O devices.
7. Automatic and encrypted backups for database and history; automatically stored at selected workstation and encrypted with a nine-character alphanumeric password, which must be used to restore or read data contained in backup.
8. Operator audit trail for recording and reporting all changes made to user-defined system options.

B. Workstation Server Functions:

1. Support other client PCs on the LAN.
2. Maintain recorded data in databases accessible from other PCs on the LAN.

C. Data Formats:

1. User-programmable export and import of data to and from commonly used Microsoft Windows spreadsheet, database, billing, and other applications; using dynamic data exchange technology.
2. Option to convert reports and graphics to HTML format.
3. Interactive graphics.
4. Option to send preprogrammed or operator designed e-mail reports.

D. Metered Data: Display metered values in real time.

E. Remote Control:

1. Display circuit-breaker status and allow breaker control.
2. User defined with load-shedding automatically initiated and executed schemes responding to programmed time schedules, set points of metered demands, utility contracted load shedding, or combinations of these.

F. Equipment Documentation: Database for recording of equipment ratings and characteristics; with capability for graphic display on monitors.

G. Graphics: Interactive color-graphics platform with pull-down menus and mouse-driven generation of power system graphics, in formats widely used for such drafting; to include the following:

1. Site plan.
2. Floor plans.
3. Equipment elevations.
4. Single-line diagrams.

H. User-Defined Monitoring and Control Events: Display and record with date and time stamps accurate to 0.1 second, and including the following:

1. Operator log on/off.
2. Attempted operator log on/off.

3. All alarms.
4. Equipment operation counters.
5. Out-of-limit, pickup, trip, and no-response events.

I. Trending Reports: Display data acquired in real-time from different meters or devices, in historical format over user-defined time; unlimited as to interval, duration, or quantity of trends.

1. Spreadsheet functions of sum, delta, percent, average, mean, standard deviation, and related functions applied to recorded data.
2. Charting, statistical, and display functions of standard Windows-based spreadsheet.

J. Alarms: Display and record alarm messages from discrete input and controls outputs, according to user programmable protocol.

1. Functions requiring user acknowledgment shall run in background during computer use for other applications and override other presentations when they occur.

K. Waveform Data: Display and record waveforms on demand or automatically on an alarm or programmed event. Include the graphic displays of the following, based on user-specified criteria:

1. Phase voltages, phase currents, and residual current.
2. Overlay of three-phase currents and overlay each phase voltage and current.
3. Waveforms ranging in length from 2 cycles to 5 minutes.
4. Disturbance and steady-state waveforms up to 512 points per cycle.
5. Transient waveforms up to 83,333 points per cycle on 60-Hz base.
6. Calculated waveform, based on recorded data, on a minimum of four cycles of data of the following:

a. THD.
b. rms magnitudes.
c. Peak values.
d. Crest factors.
e. Magnitude of individual harmonics.

L. Data Sharing: Allow export of recorded displays and tabular data to third-party applications software.

1. Tabular data shall be in the comma-separated values.
2. Csv.

M. Activity Billing Software:

1. Automatically compute and prepare activity demand and energy-use statements based on metering of energy use and peak demand integrated over user-defined interval.
2. Intervals shall be same as used by electric utilities, including current vendor.

3. Import metered data from saved records that were generated by metering and monitoring software.
4. Maintain separate directory for each activity's historical billing information.
5. Prepare summary reports in user-defined formats and time intervals.

N. Reporting: User commands initiate the reporting of a list of current alarm, supervisory, and trouble conditions in system or a log of past events.

1. Print a record of user-defined alarm, supervisory, and trouble events on workstation printer.
2. Sort and report by device name and by function.
3. Report type of signal (alarm, supervisory, or trouble), description, date, and time of occurrence.
4. Differentiate alarm signals from other indications.
5. When system is reset, report reset event with same information concerning device, location, date, and time.

O. Display Monitor:

1. Backlighted LCD to display metered data with touch-screen selecting device.
2. Touch-screen display shall be a minimum 12-inch diagonal, resolution of 800 by 600 RGB pixels, 256 colors; NEMA 250, Type 1 display enclosure.
3. Display four values on one screen at same time.

2.6 COMMUNICATION COMPONENTS AND NETWORKS

A. Network Configuration: High-speed, multi-access, open nonproprietary, industry standard communication protocol; LANs complying with EIA 485, 100 Base-T Ethernet, and Modbus TCP/IP.

2.7 POWER MONITORS

A. Separately mounted, permanently installed instrument for power monitoring and control, complying with UL 1244.

1. Enclosure: NEMA 250, Type 1 or 4x.

B. Environmental Conditions: System components shall be capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. Indoor installation in nontemperature-controlled spaces that have environmental controls to maintain ambient conditions of 0 to 122 deg F (minus 18 to plus 50 deg C) dry bulb and 20 to 90 percent relative humidity, noncondensing.

C. RMS Real-Time Measurements:

1. Current: Each phase, neutral, average of three phases, percent unbalance.

2. Voltage: Line-to-line each phase, line-to-line average of three phases, line-to-neutral each phase, line-to-neutral average of three phases, line-to-neutral percent unbalance.
3. Power: Per phase and three-phase total.
4. Reactive Power: Per phase and three-phase total.
5. Apparent Power: Per phase and three-phase total.
6. Power Factor: Per phase and three-phase total.
7. Displacement Power Factor: Per phase and three-phase total.
8. Frequency.
9. THD: Current and voltage.
10. Accumulated Energy: Real kWh, reactive kVARh, apparent kVAh (signed/absolute).
11. Incremental Energy: Real kWh, reactive kVARh, apparent kVAh (signed/absolute).
12. Conditional Energy: Real kWh, reactive kVARh, apparent kVAh (signed/absolute).

D. Demand Current Calculations, per Phase, Three-Phase Average and Neutral:

1. Present.
2. Running average.
3. Last completed interval.
4. Peak.

E. Demand Real Power Calculations, Three-Phase Total:

1. Present.
2. Running average.
3. Last completed interval.
4. Predicted.
5. Peak.
6. Coincident with peak kVA demand.
7. Coincident with kVAR demand.

F. Demand Reactive Power Calculations, Three-Phase Total:

1. Present.
2. Running average.
3. Last completed interval.
4. Predicted.
5. Peak.
6. Coincident with peak kVA demand.
7. Coincident with kVAR demand.

G. Demand Apparent Power Calculations, Three-Phase Total:

1. Present.
2. Running average.
3. Last completed interval.
4. Predicted.
5. Peak.

6. Coincident with peak kVA demand.
7. Coincident with kVAR demand.

H. Average Power Factor Calculations, Demand Coincident, Three-Phase Total:

1. Last completed interval.
2. Coincident with kW peak.
3. Coincident with kVAR peak.
4. Coincident with kVA peak.

I. Power Analysis Values:

1. THD, Voltage and Current: Per phase, three phase, and neutral.
2. Displacement Power Factor: Per phase, three phase.
3. Fundamental Voltage, Magnitude and Angle: Per phase.
4. Fundamental Currents, Magnitude and Angle: Per phase.
5. Fundamental Real Power: Per phase, three phase.
6. Fundamental Reactive Power: Per phase.
7. Harmonic Power: Per phase, three phase.
8. Phase rotation.
9. Unbalance: Current and voltage.
10. Harmonic Magnitudes and Angles for Current and Voltages: Per phase, up to 31st harmonic.

J. Power Demand Calculations: According to one of the following calculation methods, selectable by the user:

1. Thermal Demand: Sliding window updated every second for the present demand and at end of the interval for the last interval. Adjustable window that can be set in 1-minute intervals, from 1 to 60 minutes.
2. Block Interval with Optional Subintervals: Adjustable for 1-minute intervals, from 1 to 60 minutes. User-defined parameters for the following block intervals:

    a. Sliding block that calculates demand every second, with intervals less than 15 minutes, and every 15 seconds with an interval between 15 and 60 minutes.
    b. Fixed block that calculates demand at end of the interval.
    c. Rolling block subinterval that calculates demand at end of each subinterval and displays it at end of the interval.

3. Demand Calculation Initiated by a Synchronization Signal:

    a. Signal is a pulse from an external source. Demand period begins with every pulse. Calculation shall be configurable as either a block or rolling block calculation.
    b. Signal is a communication signal. Calculation shall be configurable as either a block or rolling block calculation.
    c. Demand can be synchronized with clock in the power meter.

K. Sampling:

1. Current and voltage shall be digitally sampled at a rate high enough to provide accuracy to 63rd harmonic of 60-Hz fundamental.
2. Power monitor shall provide continuous sampling at a rate of 128 samples per cycle on all voltage and current channels in the meter.

L. Minimum and Maximum Values: Record monthly minimum and maximum values, including date and time of record. For three-phase measurements, identify phase of recorded value. Record the following parameters:

1. Line-to-line voltage.
2. Line-to-neutral voltage.
3. Current per phase.
4. Line-to-line voltage unbalance.
5. Line-to-neutral voltage unbalance.
6. Power factor.
7. Displacement power factor.
8. Total power.
9. Total reactive power.
10. Total apparent power.
11. THD voltage L-L.
12. THD voltage L-N.
13. THD current.
14. Frequency.

M. Harmonic Calculation: Display and record the following:

1. Harmonic magnitudes and angles for each phase voltage and current through 31st harmonic. Calculate for all three phases, current and voltage, and residual current. Current and voltage information for all phases shall be obtained simultaneously from same cycle.
2. Harmonic magnitude reported as a percentage of the fundamental or as a percentage of rms values, as selected by user.

N. Current and Voltage Ratings:

1. Designed for use with current inputs from standard instrument current transformers with 5-A secondary and shall have a metering range of 0-10 A.
2. Withstand ratings shall not be less than 15 A, continuous; 50 A, lasting over 10 seconds, no more frequently than once per hour; 500 A, lasting 1 second, no more frequently than once per hour.
3. Designed for use with voltage inputs from standard instrument potential transformers with a 120-V secondary.

O. Accuracy:

1. Comply with ANSI C12.20, Class 0.5; and IEC 60687, Class 0.5 for revenue meters. Accuracy from Light to Full Rating shall meet the following criteria:

a. Power: Accurate to 0.25 percent of reading, plus 0.025 percent of full scale.

b. Voltage and Current: Accurate to 0.075 percent of reading, plus 0.025 percent of full scale.
c. Power Factor: Plus or minus 0.002, from 0.5 leading to 0.5 lagging.
d. Frequency: Plus or minus 0.01 Hz at 45 to 67 Hz.

2. For meters that are circuit-breaker accessories, metering accuracy at full-scale shall not be less than the following:

a. Current: Plus or minus 2.5 percent.
b. Voltage: Plus or minus 1.5 percent.
c. Energy, Demand, and Power: Plus or minus 4.0 percent.
d. Frequency: Plus or minus 1 Hz.

P. Waveform Capture:

1. Capture and store steady-state waveforms of voltage and current channels; initiated manually. Each capture shall be for 3 cycles, 128 data points for each cycle, allowing resolution of harmonics to 31st harmonic of basic 60 Hz.
2. Store captured waveforms in internal nonvolatile memory; available for PC display, archiving, and analysis.

Q. Input: One digital input signal(s).

1. Normal mode for on/off signal.
2. Demand interval synchronization pulse, accepting a demand synchronization pulse from a utility demand meter.
3. Conditional energy signal to control conditional energy accumulation.

R. Outputs:

1. Operated either by user command sent via communication link or set to operate in response to user-defined alarm or event.
2. Closed in either a momentary or latched mode as defined by user.
3. Each output relay used in a momentary contact mode shall have an independent timer that can be set by user.
4. One digital KY pulse to a user-definable increment of energy measurement. Output ratings shall be up to 120-V ac, 300-V dc, 50 mA, and provide 3500-V rms isolation.
5. One relay output module(s), providing a load voltage range from 20- to 240-V ac or from 20- to 30-V dc, supporting a load current of 2 A.
6. Output Relay Control:

a. Relay outputs shall operate either by user command sent via communication link or in response to user-defined alarm or event.
b. Normally open and normally closed contacts, field configured to operate as follows:
1) Normal contact closure where contacts change state for as long as signal exists.
2) Latched mode when contacts change state on receipts of a pickup signal; changed state is held until a dropout signal is received.

3) Timed mode when contacts change state on receipt of a pickup signal; changed state is held for a preprogrammed duration.
4) End of power demand interval when relay operates as synchronization pulse for other devices.
5) Energy Pulse Output: Relay pulses quantities used for absolute kWh, absolute kVARh, kVAh, kWh In, kVARh In, kWh Out, and kVARh Out.
6) Output controlled by multiple alarms using Boolean-type logic.

S. Onboard Data Logging:

1. Store logged data, alarms, events, and waveforms in 800 KB of onboard nonvolatile memory.
2. Stored Data:

a. Billing Log: User configurable; data shall be recorded every 15 minutes, identified by month, day, and 15-minute interval. Accumulate 24 months of monthly data, 32 days of daily data, and between 2 and 52 days of 15-minute interval data, depending on number of quantities selected.
b. Custom Data Logs: Three user-defined log(s) holding up to 96 parameters. Date and time stamp each entry to the second and include the following user definitions:
7) Schedule interval.
8) Event definition.
9) Configured as "fill-and-hold" or "circular, first-in first-out."

c. Alarm Log: Include time, date, event information, and coincident information for each defined alarm or event.
d. Waveform Log: Store captured waveforms configured as "fill-and-hold" or "circular, first-in first-out."

3. Default values for all logs shall be initially set at factory, with logging to begin on device power up.

T. Alarms.

1. User Options:

a. Define pickup, dropout, and delay.
b. Assign one of four severity levels to make it easier for user to respond to the most important events first.
c. Allow for combining up to four alarms using Boolean-type logic statements for outputting a single alarm.

2. Alarm Events:

a. Over/undercurrent.
b. Over/undervoltage.
c. Current imbalance.
d. Phase loss, current.
e. Phase loss, voltage.

f. Voltage imbalance.
g. Over kW demand.
h. Phase reversal.
i. Digital input off/on.
j. End of incremental energy interval.
k. End of demand interval.

U. Control Power: 90- to 457-V ac or 100- to 300-V dc.

V. Communications:

1. Power monitor shall be permanently connected to communicate via RS-485 Modbus TCP/IP.
2. Local plug-in connections shall be for RS-232 and 100 Base-T Ethernet.

W. Display Monitor:

1. Backlighted LCD to display metered data with touch-screen selecting device.
2. Touch-screen display shall be a minimum 12-inch diagonal, resolution of 800 by 600 RGB pixels, 256 colors; NEMA 250, Type 1 display enclosure.
3. Display four values on one screen at same time.

a. Current, per phase rms, three-phase average and neutral.
b. Voltage, phase to phase, phase to neutral, and three-phase averages of phase to phase and phase to neutral.
c. Real power, per phase and three-phase total.
d. Reactive power, per phase and three-phase total.
e. Apparent power, per phase and three-phase total.
f. Power factor, per phase and three-phase total.
g. Frequency.
h. Demand current, per phase and three-phase average.
i. Demand real power, three-phase total.
j. Demand apparent power, three-phase total.
k. Accumulated energy (MWh and MVARh).
l. THD, current and voltage, per phase.

4. Reset: Allow reset of the following parameters at the display:

a. Peak demand current.
b. Peak demand power (kW) and peak demand apparent power (kVA).
c. Energy (MWh) and reactive energy (MVARh).

2.8 STANDALONE, WEB-ENABLED MONITORING AND CONTROL INSTRUMENT

A. Separately mounted, permanently installed instrument for power monitoring and control.

1. Enclosure: NEMA 250, Type 1 , 4x.

B. Environmental Conditions: System components shall be capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability.

1. Indoor installation in nontemperature-controlled spaces that have environmental controls to maintain ambient conditions of 0 to 122 deg F (minus 18 to plus 50 deg C) dry bulb and 20 to 90 percent relative humidity, noncondensing.

C. Power-Distribution Equipment Monitor: Web enabled, with integral network port and embedded Web server with factory-configured firmware and HTML-formatted Web pages for viewing of power monitoring and equipment status information from connected devices equipped with digital communication ports.

D. LAN Connectivity: Multipoint, RS-485 Modbus serial communication network, interconnecting all breaker trip units, protective relays, drives, and metering devices equipped with communications. Serial communication network connected to Ethernet server that functions as a gateway and server, providing data access via 100 Base-T LAN.

E. Communication Devices within the Equipment: Addressed at factory and tested to verify reliable communication with network server.

F. Server Configuration:

1. Initial network parameters set using a standard Web browser. Connect via a local operator interface, or an RJ-45 port accessible from front of equipment.
2. Network server shall be factory programmed with embedded HTML-formatted Web pages that are user configurable and that provide detailed communication diagnostic information for serial and Ethernet ports as status of RS-485 network; with internal memory management information pages for viewing using a standard Web browser.
3. Login: Password protected; password administration accessible from the LAN using a standard Web browser.
4. Operating Software: Suitable for local access; firewall protected.

G. Data Access:

1. Network server shall include embedded HTML pages providing real-time information from devices connected to RS-485 network ports via a standard Web browser.

H. Equipment Monitoring Options: Login shall be followed by a main menu for selecting summary Web pages that follow.

I. Summary Web pages shall be factory configured to display the following information for each communicating device within the power equipment lineup:

1. User-Configured Custom Home Page: Provide for the lineup, showing status-at-a-glance of key operating values.
2. Circuit Summary Page: Circuit name, three-phase average rms current, power (kW), power factor, and breaker status.

3. Load Current Summary Page: Circuit name, Phase A, B, and C rms current values.
4. Demand Current Summary Page: Circuit name, Phase A, B, and C average demand current values.
5. Power Summary Page: Circuit name, present demand power (kW), peak demand power (kW), and recorded time and date.
6. Energy Summary Page: Circuit name, energy (kWh), reactive energy (kVARh), and time/date of last reset.
7. Transformer Status Page: Transformer tag, coil temperatures, and cooling fan status.
8. Motor-Control Center Status Page: Circuit name, three-phase average rms current, thermal capacity (percentage), and drive output frequency (Hz) contactor status.
9. Specific Device Pages: Each individual communicating device shall display detailed, real-time information, as appropriate for device type.

    a. Display historical energy data that shall be logged automatically for each device, as appropriate for device type.
    b. Display historical data logged from each device in graphical time-trend plots. Value to be displayed on time-trend plot shall be user selectable. Time interval to be displayed on scale shall be for previous day or week.

10. Export historical energy data to a PC or workstation through network using FTP (File Transfer Protocol). Format exported data in a CSV (Comma Separated Variable) file format for importing into spreadsheet applications.

J. Communications:

1. Power monitor: Permanently connected to communicate via RS-485 Modbus TCP/IP.
2. Local Plug-in Connections: RS-232 and 100 Base-T Ethernet.
3. Monitor Display: Backlighted LCD to display metered data with touch-screen selecting device.

2.9 RS-232 ASCII INTERFACE

A. ASCII interface shall allow RS-232 connections to be made between a meter or circuit monitor operating as the host PC and any equipment that will accept RS-232 ASCII command strings, such as local display panels and alarm transmitters.

B. Pager System Interface: Alarms shall be able to activate a pager system with customized message for each input alarm.

1. RS-232 output shall be capable of connection to a pager interface that can be used to call a paging system or service and send a signal to a portable pager. System shall allow an individual alphanumeric message per alarm input to be sent to paging system. This interface shall support both numeric and alphanumeric pagers.

C. Alarm System Interface:

1. RS-232 output shall be capable of transmitting alarms from other monitoring and alarm systems to workstation software.

D. Cables:

1. PVC-Jacketed, RS-232 Cable: Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors, polypropylene insulation, and individual aluminum foil-polyester tape shielded pairs with 100 percent shield coverage; PVC jacket. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.

a. NFPA 70, Type CM.
b. Flame Resistance: UL 1581, Vertical Tray.

2. Plenum-Type, RS-232 Cable: Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors, plastic insulation, and individual aluminum foil-polyester tape shielded pairs with 100 percent shield coverage; plastic jacket. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.

a. NFPA 70, Type CMP.
b. Flame Resistance: NFPA 262, Flame Test.

2.10 LAN CABLES

A. RS-485 Cable:

1. PVC-Jacketed, RS-485 Cable: Paired, 2 pairs, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors, PVC insulation, unshielded, PVC jacket, and NFPA 70, Type CMG.
2. Plenum-Type, RS-485 Cable: Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors, fluorinated-ethylene-propylene insulation, unshielded, and fluorinated-ethylene-propylene jacket, and NFPA 70, Type CMP.

B. Unshielded Twisted Pair Cables: Category 6 as specified for horizontal cable for data service in Section 271500 "Communications Horizontal Cabling."

2.11 LOW-VOLTAGE WIRING

A. Low-Voltage Control Cable: Multiple conductor, color-coded, No. 20 AWG copper, minimum.

1. Sheath: PVC; except in plenum-type spaces, use sheath listed for plenums.
2. Ordinary Switching Circuits: Three conductors unless otherwise indicated.
3. Switching Circuits with Pilot Lights or Locator Feature: Five conductors unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine pathway elements intended for cables. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CABLING

A. Comply with NECA 1.

B. Wiring Method: Install wiring in raceway and cable tray except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Use NRTL-listed plenum cable in environmental air spaces, including plenum ceilings. Conceal raceway and cables except in unfinished spaces.

C. Install LAN cables using techniques, practices, and methods that are consistent with specified category rating of components and that ensure specified category performance of completed and linked signal paths, end to end.

D. Install cables without damaging conductors, shield, or jacket.

3.3 IDENTIFICATION

A. Identify components and power and control wiring according to Section 260553 "Identification for Electrical Systems."

B. Label each power monitoring and control module with a unique designation.

3.4 GROUNDING

A. Comply with IEEE 1100, "Recommended Practice for Powering and Grounding Electronic Equipment."

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Tests and Inspections:

1. Electrical Tests: Use caution when testing devices containing solid-state components.
2. Continuity tests of circuits.
3. Operational Tests: Set and operate controls at workstation and at monitored and controlled devices to demonstrate their functions and capabilities. Use a methodical sequence that cues and reproduces actual operating functions as recommended by manufacturer. Submit sequences for approval. Note response to each test command and operation. Note time intervals between initiation of alarm conditions and registration of alarms at central-processing workstation.

    a. Coordinate testing required by this Section with that required by Sections specifying equipment being monitored and controlled.
    b. System components with battery backup shall be operated on battery power for a period of not less than 10 percent of calculated battery operating time.
    c. Verify accuracy of graphic screens and icons.
    d. Metering Test: Load feeders, measure loads on feeder conductor with a rms reading clamp-on ammeter, and simultaneously read indicated current on the same phase at central-processing workstation. Record and compare values measured at the two locations. Resolve discrepancies greater than 5 percent and record resolution method and results.
    e. Record metered values, control settings, operations, cues, time intervals, and functional observations and submit test reports printed by workstation printer.

E. Power monitoring and control equipment will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

G. Correct deficiencies make necessary adjustments, and retest. Verify that specified requirements are met.

H. Test Labeling: After satisfactory completion of tests and inspections, apply a label to tested components indicating test results, date, and responsible agency and representative.

I. Reports: Written reports of tests and observations. Record defective materials and workmanship and unsatisfactory test results. Record repairs and adjustments.

J. Remove and replace malfunctioning devices and circuits and retest as specified above.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain systems.

1. Train Owner's management and maintenance personnel in interpreting and using monitoring displays and in configuring and using software and reports. Include troubleshooting, servicing, adjusting, and maintaining equipment. Provide a minimum of 12 hours' training.
2. Training Aid: Use approved final versions of software and maintenance manuals as training aids.

3.7 ON-SITE ASSISTANCE

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to 3 visits to Project during other-than-normal occupancy hours for this purpose.

END OF SECTION

SECTION 260923 – DIGITAL NETWORK LIGHTING CONTROLS - Leviton GreenMAX DRC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 specification Sections.

B. All contract documents and addenda.

1.2 SUMMARY

A. Section Includes:

1. Digital network lighting control system.

B. Related Sections:

1. Section [262726 — Wiring Devices].
2. Section [265113 — Interior Lighting Fixtures, Lamps, and Ballasts:] LED and Fluorescent lighting ballasts controlled by lighting control system.
3. Section [260923 — Lighting Control Devices:] Occupancy Sensors, Photocells and Digital Switches used in conjunction with lighting control system.
4. Section [260943.16—Addressable Luminaire Level Lighting Controls:] Integrated Fixture Controls with Addressable Luminaires.

C. Contractor responsibilities:

1. Coordinate, receive, mount, connect, and place into operation all equipment. Furnish all conduit, wire, connectors, hardware, and other incidental items necessary for the complete and properly functioning relay lighting control system as described herein and shown on the plans.

1.3 REFERENCES

A. American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE) C62.41-1991 — Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.

B. ASTM International (ASTM) ()

1. D4674 -02a Standard Test Method for Accelerated Testing for Color Stability of Plastics Exposed to Indoor Fluorescent Lighting and Window-Filtered Daylight.

C. Canadian Standards Association (CSA) ().

1. CSA C22.2 # 14 Industrial Control Equipment
2. CSA C22.2 # 184 Solid-State Lighting Controls

D. International Electrotechnical Commission ().

1. (IEC) 801-2 Electrostatic Discharge Testing Standard.
2. IEC/EN 60669-2-1 Switches for household and similar fixed electrical installations - electronic switches.

E. International Organization for Standardization (ISO)

1. 9001:2000 — Quality Management Systems.

F. National Electrical Manufacturers Association (NEMA) WD1 (R2005) - General Color Requirements for Wiring Devices.

G. Norma Official Mexicana (NOM).

1. NOM-003-SCFI Productos eléctricos - Especificaciones de seguridad (Electrical productos - Safety Specific ations)

H. Underwriters Laboratories, Inc. (UL) ():

1. 508 (1999) - Standard for Industrial Control Equipment.
2. 924 – Standard for Safety of Emergency Lighting and Power Equipment

I. International Energy Conservation Code (IECC).

1. IECC

J. American Society of Heating, Refrigerating and Air-Conditioning (ASHRAE).

1. ASHRAE 90.1

K. California Energy Commission (CEC).

1. Title 24

1.4 SUBMITTALS

A. Submit under provisions of Section [01 33 00] and in accordance with Conditions of the Contract. Submittal Set shall include the following:

1. Bill of Materials: Complete list of all parts needed to fully install selected system components.
2. System One-Line Diagram.
3. Device detail drawings providing wiring details and dimensional data.
4. Product Data Sheets.

1.5 CLOSEOUT SUBMITTALS

A. To be provided within two weeks following system turn-on.

1. Warranty documents specified herein.
2. Operation and maintenance manuals in digital format (PDF format).
3. As-built drawings in digital format (PDF format).

1.6 QUALITY ASSURANCE

A. Manufacturer Requirements

1. Continuously engaged in the manufacture of architectural lighting controls and relays for no less than ten years.
2. Provide factory-direct technical support hotline 24 hours per day, 7 days per week.
3. Maintain a quality system that is registered to the ISO 9001:2000 Quality Standard.

B. Lighting control system components:

1. Listed by [CE] [CSA] [UL] specifically for the required loads or certified by recognized independent testing organizations that test to [CE] [CSA] [UL] standards.

a. UL508

1) UL916 listing not acceptable.

b. UL924

2. Comply with ASHRAE 90.1
3. Comply with CEC Title 24, Part 6
4. Comply with IECC

C. Installer Qualifications

1. Experienced in performing the work of this section.
2. Has specialized in installation of work similar to that required for this project.

D. Source Limitations

1. To assure compatibility, obtain all system components from a single source with complete responsibility for all lighting controls and accessories specified in this Section and elsewhere in Division 26 Section 09 “Lighting Controls.” The use of subcontracted component assemblers is not acceptable.

1.7 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. LED Drivers or Fluorescent Ballasts

1. Supply ballasts that are compatible with the network lighting control system.
2. Accept 0 – 10V dimming control, phase dimming, DMX or DALI.

B. All conduit, wire, connectors, hardware, and other incidental items necessary for the complete and properly functioning Network Lighting Control System as described herein and shown on the plans.

1.8 DELIVERY, STORAGE & HANDLING

A. General: Comply with Division 1 Product Requirements Sections.

B. Ordering: Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.

C. Delivery

1. Deliver materials in manufacturer's original, unopened, undamaged packages with intact identification labels.
2. Deliver to other trades in a timely manner.

D. Storage and Protection: Store materials away from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.

1.9 PROJECT CONDITIONS

A. Do not install equipment until the following conditions can be maintained in spaces to receive equipment:

1. Ambient temperature: 0° to 50° C (32° to 122° F).
2. Relative humidity: Maximum 90 percent, non-condensing.
3. Lighting control system must be protected from dust during installation.

1.10 WARRANTY

A. Manufacturer's Warranty

1. Warrant all equipment free of defects in materials and workmanship.
2. Warranty Period

    a. Warrant all system components for 25 months from date of shipment, or two years from date of turn-on, whichever occurs first.
    b. Make extended warranties available.

3. Warrant relay modules for a period of 10 years.

    a. Provide replacement modules at no cost to Owner.

4. Owner’s Rights: Manufacturer’s warranty is in addition to, not a limitation of, other rights the Owner may have under contract documents.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Acceptable Manufacturer: Leviton Manufacturing Co. Inc.

B. Basis of design product: Leviton Manufacturing Co. Inc. GreenMAX DRC or subject to compliance and prior approval with specified requirements of this section, one of the following:

1. Leviton Manufacturing Co. Inc. GreenMAX DRC
2. <<To specify an alternate manufacturer and product, insert the names here. Otherwise, delete this entire line.>>

C. Substitutions: [Not permitted.] [Permitted.]

1. Show all substitutions as an add or deduct from the base bid price.

    a. All substitutions subject to provisions of [Section 00 26 00] [Section 01 25 00] [Section 01 62 00] [Division 1]

2. Clearly delineate all proposed substitutions as such and submit in writing for approval by the design professional a minimum of 10 working days prior to the bid date.

    a. Proposed substitutions must be made available to all bidders.
    b. Proposed substitutes must be accompanied by a review of the specification noting compliance on a line-by-line basis.

3. Prior to rough-in, provide complete engineered shop drawings, including power wiring, with deviations from the original design highlighted in an alternate color, to the engineer for review and approval.
4. By using pre-approved substitutions, the contractor accepts responsibility and associated costs for all required modifications to circuitry, devices, and wiring.

2.2 DESCRIPTION

A. Wired digital network lighting control system comprised of the following components:

1. GreenMAX DRC Room Controllers
2. GreenMAX DRC App
3. Remote Load Control Smart Packs
4. Sapphire Touch Screen Room Controller
5. Phase Control Dimmer
6. Configurable Relay Cabinets

7. Remote Low Voltage Input Cabinets
8. For Line Voltage Room Controllers
9. Low Voltage Control Devices

    a. Including but not limited to digital switches, analog switches, occupancy sensors, and daylight sensors.

10. Network Equipment:

    a. Hubs, Switches, and Repeaters for connection of LumaCAN and Ethernet cabling.
    b. Network Protocol Converters (NPC) and Gateways used for system integration as required by specific project plans.
    c. Power Supplies

B. Wireless digital network lighting control system comprised of the following components:

1. GreenMAX DRC Wireless Keypad Room Controllers
2. GreenMAX DRC App
3. Wireless Load Control Devices

    a. Including but not limited to wireless power packs, digital switches, digital dimmers, and marked controlled receptacles.

4. Wireless Sensors

    a. Including but not limited to wireless sensors and wireless photocells.

5. Intellect-Enabled Fixtures

    a. Including but not limited to fixtures provided by Leviton Lighting Brands and other manufacturers.

6. Intellect-Enabled Fixtures

    a. Including but not limited to fixtures provided by Leviton Lighting Brands and other manufacturers.

2.3 PERFORMANCE CRITERIA

A. [Occupancy/Vacancy Sensing] [0-10V Dimming] [Daylight Harvesting] [Partial-ON] [Partial-OFF] [Demand Response] [Receptacle Control] [Manual Switching] to control lighting with the following hierarchy:

1. Emergency: Highest priority, overrides all other inputs.
2. Power failure: All RTC relays close upon loss of system power.
3. Bypass Switches: Second priority, over-rides all other inputs except Emergency.
4. Scheduled events and scenes: configured using the GreenMAX DRC App.

B. Room Controller Operation

1. Programmable from WiFi network using the GreenMAX DRC App on an Android or iOS smart device.
2. Multi-location switching.
3. Occupancy/vacancy detection.

    a. Allow programming of each group with the following operational behaviors:

        1) Auto ON / Auto OFF
        2) Auto ON /Auto OFF with light hold off
        3) Manual ON / Auto OFF with light hold off
        4) Manual ON / Auto OFF
        5) Manual ON / Manual OFF
        6) Manual ON / Manual OFF with light hold off

    b. Set Light Hold (delay) Times from thirty (30) seconds to thirty 30) minutes.

4. Multi-zone Daylight Harvesting.

    a. No limit to number of Zones.
    b. Closed loop daylight harvesting.
    c. Eight (8) independent pairs of rising and falling trigger point values per photocell input.
    d. Delay times of thirty (30) seconds to thirty (30) minutes.
    e. ON/OFF behavior.
    f. Auto ON with Manual Override.
    g. Blink Warn Sequence.

5. Assign fixtures to a Group.

    a. System shall have the ability to assign fixtures to Groups.

C. Digital switches

1. Assign each button to individual fixtures or Groups.

    a. Programmable behaviors to include

        1) Scene
        2) Toggle
        3) Room ON
        4) Room OFF
        5) Group Raise / Group Lower
        6) Raise
        7) Lower

2. Program delay time within each area or zone.

    a. Thirty (30) seconds to thirty (30) minutes.

2.4 NETWORK PROTOCOLS

A. WiFi

1. Connection to GreenMAX DRC App for wireless commissioning, configuration, control, monitoring and provisioning.
2. Connection to building network.

B. LumaCAN

1. Daisy chain topology.
2. Maximum branch length of 1600 feet.

    a. Devices located at branch ends must have their termination jumpers in the ON position.

C. Ethernet

1. Command Modules only.
2. Can be configured as a bridge between LumaCAN branches.
3. Can be used as an Internet connection.

    a. Remote firmware upgrades, monitoring and programming possible via Internet.

4. Ethernet switches can be used to extend system coverage area by linking Command Modules.

D. Wireless mesh network

1. Mesh network topology.
2. Wireless system connection to GreenMAX DRC, Wireless Devices, and Intellect-Enabled Fixtures.

E. BACnet IP

1. Read-only device description for Relay Cabinets.

    a. For use with Building Management System (BMS) software that does not support writing of device descriptions.

2. Re-name groups and relays via the BMS network, if it supports this function.
3. Support all 16 BACnet priorities.

    a. Separate Priority Array for each relay.
    b. 1 is highest, 16 is lowest.
    c. Higher priority maintains control until a “relinquish” command is issued.
    d. Top three priority levels permanently assigned to Internal Main Bypass, Emergency Power and Internal Relay Bypass.
    e. Individual control of all other priorities.

4. Support 252 Analog / Binary Outputs.
5. Support 240 Analog / Binary Inputs.

2.5 NETWORK CABLES AND CONNECTORS

A. LumaCAN: CAT6

B. Ethernet: CAT5 or better

C. BACnet IP: CAT5 or better

D. Terminations: RJ45 connectors

2.6 GREENMAX DISTRIBUTED ROOM CONTROL (DRC) ROOM CONTROLLERS

A. Coordinates all the energy management functions in a room as part of the GreenMAX DRC system.

B. Performance Criteria

1. GreenMAX DRC Room Controller shall be capable of the following applications:

    a. Single room controller for GreenMAX DRC systems, coordinating all the energy management functions in a room.

2. Line voltage models UL924 listed.
3. Provide 0-10V control and power relay rated.

C. Physical

1. Available in low voltage and line voltage.

    a. Low voltage model can be surface mounted or installed in a DIN rail enclosure.
    b. Line voltage model provided in NEMA 1 enclosure with nipple mounting can install into a knockout or act as cover for a 4” square box.
    c. UL2043 Plenum rated.

2. Environmental

    a. Operating Temperature: 32º to 104º F (0º to 40º C)
    b. Ambient Humidity 0% to 90% non-condensing

D. Electrical

1. Supported and listed loads

    a. 120 – 277VAC,16A LED Driver, Tungsten, Resistive, Electronic Ballast
    b. 120 – 277VAC, 20A Ballast

c. 120VAC 1/2HP Motor, 277VAC 1HP Motor, 240VAC 1HP Motor
d. 120VAC, 20A General Purpose Plug Load Control.

2. Input Voltage

a. Low Voltage: 12 – 24VDC
b. Line Voltage: 120 – 277VAC, 50/60Hz, 20A Max
c. Line Voltage: 347VAC, 60Hz, 20A Max.

3. Control output

a. Class I or Class II 0-10V wiring. #18AWG stranded
b. 0-10V Sinking Control, 20A

4. Network Connections via LumaCAN wiring using CAT6 cable with RJ45 connectors.
5. Wireless Connections via wireless mesh networks to Leviton wireless devices and Intellect-enabled fixtures and WiFi to building networks.

E. Product Components

1. Leviton GreenMAX DRC Room Controller, DIN Rail Form Factor, model # DRC00-0L0
2. Leviton GreenMAX DRC Room Controller, 120-277VAC, model # DRC07-ED0
3. Leviton GreenMAX DRC Room Controller, 347VAC, model # DRC00-E30

2.7 GREENMAX DISTRIBUTED ROOM CONTROL (DRC) SMART PACKS

A. Remotely mounted network addressable load control relays allowing for a distributed system architecture.

B. Performance Criteria

1. DRC Smart Packs shall be capable of the following applications:

a. UL924 listed for use with Normal or Emergency loads
b. Standalone load control when used with a GreenMAX DRC or Sapphire Room Controller.
c. Remote relay when used with GreenMAX Lighting Control Panel

2. Provide 0-10V dimming or switching control for all listed and compatible load types.

C. Smart Pack relay shall be listed for use on Plug Load circuits.

D. DRC Smart Pack shall provide two-way communication and metering relay capability and allow data to be collected over BACnet via connected devices.

E. Physical

1. Smart Pack provided in NEMA 1 enclosure with nipple mounting for use with standard junction box.

    a. UL2043 Plenum rated.
    b. Paintable for exposed ceiling installations

2. Environmental

    a. Operating Temperature: 23º to 122º F (-5º to 50º C)
    b. Ambient Humidity 0% to 90% non-condensing

F. Electrical

1. Supported and listed loads

    a. 120 – 277VAC,16A LED Driver, Tungsten, Resistive, Electronic Ballast
    b. 120 – 277VAC, 20A Ballast
    c. 120VAC 1/2HP Motor, 277VAC 1HP Motor, 240VAC 1HP Motor
    d. 120VAC, 20A General Purpose Plug Load Control

2. Input Voltage

    a. 120 – 277VAC, 50/60Hz, 20A Max.
    b. 347VAC, 60Hz, 12A Max.

3. Control output

    a. Class I or Class II 0-10V wiring. #18AWG stranded
    b. 0-10V Sinking control, 100mA

4. Network Connections via LumaCAN wiring using CAT6 cable with RJ45 connectors.

G. Product Components:

1. Leviton DRC Smart Pack, 120-277VAC, model # DRD07-ED0
2. Leviton DRC Smart Pack, 347VAC, model #DRD07-E30

2.8 GREENMAX DISTRIBUTED ROOM CONTROL (DRC) PHASE CONTROL DIMMER

A. Incorporates switching and dimming of 2-wire phase control loads as part of a GreenMAX DRC system.

B. Performance Criteria

1. Provides 1-4 channels of forward or reverse phase control
2. Shall provide amplify feature, allowing channels to be combined to increase output

C. Physical

1. DIN Rail mountable in Leviton DIN Rail Rack Mount Enclosures, series DINRK-XXX
2. Environmental:

    a. Operating Temperature: 32º to 140º F, (0º to 60º C)
    b. Ambient Humidity: 0% to 90% non-condensing

D. Electrical

1. Input Voltage

    a. 120 – 277VAC, 50/60Hz, 10A Max.

2. Load Ratings

    a. Supports LED, CFL, electronic ballast, magnetic ballast, cold cathode, transformer

3. Network Connections via LumaCAN wiring using CAT6A cable with RJ45 connectors.
4. Topology:

    a. Daisy chain, 1600’ max between repeaters.
    b. Home-run and networking length up to 10,000’ can be achieved when using Leviton LumaCAN network repeaters, model # NPRPT.
    c. Maximum 110 nodes between repeaters.
    d. Maximum 250 nodes on a LumaCAN network.

E. Product Components

1. Leviton GreenMAX DRC 4-Channel Phase Control Dimmer, model # DRDDP-A40
2. Leviton GreenMAX DRC 2-Channel Phase Control Dimmer, model # DRDDP-A20

2.9 GREENMAX DISTRIBUTED ROOM CONTROL (DRC) DIGITAL OCCUPANCY SENSORS

A. Provides digital occupancy/vacancy and daylight sensing as part of the GreenMAX DRC System.

B. Performance Criteria

1. Occupancy detection using PIR technology with a 450 sq. ft. field-of-view.
2. Light level detection up to 0 to 100 footcandles.
3. Configurable parameters for occupancy sensitivity, timeout, enable/disable and photocell range, enable/disable.

C. Physical

1. Sensor shall combine both a PIR occupancy/vacancy sensor with a daylight sensing photocell.

2. Sensor shall be recess mounted into a 2” diameter hole.
3. Environmental

    a. Operating Temperature: 32º to 122º F, (0º to 50º C)
    b. Ambient Humidity 0% to 90% non-condensing

D. Electrical

1. LumaCAN powered, +12-24VDC, 70-35mA

E. Product Components

1. Leviton GreenMAX DRC Occupancy Sensor and Photocell, model # OSR05-ICW

2.10 ANALOG SENSORS

A. Comply with requirements in Section 260923 “Lighting Control Devices”

1. Provide PIR, US, or multi-technology (PIR/US) occupancy or vacancy sensing or daylight sensing.

B. Performance Criteria:

1. Low voltage connected to GreenMAX DRC Analog Interface (AI), DRID0-C02 model.
2. All adjustments with exception of sensor range shall be made via the App.
3. Indoor Occupancy Sensors: May be powered directly from the lighting control network or with a standalone power supply. Units powered with a standalone power supply shall interface with the lighting control system through an electrically isolated digital input.

2.11 GREENMAX DISTRIBUTED ROOM CONTROL (DRC) ANALOG INTERFACE (AI)

A. Provides interface to allow the integration of low voltage inputs such as analog occupancy and vacancy sensors, photocells, demand response, and emergency, into the GreenMAX DRC System.

B. Performance Criteria:

1. Connect using CAT6 cable and RJ-45 connectors.
2. Provide power from control unit via LumaCAN network connection.
3. All adjustments with the exception of sensor range shall be made with the GreenMAX DRC App.

C. Physical

1. Inputs to include (2) contact closures, active high/low, 0-10V, 0-24V.

D. Electrical

1. LumaCAN powered, +12-24VDC, 35mA.

E. Product Components

1. Leviton GreenMAX DRC Analog Interface (AI), model # DRIDO-C02.

2.12 GREENMAX DISTRIBUTED ROOM CONTROL (DRC) DIGITAL SWITCHES

A. Network addressable control stations providing local control of digital lighting control system as part of a GreenMAX DRC system.

B. Performance Criteria:

1. Used as primary user interface
2. Can be used for multi-location control
3. Each button shall be individually programmed for ON, OFF, ON/OFF, dimmed raise/lower, scene on level, and other customizable scenes and settings using the GreenMAX DRC App

C. Physical:

1. Available in One (1), two (2), four (4), or (8) button configurations.
2. Available in the following colors

    a. White
    b. Ivory
    c. Light Almond
    d. Gray
    e. Red
    f. Black

3. Custom Engraving

    a. To be available for the following:

        1) Individual buttons
        2) Wallplates

4. Digital switches shall mount into a standard depth wallbox.
5. Environmental

    a. Operating Temperature: 32º to 122º F, (0º to 50º C)
    b. Ambient Humidity: 0% to 90% non-condensing

D. Electrical:

1. Digital stations powered by LumaCAN network through CAT6 cable and RJ45 connectors.

E. Product Components:

1. Leviton GreenMAX DRC Digital Switches, model # DRKDN-CXW
2. Leviton GreenMAX DRC Color Change Kit, model # CKDNK-X0Y
3. Leviton GreenMAX DRC Color Change Kit with Engraving, model # CKDNK-XEY

2.13 SAPPHIRE TOUCH SCREEN ROOM CONTROLLER

A. Provide a fully customizable touch screen-based user interface as a component of the GreenMAX DRC network lighting control system or as a standalone room control solution when used with GreenMAX DRC Smart Packs.

B. Performance Criteria:

1. 7” capacitive LCD Touch Screen providing the following configurable user interface components:

    a. Tabs / Pages
    b. Buttons
    c. Sliders

2. Integral 7-day scheduler:

    a. Astronomical time clock
    b. (2) Custom user defined holiday exception calendars
    c. Special event calendar

3. Two-way communication allows touch screen to update based on actual device status.
4. Online / Offline configuration and screen design through PC tool.
5. Controller shall provide password protected administration.
6. Touch screen shall provide local low-voltage inputs for connection of occupancy and daylight sensors.
7. Touch screen shall allow software and configuration updates through front panel via USB memory stick.

C. Physical:

1. Touch screen shall be installed in a standard 4-gang box with a 4-gang raised device cover.
2. LCP panel shall be 7” diagonal, 16.9 form factor, 800x480 WVGA: 130º x 110º viewing angle with LED backlight and 24-bit color.
3. Environmental:

    a. Operating Temperature: 14º to 122º F, (-5º to 50º C)
    b. Ambient Humidity: 0% to 90% non-condensing

4. Color change kits available in White, Black, and Light Almond.

D. Electrical

1. Controller operates on +12-24VDC, Class II SELV on the digital LumaCAN network using CAT6 cable with RJ45 connectors.
2. Power Supply

    a. Power supplied to Touch Screen via the LumaCAN network or separate power supply. Device draws 1750mA, 200mA standby current.

E. Product Components

1. Leviton Sapphire LCD Touch Screen Room Controller, model # TS007-XXX

2.14 GREENMAX DISTRIBUTED ROOM CONTROL (DRC) LUMACAN TO DALI GATEWAY

A. Allows Leviton lighting control systems based on LumaCAN architecture to be installed in facilities that use DALI communication protocols, allowing for full system compatibility and integration.

B. Performance Criteria

1. Connect up to 64 devices.
2. Convert LumaCAN channels to DALI driver control.
3. Work with short address assignment to DALI devices.
4. Provide fixed fade time for each device.
5. Configure system with GreenMAX DRC App.

C. Physical:

1. Network Topology: maximum run length to DALI is 984 ft. (300 m)
2. Environmental

    a. Operating Temperature: 32º to 113º F, (0º to 45º C)
    b. Ambient Humidity: 0% to 95% non-condensing

D. Electrical:

1. Power Input, Gateway: 24VDC, 60mA.
2. Power Input, DALI: 23 to 30VDC, 250mA per DALI channel, 2 DALI channels, maximum.

E. Product Components:

1. Leviton GreenMAX DRC LumaCAN to DALI Gateway, model # DRCDD-0L0
2. Leviton DIN Rail Cabinet, model # DINRK-XXX
3. Leviton DIN Rail Mount Power Supply, model # PST24-I10

2.15 GREENMAX DISTRIBUTED ROOM CONTROL (DRC) LUMACAN GATEWAY

A. Allows Leviton lighting control systems based on LumaCAN architecture to be installed in facilities that use Luma-Net communication protocols, allowing for full system compatibility and integration.

B. Performance Criteria

1. Process channel, group, and dimmer status messages.
2. Convert LumaCAN2 and LumaCAN3 protocols.
3. Provide LCD front display panel.
4. Provide LED indicator for Luma-Net, LumaCAN, and Ethernet activity.
5. Provide rack ears for installation in 19 inch (483 mm) rack.

C. Physical:

1. Subnet Quantity: 254, maximum.
2. Node Quantity: 250 per subnet.
3. Environmental

a. Operating Temperature: 32º to 104º F, (0º to 40º C)
b. Ambient Humidity: 0% to 95% non-condensing

D. Electrical:

1. Power Input, Gateway: 12-24 VDC, 0.6A.
2. Power Input, DALI: 23 to 30VDC, 250mA per DALI channel, 2 DALI channels, maximum.

E. Product Components:

1. Leviton GreenMAX DRC LUMACAN Gateway, model # NP00G

2.16 GREENMAX DISTRIBUTED ROOM CONTROL (DRC) POWER SUPPLY

A. Provides power to the LumaCAN devices in a GreenMAX DRC system.

B. Performance Criteria

1. Power LumaCAN devices.

C. Physical:

1. Connects using RJ45 connectors and CAT6 wiring
2. UL2043 Plenum Rated for use in Chicago Plenum applications
3. Environmental

a. Operating Temperature: 23º to 122º F (-5º to 50º C)
b. Ambient Humidity: 0-90% non-condensing

D. Electrical:

1. Power Input: 120-277VAC, 50/60 Hz
2. Input Power: Max 17.5W for 120V, 16.5W for 277V
3. LumaCAN Power: 500mA, 24VDC

E. Product Components:

1. Leviton GreenMAX DRC Power Supply, model # DRC00-0D0

2.17 GREENMAX RELAY CABINETS

A. Digital Lighting Control panel consisting of Enclosure, Command Module, Relay Insert Panels, and Modular Relays capable of being field assembled without voiding UL listing.

B. Performance Criteria

1. Capacities

a. Eight (8), sixteen (16), thirty-two (32) or forty-eight (48) single- or dual-pole relays.
b. Optional Factory Installed Low Voltage Input cards

1) Eight (8) or sixteen (16) inputs

2. Command Module

a. Field-installable and/or replaceable self-contained units with Emergency input.

1) Integral overload and short circuit protection provide separate overload protection for system processor and connected LumaCAN devices including Low Voltage Input Card.

b. Supplies power to all electronics in the Relay Cabinet
c. Supplies power to digital switches and Handheld Display Unit via LumaCAN
d. Can supply +24VDC to other low-voltage inputs
e. Can contain an optional Low Voltage Input (+24VDC) card suitable for termination of eight (8) or sixteen (16) low voltage inputs.
f. Emergency Signal Input

1) Input for a hardwired emergency override signal
2) Requires external contacts
3) Activates Emergency status when a signal of +24VDC is present
4) Releases Emergency status when signal falls to zero (0VDC).

g. Controls all relays as assigned by the user regardless of processor operation.
h. Provides +24VDC to external contacts

1) Low Voltage Input Card Option allows user to configure inputs as:
2) 0 to 10VDC analog
3) +24VDC switched
4) Contact closure.

i. +24VDC power supply

1) 70W (2.9 amperes) capacity
2) Input devices can use external power supplies

j. Compatible with the following devices

1) Occupancy sensors
2) Photocells
3) GE switches
4) External Contacts
5) Multi-button low voltage switches
6) ON/OFF dedicated button low voltage switches

3. Handheld Display Unit used for system configuration and monitoring.

a. Current Operating Status
b. Errors
c. Current Time
d. Alarms
e. Astronomical Time Clock settings
f. Monitor Menus
g. Control Menus
h. Configuration Menus
i. Remote Manual operation of all system relays
j. Inspection of both digital and low voltage inputs

1) State
2) Status
3) Current value

k. Schedule monitoring and adjustment
l. Temporary override of schedule on a day by day basis

C. Physical

1. Material

a. Steel

2. Finishes

a. Leviton Standard Green.

3. Removable locking hinged door.

a. Removing the door from its hinges shall not defeat the locking mechanism.
b. Able to be delivered empty of electronics

4. Relay Insert Panel

a. Allow relays modules to be installed, removed and relocated without internal rewiring or mounting screws

D. Electrical

1. Grounding point provided in left wire-way
2. Relays shall be rated to switch voltages from 24 to 277VAC and +24VDC.
3. Short Circuit Current Rating (SCCR) of the assembled cabinet, regardless of its specific configuration, to be 25,000 Amperes at 277VAC.
4. Command Module requires single-phase power supply, 120 / 277VAC.

E. Product Components:

1. GreenMAX enclosure with lockable hinged door.
2. Command Module.
3. Relay Insert Panels
4. Modular Relays, type per panel schedule

2.18 GREENMAX REMOTE LOW VOLTAGE INPUT CABINETS

A. Remotely mounted network node providing additional Network power and local connection point for low voltage control devices.

B. Performance Criteria:

1. Fully functional as independent LumaCAN network nodes

a. Can be connect to network at any location: direct dedicated connection to a Relay Cabinet is not required
b. Eight (8) or sixteen (16) Low Voltage inputs
c. Provides power to LumaCAN digital devices
d. Provides a connection point for the HDU

C. Physical:

1. Surface mount enclosure

a. #16 US gage Steel

2. Finishes

a. Leviton Standard Green.

3. Removable locking hinged door.

a. Removing the door from its hinges shall not defeat the locking mechanism

D. Electrical

1. Integrated power supply

a. Supply 100 – 277VAC
b. Rated output at 70W of +24VDC power via LumaCAN
c. Connected devices can be self-powered.
d. Product Components

2. GreenMAX Remote Low Voltage Input Cabinet

a. RLV08-110 with (8) low voltage inputs
b. RLV16-110 with (16) low voltage inputs

2.19 GREENMAX DIGITAL SWITCHES

A. Network addressable control stations providing local control of digital lighting control system.

B. Performance Criteria:

1. GreenMAX Digital Switches shall be capable of the following applications:

a. ON, OFF, Raise, Lower of 0-10V loads

C. Physical:

1. Button Stations available in One (1), two (2), four (4), or (8) button configurations.
2. Key station available in single-operator stainless steel configuration.
3. Button stations available in the following colors

a. White
b. Ivory
c. Light Almond
d. Gray

4. Custom Engraving

a. To be available for the following:

1) Individual buttons
2) Station wallplates

b. Engraved characters to be of a contrasting color as shown on drawings

D. Electrical:

1. Digital stations powered by LumaCAN network through CAT6 cable and RJ45 connectors.
2. RJ45 connections available on each device:

    a. LumaCAN input
    b. LumaCAN throughput
    c. Hand Held Display Unit access to entire network

E. Product Components:

1. GreenMAX Digital Switches, model # RLVSW-XXX

2.20 GREENMAX DISTRIBUTED ROOM CONTROL (DRC) WIRELESS KEYPAD ROOM CONTROLLERS

A. Coordinates all the energy management functions in a room as part of the GreenMAX DRC wireless system.

B. Performance Criteria

1. GreenMAX DRC Wireless Keypad Room Controller shall be capable of the following applications:

    a. Single room controller for GreenMAX DRC wireless system, coordinating all the energy management functions in a room

C. Physical

1. Button Stations available in One (1), two (2), four (4), or (8) button configurations.
2. Button stations available in the following colors

    a. White
    b. Ivory
    c. Light Almond
    d. Gray
    e. Red
    f. Black

3. Custom Engraving

    a. To be available for the following:

        1) Individual buttons
        2) Station wallplates

    b. Engraved characters to be of a contrasting color as shown on drawings

4. Environmental

    a. Operating Temperature: 32º to 122º F (0º to 50º C)

b. Ambient Humidity 0% to 90% non-condensing

D. Electrical

1. Supported and listed loads

a. 120 – 277VAC,16A LED Driver, Tungsten, Resistive, Electronic Ballast
b. 120 – 277VAC, 20A Ballast
c. 120VAC 1/2HP Motor, 277VAC 1HP Motor, 240VAC 1HP Motor
d. 120VAC, 20A General Purpose Plug Load Control.

2. Input Voltage

a. Line Voltage: 120 – 277VAC, 50/60Hz, 30mA

3. Wireless mesh network connectivity to Leviton wireless devices and Intellect-enabled fixtures and WiFi to building networks

E. Product Components

F. Leviton GreenMAX DRC Wireless Keypad Room Controller, 120-277VAC, model # DRKDN-UXW

2.21 WIRELESS POWER PACKS

A. Remotely mounted network addressable load control relays allowing for a wireless distributed system architecture.

B. Performance Criteria

1. Wireless Power Packs shall be capable of the following applications:

a. Standalone load control when used with a GreenMAX DRC Wireless Keypad Room Controller.

2. Provide 0-10V dimming, phase cut dimming, or switching control for all listed and compatible load types.
3. 20A relay shall be listed for general purpose use on Plug Load circuits.

C. Physical

1. Environmental

a. Operating Temperature: 30º to 122º F (0º to 50º C)
b. Ambient Humidity 0% to 90% non-condensing

D. Electrical

1. Supported and listed loads

a. 120 – 277VAC,16A LED Driver, Tungsten, Resistive, Electronic Ballast
b. 120 – 277VAC, 20A Ballast
c. 120VAC 1/4HP Motor, 277VAC 1/3HP Motor, 240VAC 1/3HP Motor
d. 120VAC, 20A General Purpose Plug Load Control
e. 800W Incandescent

2. Input Voltage

a. 120VAC, 60Hz.
b. 120 – 277VAC, 50/60Hz, 20A Max.

3. Network and device connections via wireless mesh network.

E. Product Components:

1. Leviton Wireless 20A ON/OFF Switching Power Pack, model # LU20S-DNW
2. Leviton Wireless 10A 0-10V Dimming Power Pack, model # LU107-DNW
3. Leviton Wireless 800W Phase Cut Dimming Power Pack, model # LU04P-1NW

2.22 WIRELESS DIGITAL SWITCHES AND DIMMERS

A. Network addressable control stations providing wireless local control of digital lighting control system as part of a GreenMAX DRC wireless system.

B. Performance Criteria:

1. Used as secondary user interface
2. Can be used for multi-location control
3. Configurable using the GreenMAX DRC App

C. Physical:

1. Available as an ON/OFF switch or 0-10V dimmer
2. Digital switches shall mount into a standard depth wallbox.
3. Environmental

a. Operating Temperature: 32º to 104º F, (0º to 40º C)
b. Ambient Humidity: 0% to 90% non-condensing

D. Electrical

1. Supported and listed loads

a. 120 – 277VAC,16A LED Driver, Tungsten, Resistive, Electronic Ballast
b. 120 – 277VAC, 20A Ballast
c. 120VAC 1/4HP Motor, 277VAC 1/3HP Motor, 347VAC 1/4HP Motor
d. 120VAC, 20A General Purpose Plug Load Control
e. 1000W Incandescent

2. Input Voltage

a. 120VAC, 60Hz.
b. 120 – 277VAC, 50/60Hz, 20A Max.
c. 347VAC, 60Hz.
d. 24VDC.

3. Network and device connections via wireless mesh network.

E. Product Components:

1. Leviton 10A ON/OFF Decora Wall Switch, model # ZS10S-D0Z
2. Leviton 0-10V Decora Wall Dimmer, 120-277VAC, model # ZS057-D0Z
3. Leviton 0-10V Decora Wall Dimmer, 347V, model # ZS057-30Z
4. Leviton 0-10V Low Voltage Decora Wall Dimmer, model # ZS057-ALZ
5. Leviton 1000W Dimmer, model # DL1KD-1BZ

2.23 WIRELESS DIGITAL SENSORS

A. Provides digital occupancy/vacancy and daylight sensing as part of the GreenMAX DRC Wireless System.

B. Performance Criteria

1. Occupancy detection using PIR technology with a 450 or 1500 sq. ft. field-of-view
2. Light level detection up to 0 to 100 footcandles
3. Configurable parameters for occupancy sensitivity, timeout, enable/disable and photocell range, enable/disable with the GreenMAX DRC App.

C. Physical

1. Environmental

a. Operating Temperature for Wireless Sensor: 32º to 104º F, (0º to 40º C)
b. Operating Temperature for Wireless Photocell: 14º to 122º F, (-10º to 50º C)
c. Ambient Humidity 0% to 95% non-condensing

D. Electrical

1. Wireless Occupancy Sensors: CR2450 lithium battery (included).
2. Wireless Photocell: (2) CR2450 3V lithium batteries (included).
3. Network and device connections via wireless mesh network.

E. Product Components

1. Leviton Wireless PIR Occupancy Sensor, 450 sq. ft., model # ZSC04-INW
2. Leviton Wireless PIR Occupancy Sensor, 1500 sq. ft., model # ZSC15-INW
3. Leviton Wireless Photocell, model # LURPC-01W

2.24 INTELLECT-ENABLED FIXTURES

A. Intelligent fixture with integrated Solo or Wireless controls, fully compatible with Leviton GreenMAX DRC Wireless Room Control System. All controls pre-installed and fully integrated within the fixture, requiring the contractor to land only hot/neutral/ground to the fixture. On emergency fixtures, an additional EM Hot/Neutral will be allowed.

B. Performance Criteria

1. Full range dimming.
2. Occupancy detection over coverage area of fixture and within recommended mounting heights.
3. Provides 3% accurate or better energy metering to include the following points.

    a. KWH
    b. KW
    c. Voltage
    d. Power Vactor
    e. kVAR
    f. kVARH

4. Upon initial power-up, and, until commissioned, fixture shall support default out-of-the box functionality to include:

    a. Occupancy Detection

        1) Fixture Turns off on vacancy
        2) Fixture Turn on upon occupancy

    b. Automatically calibrated Daylighting Harvesting

5. Reports product failure and status to the network.
6. Detects and reports ambient light level to network for use by daylight harvesting controllers.
7. Wireless communicates with all other devices in a room.
8. Daylight Harvesting capabilities:

    a. Closed loop daylight harvesting.
    b. Configurable dead band.
    c. Override of the daylighting target level may be enabled or disabled in the configuration App.

9. Fully digital with the following configurable attributes:

    a. Time Out
    b. Sensitivity
    c. Target Light Level
    d. Occupancy / Vacancy mode
    e. Exclude sensor.

10. Physical Test Switch allows manual control, restore factory defaults, and pushbutton pairing.

C. Product Components:

1. Viscor Intellect-Enabled LED ALLURA Linear Pendant Type M, model # ALRM
2. Viscor Intellect-Enabled LED ALLURA Linear Pendant Type A, model # ALRA
3. Viscor Intellect-Enabled LED ALLURA Linear Pendant Type B, model # ALRB
4. Viscor Intellect-Enabled LED Troffer Dish Lensed, model # LRTH
5. Viscor Intellect-Enabled LED Commercial Type N Square, model # LCOMN SQ L
6. ConTech Lighting Intellect-Enabled 4” Integrated LED Universal New Construction Downlight, model # R4NCIE
7. ConTech Lighting Intellect-Enabled 4” Square Integrated LED Universal New Construction Downlight, model # R4SQNCIE
8. ConTech Lighting Intellect-Enabled 6” LED Recessed Downlight; Universal New Construction Downlight, model # R6NCIE
9. Birchwood Lighting Intellect-Enabled Jake Recessed Linear Luminaire, model # JAK-LED
10. Intense Lighting Intellect-Enabled 4” LED Round Downlight, model # SS4G4DR
11. Additional Intellect-Enabled Fixtures available from other manufacturers.

2.25 GREENMAX DISTRIBUTED ROOM CONTROL (DRC) APP

A. Used to configure and provide app-based control in a GreenMAX DRC System.

B. Performance Criteria

1. For Android and iOS smart devices.
2. Wirelessly communicates with GreenMAX DRC system components via Wi-Fi.
3. Provide secure administrative settings for communications.
4. Manage devices, create groups, configure daylighting zones, edit scenes, program digital keypads, and program schedules.
5. Provide User Access Control to allow users to adjust individual space lighting using their personal smart device determined by user privileges authenticated by the administrator.

C. Product Components:

1. Leviton GreenMAX DRC App, download at Google Play or Apple Store

PART 3 - EXECUTION

3.1 INSTALLATION

A. Coordinate, receive, mount, connect, [and place into operation] all equipment.

B. Install equipment in accordance with manufacturer’s installation instructions.

C. Provide complete installation of system in accordance with Contract Documents.

D. Maintain performance criteria stated by the manufacturer without defects, damage, or failure.

E. Provide equipment at locations and in quantities indicated on Drawings. Provide any additional equipment required to provide control intent.

F. Ensure that daylight sensor placement minimizes sensors view of electric light sources; ceiling mounted and fixture-mounted daylight sensors shall not have direct view of luminaries.

G. Furnish all conduit, wire, connectors, hardware, and other incidental items necessary for a properly functioning lighting control and relay system as described herein and shown on the plans. The Electrical Contractor shall maintain performance criteria stated by the manufacturer without defects, damage, or failure.

H. Compliance: Contractor shall comply with manufacturer's product data, including shop drawings, technical bulletins, product catalog installation instructions, and product carton instructions for installation.

I. Circuit Testing: The contractor shall test that all branch load circuits are operational before connecting loads to system load terminals, and then de-energize all circuits before installation.

J. Application of Power: Power shall not be applied to the relay system during construction and prior to turn-on unless specifically authorized by written instructions from the manufacturer.

K. [Programming: Program [low-voltage] [and] [digital switch] functionality remotely from the GreenMAX DRC App.]

1. Terminate and test all network cable assemblies. Each field installed RJ45 connection must be tested prior to system interconnection. A test report must be furnished to factory-certified service engineer prior to scheduling commissioning activity.

3.2 SITE VERIFICATION

A. Verify that wiring conditions, which have been previously installed under other sections or at a previous time, are acceptable for product installation in accordance with manufacturer's instructions.

3.3 FIELD MEASUREMENTS

A. The electrical contractor shall be responsible for field measurements and coordinating the physical size of all equipment with the architectural requirements of the spaces into which they are to be installed.

3.4 INSPECTION

A. Inspect all material included in this contract prior to installation. Manufacturer shall be notified of unacceptable material prior to installation.

3.5 SITE PROTECTION

A. Contractor shall protect installed product and finished surfaces from damage during all phases of installation including storage, preparation, testing, and cleanup.

3.6 COMMISSIONING

A. Provide factory-certified field service engineer to ensure proper system installation and operation under following parameters:

1. Certified by the equipment manufacturer on the system installed.
2. Site visit activities:

    a. Verify connection of power feeds and load circuits.
    b. Verify connection of controls.
    c. Verify system operation control by control, circuit by circuit.
    d. Obtain sign-off on system functions.
    e. Demonstrate system capabilities, operation and maintenance and educate Owner’s representative on the foregoing.

3. At least three site visits to accomplish the following tasks:

    a. Prior to wiring

        1) Review and provide installer with instructions to correct any errors in the following areas:

            a) Low voltage wiring requirements
            b) Separation of high and low voltage wiring runs
            c) Wire labeling
            d) Load schedule information
            e) Switching cabinet locations and installation
            f) Physical locations and network addresses of controls
            g) Ethernet connectivity
            h) Computer-to-network connections
            i) Load circuit wiring
            j) Connections to other systems and equipment
            k) Placement and adjustment of Occupancy Sensors
            l) Placement and adjustment of Photocells

    b. After system installation

        1) Check and approve or provide correction instructions on the following:

a) Connections of power feeds and load circuits
b) Connections and locations of controls
c) Connections of low voltage inputs
d) Connections of the data network

2) Turn on system control processor and upload any pre-programmed system configuration
3) Verify cabinet address(es)
4) Upload pre-programmed system configuration and information to switching and/or dimming cabinets
5) Check load currents and remove bypass jumpers
6) Verify that each system control is operating to specification
7) Verify that each system circuit is operational according to specification
8) Verify that manufacturers' interfacing equipment is operating to specification
9) Verify that any computers and software supplied by the manufacturer are performing to specifications
10) Verify that any remote WAN (Wide Area Network) connections are operating properly
11) Have an owner's representative sign off on the above-listed system functions

c. Before project completion and hand-off

1) Demonstrate system capabilities and functions to owner's representative
2) Train owner's representative on the proper operation, adjustment, and maintenance of the system.

B. Notification: Upon completion of the installation, the contractor shall notify the manufacturer that the system is ready for formal checkout. Notification shall be given in writing a minimum of 21 days prior to the time factory-trained personnel are required on site. Each field installed RJ45 connection must be tested prior to system interconnection. A test report must be furnished to manufacturer prior to scheduling commissioning activity. Manufacturer shall have the option to waive formal turn-on.

C. Turn-On: Upon completion of all line, load and interconnection wiring, and after all fixtures are installed and lamped, Manufacturer's Rep or, if waived, Contractor shall completely check the installation prior to energizing the system. Each installed relay system shall be tested for proper ON/OFF operations, and proper LED illumination. Each installed control cabinet shall be tested verifying that each controlled load adjusts to the selected setting and that all switch LED's illuminate properly.

D. At the time of checkout and testing, the owner's representative shall be thoroughly instructed in the proper operation of the system.

3.7 MAINTENANCE

A. Enable the end user to order new equipment for system expansion, replacements, and spare parts.

B. Make new replacement parts available for a minimum of ten years from the date of manufacture.

C. Provide factory-direct technical support hotline 24 hours per day, 7 days per week.

D. Offer renewable annual service contracts, to include parts, factory labor, and annual training visits. Make service contracts available up to ten years after date of system commissioning.

END OF SECTION

SECTION 262413 - SWITCHBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Service and distribution switchboards rated 600 V and less and between 800A to 1600A.
2. Surge Protective Devices (SPD).
3. Disconnecting and overcurrent protective devices.
4. Instrumentation.
5. Control power.
6. Accessory components and features.
7. Identification.

B. Switchboard shall be front aligned.

C. Related Sections include the following:

1. Section 260526 “Grounding and Bonding for Electrical Systems”.
2. Section 260553 “Identification for Electrical Systems”.
3. Section 260573 "Overcurrent Protective Device Coordination Study" for short-circuit rating of devices and for setting of overcurrent protective devices.
4. Section 260913 "Electrical Power Monitoring and Control" for communication features of power distribution system devices.

1.3 DEFINITIONS

A. NETA ATS: InterNational Electrical Testing Association - Acceptance Testing Specification.

B. EMI: Electromagnetic interference.

C. GFCI: Ground-fault circuit interrupter.

D. RFI: Radio-frequency interference.

E. RMS: Root mean square.

F. SPDT: Single pole, double throw.

G. AIC: Interrupting capacity (RMS symmetrical) in amperes.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Switchboards shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
2. Seismic Importance Factor: 1.25.
3. Deflection Amplification Factor: 5.
4. Response Modification Coefficient: 5.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of switchboard, overcurrent protective device, transient voltage suppression device, ground-fault protector, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

B. Shop Drawings: For each switchboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details, including required horizontal and vertical clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Detail short-circuit current rating of switchboards and overcurrent protective devices.
5. Include descriptive documentation of optional barriers specified for electrical insulation and isolation.
6. Include evidence of UL listing for series rating of installed devices. Series rated devices shall be provided if specified on the drawings.
7. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
8. Include time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.
9. Include diagram and details of proposed mimic bus.
10. Include schematic and wiring diagrams for power, signal, and control wiring.

C. Samples: Representative portion of mimic bus with specified material and finish, for color selection.

1.6 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Ceiling and floor plans, drawn to scale (1/4”=1”-0”), on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Show structural members e.g columns, beams, doors etc. within the area where switchboards are located.

B. Qualification Data: For qualified testing agency.

C. Seismic Qualification Certificates: Submit certification that switchboards, overcurrent protective devices, accessories, and components will withstand seismic forces defined in Section 260548 "Vibration and Seismic Controls for Electrical Systems." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Field Quality-Control Reports:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
4. Submit within two (2) weeks of completion of tests.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For switchboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Routine maintenance requirements for switchboards and all installed components.
2. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
3. Time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Potential Transformer Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.
2. Control-Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.
3. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
4. Indicating Lights: Equal to 10 percent of quantity installed for each size and type, but no fewer than one of each size and type.

1.9 QUALITY ASSURANCE

A. If alternate manufacturer of products other than what are specified in this section are submitted, all necessary documents not limited to cut sheets, technical information, test reports from recognized testing labs and factory test reports shall be submitted to the satisfaction of the owner/engineer to ensure quality and conformance to the specifications. Additional testing shall be undertaken if it is concluded by the owner/engineer that the submitted test reports are either insufficient or do not include all tests necessary for product acceptance. The tests shall be conducted by a recognized lab acceptable to the owner/engineer and all tests shall be witnessed by owner's/engineer's personnel. All testing procedures and test results shall be satisfactory to the owner/engineer. Contractor shall be responsible for arranging the tests, for transportation, food and lodging for minimum of one owner's/engineer's representative to witness the test at the testing lab. Include all costs for the above in the bid.

B. Contractor shall ensure that the manufacturer has a minimum of 15 years experience in the production of Switchboards similar to the type and size specified in this project.

C. Manufacturer shall have ISO 9001 or 9002 Certification.

D. Manufacturer shall have ability to readily provide replacement parts for a minimum period of ten (10) years, from the date of completion of the project. Furnish a letter from the manufacturer confirming the availability.

E. Switchboards shall be assembled at the manufacturer's own manufacturing facility using its own major devices (e.g., circuit breakers) for the assembly. These devices shall be normally carried by the manufacturer as standard catalog items.

F. Switchboard shall comply with seismic zone applicable to the project. Unless otherwise indicated, verify requirements with Architect or Structural Engineer of Record (SEOR). Provide certified test reports of shake table test done by manufacturer on similar units.

G. Materials and equipment shall be new, modern in design and shall not have been in prior service except as required by factory tests. Major components (e.g., primary switch, transformer, and switchboard) shall be manufactured within six months of installation.

H. Source Limitations: Obtain switchboards, overcurrent protective devices and accessories through one source from a single manufacturer through a local distributor

unless otherwise indicated. All power distribution equipment shall be of the same manufacturer as the substation.

I. Comply with NEMA PB 2.

J. Comply with NFPA 70.

K. Comply with UL 891.

L. Installer Qualifications: An employer of workers qualified as defined in NEMA PB 2.1 and trained in electrical safety as required by NFPA 70E.

M. Product Options: Drawings indicate size, profiles, and dimensional requirements of switchboards and are based on the specific system indicated. Refer to Part 2 "Product Requirements."

N. Electrical Components, Devices, and Accessories: UL Listed and labeled as defined in NFPA 70, Article 100and marked for intended location and application.

O. Testing Agency Qualifications: Member of NETA;

1. Testing agency shall be an independent company; shall have been a member of NETA for a minimum of ten (10) years and has permanent in-house testing engineers and technicians involved with testing of switchboards and OCPDs similar to those specified on this project.
2. Testing company shall be located with 50 miles radius of the project.
3. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing to supervise on-site testing specified in Part 3.
4. Field Testing technician and supervisor shall have minimum ten (10) years' experience in field testing of switchboards similar to the type and rating specified on this project.

P. Product Selection for Restricted Space: Drawings indicate maximum dimensions for switchboards including clearances between switchboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products in accordance with manufacturer's recommended practices and as listed in Installation and Maintenance Manual.

B. Each switchboard section shall be shipped in individual shipping splits for ease of handling. They shall be mounted on shipping skids and individually wrapped.

C. Deliver switchboards in sections or lengths that can be moved past obstructions in delivery path at site.

D. Inspect and report damage to carrier within their required time period.

E. Store indoors in clean dry space with uniform temperature to prevent condensation. Protect from exposure to dirt, fumes, water, corrosive substances, and physical damage.

F. If stored in areas subjected to weather, cover switchboards to provide protection from weather, dirt, dust, corrosive substances, and physical damage.

G. Remove loose packing and flammable materials from inside switchboards and install temporary electric heating (250 W per section) to prevent condensation.

H. Handle and prepare switchboards for installation according to NEMA PB 2.1.

1.11 PROJECT CONDITIONS

A. Installation Pathway: Remove and replace access fencing, doors, lift-out panels, and structures to provide pathway for moving switchboards into place.

B. Environmental Limitations:

1. Do not deliver or install switchboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above switchboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

    a. Ambient Temperature: Not exceeding 104 deg F (40 deg C).
    b. Altitude: Not exceeding 6600 feet (2000 m).

C. Service Conditions: NEMA PB 2, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet (2000 m).

D. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Construction Manager and Owner no fewer than fourteen (14) days in advance of proposed interruption of electric service.
2. Do not proceed with interruption of electric service without Construction Manager and Owner written permission.
3. All utility shutdowns will be done by Owner’s authorized personnel unless otherwise noted. Coordinate through Owner’s Representative.
4. Comply with NFPA 70E.
5. Provide temporary standby power through a standby diesel quiet type back-up generator complete with fuel and 7/24 monitoring if the existing service interruption exceeds 2 hours. Coordinate additional requirements with owner minimum fourteen days in advance. Indicate method of providing temporary electric service.

1.12 COORDINATION

A. Coordinate layout and installation of switchboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

1.13 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace SURGE PROTECTION DEVICES that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Square D; a brand of Schneider Electric
2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
3. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
4. Siemens Energy & Automation, Inc.

C. Front-Connected, Front-Accessible Switchboards:

1. Main Devices: Fixed, individually mounted unless otherwise indicated.
2. Branch Devices: Panel mounted for sizes up to 400A.
3. Sections front and rear aligned.

D. Nominal System Voltage: 208Y/120 V.

E. Main-Bus Continuous: Amperage Per Design Plans.

F. Seismic Requirements: Fabricate and test switchboards according to IEEE 344 to withstand seismic forces defined in Section 260548 "Vibration and Seismic Controls for Electrical Systems."

G. Indoor Enclosures: Steel, NEMA 250, Type 1, unless noted otherwise on plans.

H. Enclosure Finish for Indoor Units: Factory-applied finish in manufacturer's standard gray finish over a rust-inhibiting primer on treated metal surface.

I. Barriers: Between adjacent switchboard sections.

J. Insulation and isolation for main and vertical buses of feeder sections.

K. Bus Transition and Incoming Pull Sections: Matched and aligned with basic switchboard.

L. Removable, Hinged Rear Doors and Compartment Covers: Secured by standard bolts, for access to rear interior of switchboard.

M. Hinged Front Panels: Allow access to circuit breaker, metering, accessory, and blank compartments.

N. Buses and Connections: Three phase, four wire unless otherwise indicated.

1. Phase- and Neutral-Bus Material: Hard-drawn copper of 98 percent conductivity, silver-plated, copper feeder circuit-breaker line connections.
2. Load Terminals: Insulated, rigidly braced, runback bus extensions, of same material as through buses, equipped with mechanical connectors for outgoing circuit conductors. Provide load terminals for future circuit-breaker positions at full-ampere rating of circuit-breaker position.
3. Ground Bus: 1/4-by-2-inch- (6-by-50-mm-) hard-drawn copper of 98 percent conductivity, equipped with mechanical connectors for feeder and branch-circuit ground conductors. For busway feeders, extend insulated equipment grounding cable to busway ground connection and support cable at intervals in vertical run.
4. Main Phase Buses and Equipment Ground Buses: Uniform capacity for entire length of switchboard's main and distribution sections. Provide for future extensions from both ends.
5. Neutral Buses: 100 percent of the ampacity of phase buses unless otherwise indicated, equipped with mechanical connectors for outgoing circuit neutral cables. Brace bus extensions for busway feeder neutral bus.
6. Isolation Barrier Access Provisions: Permit checking of bus-bolt tightness.
7. Provide for all switchboard silver-plated copper bus bars of same capacity as main breaker, or as indicated on Drawings, between current transformer and main section and distribution sections; also, full height of breaker space in distribution portions. Copper bus shall have current density of 1000A per square inch of cross section. Bus structure shall be free-fitted, and shall have sufficient strength to withstand short-circuit as indicated on drawings. Connections shall be securely bolted together with corrosion-resistant plated carbon steel, minimum grade 5 machine screws secured with constant pressure-type locking devices. Bus bar bracing shall be designed to withstand maximum available short-circuit current. Connections for cables to all circuit breakers, switches and motor control devices shall be heavy-duty mechanical pressure type terminal lugs. Provide service cable lugs as required by utility company. Cables and internal wiring shall be supported with suitable cleats.

O. Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of circuit-breaker compartment.

P. Bus-Bar Insulation: Factory-applied, flame-retardant, tape wrapping of individual bus bars or flame-retardant, spray-applied insulation. Minimum insulation temperature rating of 105 deg C.

Q. Switchboards shall be floor standing, dead front, dead rear, line bussed, front operated and connected, circuit-breaker type, unless otherwise indicated and shall contain equipment indicated and specified. Switchboard shall be complete with pull, service, and distribution sections as required.

R. Required equipment shall be enclosed in fully interchangeable die formed steel sectional cabinets with top and bottom plates and required braces and gussets so that cabinets will be absolutely rigid, plumb and uniform in size. Each cabinet shall be a separate and independent unit with assembly holes die-stamped or jig drilled; openings for interconnections shall be so placed that any cabinet can be located in any position in assembly without drilling or cutting holes on job. Deliver switchboard to Project site in completely assembled sections and provide required assembly bolts and blanking plates. Front plates and doors shall be of not less than 12 gage furniture steel, completely removable, secured to cabinet with machine screws, with cup washers uniformly and symmetrically spaced. Provide hinged wire gutter covers for distribution sections. Equipment shall meet NEMA and UL standards.

2.2 SURGE PROTECTIVE DEVICES (SPD)

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following

1. Square D; a brand of Schneider Electric.
2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
3. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
4. Siemens Energy & Automation, Inc.

B. Surge Protection Device Description: IEEE C62.41-compliant, integrally mounted, solid-state, parallel-connected, modular (with field-replaceable modules) type, with sine-wave tracking suppression and filtering modules, UL 1449, second edition, short-circuit current rating matching or exceeding the switchboard short-circuit rating, and with the following features and accessories:

1. Fuses rated at 200-kA interrupting capacity.
2. Fabrication using bolted compression lugs for internal wiring.
3. Integral disconnect switch.
4. Redundant suppression circuits.
5. Redundant replaceable modules.
6. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
7. LED indicator lights for power and protection status.
8. Audible alarm, with silencing switch, to indicate when protection has failed.

9. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of system operation. Contacts shall reverse position on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.
10. Six-digit, transient-event counter set to totalize transient surges.

C. Peak Single-Impulse Surge Current Rating: per manufacturer requirements.

D. Withstand Capabilities: 12,000 IEEE C62.41, Category C3 (10 kA), 8-by-20-mic.sec. surges with less than 5 percent change in clamping voltage.

E. Protection modes and UL 1449 SVR for grounded wye circuits with 480Y/277 and 208Y/120-V, three-phase, four-wire circuits shall be as follows:

1. Line to Neutral: 800 V for 480Y/277 400 V, for 208Y/120.
2. Line to Ground: 800 V for 480Y/277 400 V, for 208Y/120.
3. Neutral to Ground: 800 V for 480Y/277 400 V, for 208Y/120

2.3 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity (AIC) to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; field replaceable and the following field-adjustable settings:

    a. Instantaneous trip.
    b. Long- and short-time pickup levels.
    c. Long- and short-time time adjustments.
    d. Ground-fault pickup level, time delay, and I2t response.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
5. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
6. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
7. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:

    a. Standard frame sizes, trip ratings, and number of poles.
    b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor material.
    c. Application Listing: Appropriate for application.

d. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
e. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.
f. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
g. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
h. Key Interlock Kit and lock out provisions: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.

B. Insulated-Case Circuit Breaker (ICCB): 80 percent rated (100% for above 800 Amps), sealed, insulated-case power circuit breaker with interrupting capacity rating to meet available fault current.

1. Fixed circuit-breaker mounting.
2. Two-step, stored-energy closing.
3. Microprocessor-based trip units with interchangeable rating plug, trip indicators, and the following field-adjustable settings:

a. Instantaneous trip.
b. Long- and short-time time adjustments.
c. Ground-fault pickup level, time delay, and I2t response.

4. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.
5. Remote trip indication and control.
6. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
7. Control Voltage: per manufacturer.

C. Feeder circuit breakers shall be automatic, one-piece molded-case, trip-free, common trip, quick-make, quick-break, thermal-magnetic or solid state type bolted to bus, with handles clearly indicating tripped position. Breakers shall be furnished with a single handle with no tie-bar. Voltage, amperage, and number of poles shall be as indicated on Drawings. Breaker ratings shall be on handle or label. Breakers shall be furnished with lockout provisions approved by the State of California for padlocking and shall provide a minimum symmetrical short-circuit interrupting rating, as indicated on Drawings. Series rated circuit breaker combinations are not acceptable.

2.4 INSTRUMENTATION

A. Instrument Transformers: IEEE C57.13, NEMA EI 21.1, and the following:

1. Potential Transformers: IEEE C57.13; 120 V, 60 Hz, single secondary; disconnecting type with integral fuse mountings. Burden and accuracy shall be consistent with connected metering and relay devices.

2. Current Transformers: IEEE C57.13; 5 A, 60 Hz, secondary; type; single secondary winding and secondary shorting device. Burden and accuracy shall be consistent with connected metering and relay devices.
3. Current Transformers for Neutral and Ground-Fault Current Sensing: Connect secondary wiring to ground overcurrent relays, via shorting terminals, to provide selective tripping of main and tie circuit breaker. Coordinate with feeder circuit-breaker, ground-fault protection.

B. Multifunction Digital-Metering Monitor: Microprocessor-based unit suitable for three- or four-wire systems and with the following features:

1. Switch-selectable digital display of the following values with maximum accuracy tolerances as indicated:

a. Phase Currents, Each Phase: Plus or minus 1 percent.
b. Phase-to-Phase Voltages, Three Phase: Plus or minus 1 percent.
c. Phase-to-Neutral Voltages, Three Phase: Plus or minus 1 percent.
d. Megawatts: Plus or minus 2 percent.
e. Megavars: Plus or minus 2 percent.
f. Power Factor: Plus or minus 2 percent.
g. Frequency: Plus or minus 0.5 percent.
h. Accumulated Energy, Megawatt Hours: Plus or minus 2 percent; accumulated values unaffected by power outages up to 72 hours.
i. Megawatt Demand: Plus or minus 2 percent; demand interval programmable from five to 60 minutes.
j. Contact devices to operate remote impulse-totalizing demand meter.

2. Mounting: Display and control unit flush or semi-flush mounted in instrument compartment door.
3. Digital energy meter, Accuvim IIR series shall be provided and connected to building energy management system.
4. In main and distribution switchboards provide a multifunctional digital meter with true RMS measured Amperes (each phase and neutral) Volts (line-to-line and line-to-neutral), Power Factor, Frequency, VA, VAR, Watts, KWH, KVARH, KVAH, voltage/current unbalance, and demand metering: W, VAR, Amperes, VA. Meter to have a front mounted RS232 port to allow programming and meter values via laptop computer and supplied software.

2.5 CONTROL POWER

A. Control Circuits: 120-V ac, supplied through secondary disconnecting devices from control-power transformer.

B. Control Circuits: voltage per manufacturer equipment.

C. Control-Power Fuses: Primary and secondary fuses for current-limiting and overload protection of transformer and fuses for protection of control circuits.

D. Control Wiring: Factory installed, with bundling, lacing, and protection included. Provide flexible conductors for No. 8 AWG and smaller, for conductors across hinges, and for conductors for interconnections between shipping units.

2.6 ACCESSORY COMPONENTS AND FEATURES

A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

B. Portable Test Set: For testing functions of solid-state trip devices without removing from switchboard. Include relay and meter test plugs suitable for testing switchboard meters and switchboard class relays.

2.7 IDENTIFICATION

A. Presentation Media: Painted graphics in color contrasting with background color to represent bus and components, complete with lettered designations.

B. Service Equipment Label: UL labeled for use as service equipment for switchboards with one or more service disconnecting and overcurrent protective devices.

C. Provide nameplates for components on switchboards. Plates shall be black and white plastic nameplate stock, with characters cut through black exposing white, and shall bear designation of service, or feeders controlled and fuse size. Provide similar nameplates for meter and transformer compartments. A large nameplate identifying switchboard, indicating service voltage, function and current rating shall be furnished with 3/16 inch engraved block letters.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store switchboards according to NEMA PB 2.1.

B. Examine switchboards before installation to verify compliance with approved shop drawings. Reject switchboards that are moisture damaged or physically damaged.

C. Examine elements and surfaces to receive switchboards for compliance with installation tolerances and other conditions affecting performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected to the satisfaction of the owner.

3.2 INSTALLATION

A. Install switchboards and accessories according to NEMA PB 2.1.

B. For grounded wye electrical service switchboards rated more than 150 volts, to ground and 1,000 amperes or more, provide ground fault protection for main protective device. Ground fault protection shall be UL listed, with ground sensor encircling all phase conductors and neutral conductors integral with the main protective device. Provide testing of ground fault protection system by an independent recognized testing laboratory. Testing lab shall provide necessary testing equipment at the Project site and perform a certified test on ground protection system in presence of the IOR. The ground fault setting shall be selected to coordinate with downstream circuit protective devices. Verify that the system neutral is grounded at the service entrance switchboard only, except neutrals of step down distribution transformers. For branch circuit protective devices, rated 800 amps or more, provide ground fault protection where shown on the drawings, or as described above, for main protective device. Coordinate settings with main protective device ground fault protection

C. Equipment Mounting: Install switchboards on concrete base, 4-inch (100-mm) nominal thickness. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete."

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.
2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to switchboards.

D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from switchboard units and components.

E. Operating Instructions: Frame and mount the printed basic operating instructions for switchboards, including control and key interlocking sequences and emergency procedures. Fabricate frame of finished wood or metal and cover instructions with clear acrylic plastic. Mount on front of switchboards.

F. Install filler plates in unused spaces of panel-mounted sections.

G. Install overcurrent protective devices, surge protection devices, and instrumentation.

1. Set field-adjustable switches and circuit-breaker trip ranges in accordance with the recommendations of the Overcurrent Protective Device Short Circuit, Coordination and Arc Flash Study.

H. Comply with NECA 1.

I. Switchboards shall be located so that they are readily accessible and not exposed to physical damage.

J. Switchboard locations shall provide sufficient working space around the switchboard to comply with the California Electrical Code.

K. Switchboards shall be securely fastened to the mounting surface.

L. Switchboard cabinets shall be grounded as specified in Article 250 of the California Electrical Code.

M. Conduits shall be installed so as to prevent moisture or water from entering and accumulating within the enclosure.

N. Lugs shall be suitable and as required for installation with the conductor being connected.

O. Conductor lengths shall be maintained to a minimum within the wiring gutter space. Conductors shall be long enough to reach the terminal location in a manner that avoids strain on the connecting lugs.

P. Maintain the required bending radius of conductors inside the cabinet.

Q. Distribute and arrange conductors neatly in the wiring gutters.

R. Tightening the wire lugs or any conductor connections shall be performed in the presence of the IOR. Torque values shall be those recommended by manufacturer.

S. Remove shipping blocks from component devices.

T. Manually exercise circuit breakers to verify they operate freely.

U. Remove debris from switchboard interior.

V. Follow manufacturer's instructions for installation.

W. Furnish one spare fuse for each fusible switch installed. Spare fuses shall be of the same type and rated as those installed.

X. Do not install in highly corrosive environments such as pool equipment, boiler, chemical and corrosive materials storage rooms, and similar areas. When equipment is installed in such areas, it shall be labeled and listed for the application.

3.3 CONNECTIONS

A. Comply with requirements for terminating feeder bus specified in Section 262500 "Enclosed Bus Assemblies." Drawings indicate general arrangement of bus, fittings, and specialties.

B. Comply with requirements for terminating cable trays specified in Section 260536 "Cable Trays for Electrical Systems." Drawings indicate general arrangement of cable trays, fittings, and specialties.

C. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

E. Connections to any bussing shall be securely bolted together with corrosion-resistant plated carbon steel, minimum grade 5 machine screws secured with constant pressure-type locking devices.

3.4 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

B. Switchboard Nameplates: Label each switchboard compartment with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

C. Device Nameplates: Label each disconnecting, and overcurrent protective device and each meter and control device mounted in compartment doors with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, start-up and to assist in testing.

C. Acceptance Testing Preparation:

1. Test insulation resistance for each switchboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

D. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. All tests shall be witnessed by owner’s representative. Provide minimum fourteen (14) days advance notice.
3. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
4. Perform the following infrared scan tests and inspections and prepare reports:

a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each switchboard. Remove front and rear panels so joints and connections are accessible to portable scanner.
b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switchboard 11 months after date of Substantial Completion.
c. Instruments and Equipment:

1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

5. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

E. Switchboard will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports, including a certified report that identifies switchboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6 ADJUSTING

A. Adjust moving parts and operable components to function smoothly and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Section 260573 "Overcurrent Protective Device Coordination Study."

3.7 PROTECTION

A. Temporary Heating: Apply temporary heat, to maintain temperature according to manufacturer's written instructions, until switchboard is ready to be energized and placed into service.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain switchboards, overcurrent protective devices, instrumentation, and accessories, and to use and reprogram microprocessor-based trip, monitoring, and communication units.

END OF SECTION

SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.

B. Related Sections include the following:

1. Section 260553 “Identification for Electrical Systems”.
2. Section 260573 "Overcurrent Protective Device Coordination Study" for short-circuit rating of devices and for setting of overcurrent protective devices.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. RMS: Root mean square.

D. SPDT: Single pole, double throw

E. SPD: Surge Protective Device

1.4 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

1.5 ACTION SUBMITTALS

A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types and details for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.
5. Include evidence of UL listing for series rating of installed devices. Series rated devices shall be permitted if specified on the drawings.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
7. Include wiring diagrams for power, signal, and control wiring.
8. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Seismic Qualification Certificates: Submit certification that panelboards, overcurrent protective devices, accessories, and components will withstand seismic forces defined in Section 260548 "Vibration and Seismic Controls for Electrical Systems." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Field Quality-Control Reports:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
4. Submit within two (2) weeks of completion of tests.

D. Panelboard Schedules: For installation in panelboards.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Keys: Two spares for each type of panelboard cabinet lock.
2. Circuit Breakers Including GFCI and Ground Fault Equipment Protection (GFEP) Types: Two spares for each panelboard.
3. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
4. Fuses for Fused Power-Circuit Devices: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

1.9 QUALITY ASSURANCE

A. If alternate manufacturer of products other than what are specified in this section are submitted, all necessary documents not limited to cut sheets, technical information, test reports from recognized testing labs and factory test reports shall be submitted to the satisfaction of the owner/engineer to ensure quality and conformance to the specifications. Additional testing shall be undertaken if it is concluded by the owner/engineer that the submitted test reports are either insufficient or do not include all tests necessary for product acceptance. The tests shall be conducted by a recognized lab acceptable to the owner/engineer and all tests shall be witnessed by owner’s/engineer’s personnel. All testing procedures and test results shall be satisfactory to the owner/engineer. Contractor shall be responsible for arranging the tests, for transportation, food and lodging for minimum of one owner’s/engineer’s representative to witness the test at the testing lab. Include all costs for the above in the bid.

B. Contractor shall ensure that the manufacturer has a minimum of 15 years experience in the production of Panelboards similar to the type and size specified in this project.

C. Manufacturer shall have ISO 9001 or 9002 Certification.

D. Manufacturer shall have ability to readily provide replacement parts for a minimum period of ten (10) years, from the date of completion of the project. Furnish a letter from the manufacturer confirming the availability.

E. Panelboards shall be assembled at the manufacturer's own manufacturing facility using its own major devices (e.g., circuit breakers) for the assembly. These devices shall be normally carried by the manufacturer as standard catalog items.

F. Panelboard shall comply with seismic zone applicable to the project. Unless otherwise indicated, verify requirements with Architect or Structural Engineer of Record (SEOR).

G. Materials and equipment shall be new, modern in design and shall not have been in prior service except as required by factory tests. Major components (e.g. Circuit breakers) shall be manufactured within six months of installation.

H. Source Limitations: Obtain panelboards, overcurrent protective devices and accessories through one source from a single manufacturer through a local distributor unless otherwise indicated. All power distribution equipment shall be of the same manufacturer as the substation.

I. Comply with NFPA 70.

J. Comply with NEMA PB 1.

K. Comply with UL 891.

L. Installer Qualifications: An employer of workers qualified as defined in NEMA PB 2.1 and trained in electrical safety as required by NFPA 70E.

M. Product Options: Drawings indicate size, profiles, and dimensional requirements of panelboards and are based on the specific system indicated. Refer to Part 2 "Product Requirements."

N. Electrical Components, Devices, and Accessories: UL Listed and labeled as defined in NFPA 70, Article 100—and marked for intended location and application.

O. Testing Agency Qualifications: Member of NETA;

1. Testing agency shall be an independent company; shall have been a member of NETA for a minimum of ten (10) years and has permanent in-house testing engineers and technicians involved with testing of switchboards, panelboards and OCPDs similar to those specified on this project.
2. Testing company shall be located with 50 miles radius of the project.
3. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing to supervise on-site testing specified in Part 3.
4. Field Testing technician and supervisor shall have minimum ten (10) years experience in field testing of switchboards similar to the type and rating specified on this project.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.

B. Handle and prepare panelboards for installation according to NECA 407.

1.11 PROJECT CONDITIONS

A. Environmental Limitations:

1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

    a. Ambient Temperature: Not exceeding minus 22 deg F (minus 30 deg C) to plus 104 deg F (plus 40 deg C).
    b. Altitude: Not exceeding 6600 feet (2000 m).

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet (2000 m).

C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Construction Manager and Owner no fewer than 14 days in advance of proposed interruption of electric service.
2. Do not proceed with interruption of electric service without Construction Manager and Owner written permission.
3. Comply with NFPA 70E.

1.12 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

1.13 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Section 260548 "Vibration and Seismic Controls for Electrical Systems."

B. Enclosures: Flush- and surface-mounted cabinets (surface in electrical/IT/mechanical rooms only).

1. Rated for environmental conditions at installed location.

a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
b. Outdoor Locations: NEMA 250, Type 3R.

2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
4. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor. No splices shall be permitted inside the skirt.
5. Finishes:

a. Panels and Trim: galvanized steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat or Powder coated
b. Back Boxes: Same finish as panels and trim.

6. Directory Card: Inside panelboard door, mounted in transparent card holder.

C. Incoming Mains Location: Top and bottom.

D. Phase, Neutral, and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
3. Isolated Ground Bus: Adequate for branch-circuit isolated ground conductors; insulated from box.
4. Split Bus: Vertical buses divided into individual vertical sections.

E. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Main and Neutral Lugs: Mechanical type.
3. Ground Lugs and Bus-Configured Terminators: Mechanical type.
4. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
5. Subfeed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.

F. Service Equipment Label: UL labeled for use as service equipment for panelboards or load centers with one or more main service disconnecting and overcurrent protective devices.

G. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

H. Panelboard shall be listed and labeled with UL short circuit rating. If Series Rated Panelboard is specified-the panelboard shall be rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by UL. Include size and type of allowable upstream and branch devices, listed and labeled for series-connected short-circuit rating by UL.

I. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2 DISTRIBUTION PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers

1. Square D; a brand of Schneider Electric
2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
3. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
4. Siemens Energy & Automation, Inc.

B. Panelboards: NEMA PB 1, power and feeder distribution type.

C. Interiors shall be completely factory assembled. These shall be designed such that switching and protective devices can be replaced without disturbing adjacent units and without removing the main bus interiors.

D. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

1. For doors more than 36 inches (914 mm) high, provide two latches, keyed alike.

E. Mains: Circuit breaker and Lugs only.

F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.

G. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

H. Column-Type Panelboards: Narrow gutter extension, with cover, to overhead junction box equipped with ground and neutral terminal buses.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers

1. Square D; a brand of Schneider Electric
2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
3. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
4. Siemens Energy & Automation, Inc.

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Mains: Circuit breaker or lugs only.

D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

E. Doors: Door-in-door type. Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers

1. Square D; a brand of Schneider Electric
2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
3. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
4. Siemens Energy & Automation, Inc..

B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Where indicated provide circuit breakers UL listed for application at 100% of their continuous ampere rating in their intended enclosure.
2. Thermal-Magnetic Circuit Breakers (below 400A frame): Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Provide field adjustable magnetic trip setting for circuit-breakers serving motor loads or other special applications as indicated
3. Electronic trip circuit breakers (400A frame size and larger) with rms sensing; field-replaceable rating plug or field-replaceable electronic trip; and the following field-adjustable settings:

a. Instantaneous trip.
b. Long- and short-time pickup levels.
c. Long- and short-time time adjustments.
d. Ground-fault pickup level, time delay, and I^2t response.
e. CBs shall have an integral power supply installed at the factory if required for proper functioning of the breaker. An external power supply shall not be acceptable.

4. Circuit breakers shall have a minimum interrupting rating of 10,000 amperes RMS symmetrical at 240 volts, and 14,000 amperes RMS symmetrical at 480 volts, unless otherwise noted on the drawings. Verify maximum available fault levels from the Short Circuit and Coordination Study. Minimum interrupting rating (AIC) shall be 110% of the available fault level.
5. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
6. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
7. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
8. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
9. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:

a. Standard frame sizes, trip ratings, and number of poles.
b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
c. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
d. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
e. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function with other upstream or downstream devices.
f. Multipole units enclosed in a single housing or factory assembled to operate as a single unit.
g. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.
h. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.
i. Circuit breaker handle locks shall be provided for all circuits that supply exit signs, emergency lights, energy management, and control system (EMCS) panels and fire alarm panels.

2.5 PANELBOARD SUPPRESSORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers

1. Square D; a brand of Schneider Electric

2. Current Technology; a subsidiary of Danahar Corporation.
3. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
4. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
5. Siemens Energy & Automation, Inc..

B. Surge Protection Device: IEEE C62.41-compliant, integrally mounted, bolt-on, solid-state, parallel-connected, modular (with field-replaceable modules) type, with sine-wave tracking suppression and filtering modules, UL 1449, second edition, short-circuit current rating matching or exceeding the panelboard short-circuit rating, and with the following features and accessories:

1. Accessories:

    a. Fuses rated at 200-kA interrupting capacity.
    b. Fabrication using bolted compression lugs for internal wiring.
    c. Integral disconnect switch.
    d. Redundant suppression circuits.
    e. Redundant replaceable modules.
    f. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
    g. LED indicator lights for power and protection status.
    h. Audible alarm, with silencing switch, to indicate when protection has failed.
    i. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of system operation. Contacts shall reverse position on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.
    j. Six-digit, transient-event counter set to totalize transient surges.

2. Peak Single-Impulse Surge Current Rating: per manufacturer requirements.
3. Minimum single-impulse current ratings, using 8-by-20-mic.sec. waveform described in IEEE C62.41.2.

    a. Line to Neutral: 70,000 A.
    b. Line to Ground: 70,000 A.
    c. Neutral to Ground: 50,000 A.

4. Withstand Capabilities: 12,000 IEEE C62.41, Category C3 (10 kA), 8-by-20-mic.sec. surges with less than 5 percent change in clamping voltage.
5. Protection modes and UL 1449 SVR for grounded wye circuits with 480Y/277, 208Y/120-V, three-phase, four-wire circuits shall be as follows:

    a. Line to Neutral: 800 V for 480Y/277, 400 V for 208Y/120.
    b. Line to Ground: 800 V for 480Y/277, 400 V for 208Y/120.
    c. Neutral to Ground: 800 V for 480Y/277, 400 V for 208Y/120.

2.6 ACCESSORY COMPONENTS AND FEATURES

A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

B. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.

B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.

C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install panelboards and accessories according to NEMA PB 1.1.

B. Equipment Mounting: Install panelboards on concrete bases, 4-inch (100-mm) nominal thickness. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete."

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around full perimeter of base.
2. For panelboards, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to panelboards.
5. Attach panelboard to the vertical finished or structural surface behind the panelboard.

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

D. Comply with mounting and anchoring requirements specified in Section 260548 "Vibration and Seismic Controls for Electrical Systems."

E. Mount top of trim 90 inches (2286 mm) above finished floor unless otherwise indicated. Mounting height of Over Current Protective Devices shall be 6”7” above finished floor to the center of the grip of device operating handle unless a lower height is indicated or required by code.

F. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

G. Install overcurrent protective devices and controllers not already factory installed.

1. Set field-adjustable, circuit-breaker trip ranges.

H. Install filler plates in unused spaces.

I. Stub four 1-inch (27-GRC) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch (27-GRC) empty conduits into raised floor space or below slab not on grade.

J. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

K. Comply with NECA 1.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Section 260553 "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

E. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:

a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 11 months after date of Substantial Completion.
c. Instruments and Equipment:

1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

F. Panelboards will be considered defective if they do not pass tests and inspections.

G. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable component to function smoothly and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as indicated or as specified in Section 260573 "Overcurrent Protective Device Coordination Study."

C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.

1. Measure as directed during period of normal system loading.
2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour

services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.

3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

3.6 PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION

SECTION 262713 - ELECTRICITY METERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes equipment for electricity metering by Owner.

1.3 DEFINITIONS

A. KY Pulse: Term used by the metering industry to describe a method of measuring consumption of electricity that is based on a relay opening and closing in response to the rotation of the disk in the meter.

B. PC: Personal computer.

1.4 ACTION SUBMITTALS

A. Product Data: Manufacturer’s technical data for each type of product indicated.

B. Shop Drawings: For electricity-metering equipment.

1. Dimensioned plans and sections or elevation layouts.
2. Wiring Diagrams: For power, signal, and control wiring. Identify terminals and wiring designations and color-codes to facilitate installation, operation, and maintenance. Indicate recommended types, wire sizes, and circuiting arrangements for field-installed wiring, and show circuit protection features.

C. Manufacturer Seismic Qualification Certification for Electricity-Metering Equipment: Submit certification that equipment components and their mounting and anchorage provisions have been designed to remain in place without separation of any parts or loosening of factory-made connections when subjected to the seismic forces and shall include the following:

1. Basis for Certification: Indicate whether certification is based on actual test of assembled components or on calculations.
2. Detailed description of equipment mounting and anchorage devices on which the certification is based and their installation requirements.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Application and operating software documentation.
2. Software licenses.
3. Software service agreement.
4. Hard copies of manufacturer's operating specifications, design user's guides for software and hardware, and PDF files on CD-ROM of the hard-copy Submittal.

1.7 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: UL Listed and labeled as defined in NFPA 70 and marked for intended location and application.

B. Owner’s Meters in switchgear/switchboard/distribution board shall be installed by the manufacturer at the factory.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Receive, store, and handle modular meter center according to NECA 400.

1.9 PROJECT CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted in writing under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify Architect, Construction Manager, Owner no fewer than fourteen (14) days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Architect's, Construction Manager's, Owner's written permission.
3. Comply with NFPA 70E.
4. Provide temporary standby power through a standby diesel quiet type back-up generator complete with fuel and 7/24 monitoring if the existing service interruption exceeds 2 hours. Coordinate additional requirements with owner minimum fourteen days in advance. Indicate method of providing temporary electric service.

1.10 COORDINATION

A. Electrical Service Connections: Coordinate with utility companies and components they furnish as follows:

1. Comply with requirements of utilities providing electrical power services.
2. Coordinate installation and connection of utilities and services, including provision for electricity-metering components.

1.11 SOFTWARE SERVICE AGREEMENT

A. Technical Support: Beginning with Substantial Completion, provide software support for two years from the date of acceptance of the project by the owner.

B. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software at no additional cost to the owner.

1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade his computer equipment if necessary.

PART 2 - PRODUCTS

2.1 EQUIPMENT FOR ELECTRICITY METERING BY OWNER

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following

1. Electrotech Industries Accuvim IIR Revenue Grade Digital Meter

B. General Requirements for Owner's Meters:

1. Comply with UL 1244.
2. Meters used for billing shall have an accuracy of 0.2, 0.5 percent of reading, complying with requirements in ANSI C12.20.
3. Meters shall be certified by California Type Evaluation Program as complying with Title 4, California Code of Regulations, Article 2.2.
4. Enclosure: NEMA 250, Type 1.
5. Identification: Comply with requirements in Section 260553 "Identification for Electrical Systems."
6. Memory Backup: Self-contained to maintain memory throughout power outages of 72 hours, minimum.
7. Sensors: Current-sensing type, with current or voltage output, selected for optimum range and accuracy for meters indicated for this application.

a. Type: Split and solid core.

8. Current-Transformer Cabinet: Listed or recommended by metering equipment manufacturer for use with sensors indicated.
9. Building Automation System (BAS) Interface: One digital KY pulse to a user-definable increment of energy measurement. Match signal to BAS input and arrange to convey the instantaneous, integrated, demand level measured by meter to provide data for processing and possible programmed demand control action by destination system.

C. Data Transmission Cable: Transmit KY pulse data over Class 1 control-circuit conductors in raceway. Comply with Section 260523 "Control-Voltage Electrical Power Cables."

D. Software: PC based, a product of meter manufacturer, suitable for calculation of utility cost allocation and billing.

1. Utility Cost Allocation: Automatically import energy-usage records to allocate energy costs.
2. Tenant or Activity Billing Software: Automatically import energy-usage records to automatically compute and prepare tenant bills activity demand and energy-use statements based on metering of energy use and peak demand. Maintain separate directory for each tenant's historical billing information. Prepare summary reports in user-defined formats and time intervals.

E. Accessories:

1. Fuses: Provide fuses to protect meters.
2. Shunting Devices: Provide shunting devices for maintenance of meters.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with equipment installation requirements in NECA 1.

B. Install meters furnished by utility company. Install raceways and equipment according to utility company's written requirements. Provide empty conduits for metering leads and extend grounding connections as required by utility company.

C. Install modular meter center according to NECA 400 switchboard installation requirements.

D. Install arc-flash labels as required by NFPA 70.

E. Wiring Method:

1. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

2. Install unshielded, twisted-pair cable for control and signal transmission conductors, complying with Section 271513 "Communications Copper Horizontal Cabling."
3. Minimum conduit size shall be 1/2 inch (13 mm).

3.2 IDENTIFICATION

A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

1. Series Combination Warning Label: Self-adhesive type, with text as required by NFPA 70.
2. Equipment Identification Labels: Adhesive film labels with clear protective overlay. For residential meters, provide an additional card holder suitable for printed, weather-resistant card with occupant's name.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Connect a load of known kilowatt rating, 1.5 kW minimum, to a circuit supplied by metered feeder.
2. Turn off circuits supplied by metered feeder and secure them in off condition.
3. Run test load continuously for eight hours minimum, or longer, to obtain a measurable meter indication. Use test-load placement and setting that ensures continuous, safe operation.
4. Check and record meter reading at end of test period and compare with actual electricity used, based on test-load rating, duration of test, and sample measurements of supply voltage at test-load connection. Record test results. This shall be done in the presence of Owner’s Meter Shop Personnel. Coordinate through Owner's Representative.

C. Electricity metering will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION

SECTION 262813 - FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Cartridge fuses rated 600-V ac and less.
2. Plug fuses rated 125-V ac and less.
3. Plug-fuse adapters for use in Edison-base, plug-fuse sockets.
4. Spare-fuse cabinets.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material, dimensions, descriptions of individual components, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:

1. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.

    a. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
    b. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.

2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
3. Current-limitation curves for fuses with current-limiting characteristics.
4. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse. Submit on translucent log-log graph paper.
5. Coordination charts and tables and related data.
6. Fuse sizes for elevator feeders and elevator disconnect switches.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Ambient temperature adjustment information.
2. Current-limitation curves for fuses with current-limiting characteristics.
3. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse. Submit on translucent log-log graph paper.
4. Coordination charts and tables and related data.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NEMA FU 1 for cartridge fuses.

D. Comply with NFPA 70.

E. Comply with UL 248-11 for plug fuses.

1.7 PROJECT CONDITIONS

A. Where ambient temperature to which fuses are directly exposed is less than [40 deg F (5 deg C) or more than 100 deg F (38 deg C) apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.8 COORDINATION

A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

1. Manufacturers: Subject to compliance with requirements, provide one of the following manufacturers:
2. Cooper Bussmann, Inc.
3. Edison Fuse, Inc.
4. Ferraz Shawmut, Inc.
5. Littelfuse, Inc.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

2.3 PLUG FUSES

A. Characteristics: UL 248-11, nonrenewable plug fuses; 125-V ac.

2.4 PLUG-FUSE ADAPTERS

A. Characteristics: Adapters for using Type S, rejection-base plug fuses in Edison-base fuseholders or sockets; ampere ratings matching fuse ratings; irremovable once installed.

2.5 SPARE-FUSE CABINET

A. Characteristics: Wall-mounted steel unit with full-length, recessed piano-hinged door and key-coded cam lock and pull.

1. Size: Adequate for storage of spare fuses specified with 15 percent spare capacity minimum.
2. Finish: Gray, baked enamel.
3. Identification: "SPARE FUSES" in 1-1/2-inch- (38-mm-) high letters on exterior of door.
4. Fuse Pullers: For each size of fuse, where applicable and available, from fuse manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.

B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.

C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

A. Cartridge Fuses:

1. Feeders: Class L, fast acting.
2. Motor Branch Circuits: Class RK1, time delay.
3. Other Branch Circuits: Class RK1, time delay.
4. Control Circuits: Class CC, fast acting.

B. Plug Fuses:

1. Motor Branch Circuits: Edison-base type, dual.
2. Other Branch Circuits: Edison-base type, single-element fast acting.

3.3 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

B. Install plug-fuse adapters in Edison-base fuseholders and sockets. Ensure that adapters are irremovable once installed.

C. Install spare-fuse cabinet(s).

3.4 IDENTIFICATION

A. Install labels complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems" and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Nonfusible switches.
3. Shunt trip switches.
4. Molded-case circuit breakers (MCCBs).
5. Molded-case switches.
6. Enclosures.

1.3 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.5 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current ratings (interrupting and withstand, as appropriate).
4. Include evidence of NRTL listing for series rating of installed devices.
5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Seismic Qualification Certificates: For enclosed switches and circuit breakers, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Field quality-control reports.

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

D. Manufacturer's field service report.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
2. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
2. Fuse Pullers: Two for each size and type.

1.9 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. Comply with NFPA 70.

1.10 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
2. Altitude: Not exceeding 6600 feet.

B. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Construction Manager and Owner no fewer than seven days in advance of proposed interruption of electric service.
2. Indicate method of providing temporary electric service.
3. Do not proceed with interruption of electric service without Construction Manager's and Owner's written permission.

4. Comply with NFPA 70E.

1.11 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Isolated Ground Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
5. Auxiliary Contact Kit: Two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
6. Hookstick Handle: Allows use of a hookstick to operate the handle.
7. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.2 NONFUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.

3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Isolated Ground Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
4. Auxiliary Contact Kit: Two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
5. Hookstick Handle: Allows use of a hookstick to operate the handle.
6. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.3 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 3R.
3. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Comply with mounting and anchoring requirements specified in Section 260548 "Vibration and Seismic Controls for Electrical Systems."

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

D. Install fuses in fusible devices.

E. Comply with NFPA 70 and NECA 1.

3.3 IDENTIFICATION

A. Comply with requirements in Section 260553 "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

E. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:

a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.

b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each enclosed switch and circuit breaker 11 months after date of Substantial Completion.
c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

F. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

G. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Section 260573 "Overcurrent Protective Device Coordination Study."

END OF SECTION

SECTION 263100 - PHOTOVOLTAIC COLLECTORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. PV laminates (cells laminated into rigid sheets, with connecting cables).
2. PV modules (laminates in mounting frames).
3. Inverters.
4. Mounting structures.

1.2 DEFINITIONS

A. AIC: Interrupting rating in RMS Symmetrical amperes

B. CEC: California Energy Commission.

C. ETFE: Ethylene tetrafluoroethylene.

D. FEP: Fluorinated ethylene propylene.

E. IP Code: Required ingress protection to comply with IEC 60529.

F. MPPT: Maximum power point tracking.

G. NEMA: National Electrical Manufacturers Association

H. NETA: InterNational Electrical Testing Association.

I. OCPD: Over Current Protective Device

J. PTC: PVUSA Test Condition. Commonly regarded as a "real-world" measure of PV output. See below for definition of "PVUSA."

K. PV: Photovoltaic.

L. PVUSA: Photovoltaics for Utility Systems Applications.

M. STC: Standard Test Conditions defined in IEC 61215.

N. UL: Underwriter Laboratories.

1.3 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Enclosed switches, circuit breakers, inverters, controllers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer’s catalog cuts, construction details, material descriptions, dimensions of individual components and profiles, and finishes for PV panels.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
3. Include ratings (volts, amps and interrupting ratings (AIC) of Over Current Protective Devices (OCPD). Each device shall be fully rated for the available fault at the device.
4. Indicate name and location of each manufacturer where each equipment/device is manufactured.

B. Shop Drawings: For PV modules.

1. Include plans drawn to scale (1/4”=1’-0”), elevations, sections, and mounting details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Detail fabrication and assembly.
4. Include diagrams for power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
4. Submit within 2 weeks of completion of tests.

B. Sample Warranty: For manufacturer's special materials and workmanship warranty and minimum power output warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For PV modules to include in operation and maintenance manuals.

1.7 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace components of PV modules that fail in materials or workmanship within specified warranty period.

1. Manufacturer's materials and workmanship warranties include, but are not limited to, the following:

a. Faulty operation of PV modules.
b. Inverters,
c. Meters
d. Charge Controllers
e. Energy storage system.

2. Warranty Period: Five years from date of Substantial Completion.

B. Manufacturer's Special Minimum Power Output Warranty: Manufacturer agrees to repair or replace components of PV modules that fail to exhibit the minimum power output within specified warranty period. Special warranty, applying to modules only, applies to materials only, on a prorated basis, for period specified.

1. Manufacturer's minimum power output warranties include, but are not limited to, the following warranty periods, from date of Substantial Completion:

a. Specified minimum power output to 80 percent or more, for a period of 25 years.

PART 2 - PRODUCTS

2.1 SCE INTERCONNECTION PERMIT: CONTRACTOR IS SOLELY RESPONSIBLE FOR COORDINATING AND OBTAINING INTERCONNECTION PERMIT FOR SOLAR SYSTEM. CONTRACTOR SHALL INCLUDE ALL COSTS FOR PERMIT, DISCONNECT SWITCH, COORDINATION WITH UTILITY AS PART OF PROJECT COSTS. CONTRACTOR SHALL COORDINATE WITH UTILITY AND FURNISH SOLAR METERING AND DISCONNECT SWITCH REQUIREMENTS THAT MEETS THE SCE REQUIREMENTS AT NO ADDITIONAL COST TO THE COLLEGE.

2.2 MANUFACTURED UNITS

A. Manufacturers: Subject to compliance with the requirements, provide products by one of the following manufacturers unless otherwise indicated on drawings:

1. Sunpower A440 or approved equal.

2.3 MANUFACTURERS FOR OVER CURRENT PROTECTIVE DEVICES

A. Manufacturers: Subject to compliance with the requirements, provide products by one of the following manufacturers:

1. Square D-Schenieder Elect
2. Eaton-Cutler Hammer
3. Or equal.

2.4 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: UL Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Hazardous Locations: FM Global approved for NFPA 70, Class 1, Division 2, Group C and Group D.

C. Seismic Qualification Certificates: For Inverter, circuit breakers, disconnects, other equipment associated with PV System installation, accessories, and components, from manufacturer. Each equipment shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
2. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
3. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
4. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

2.5 PV SYSTEMS DESCRIPTION

A. Interactive PV System: Collectors connected in parallel to the electrical utility; and capable of providing power for Project and supplying power to a distributed network.

1. Module array to generate a total nominal rated output of minimum 350kWdc capacity with annual energy generation of 600,000kWh.
2. System Components:

a. PV modules.
b. Array frame.
c. Utility-interactive inverter.(SMA-41 or approved equal)
d. Overcurrent protection and disconnect devices.

e. Mounting structure.
f. Utility meter.
g. Meter for use by Compton College

2.6 MANUFACTURED PV UNITS

A. Cell Materials: Monocrystalline.

1. c-Si.
2. Gallium arsenide (GaAs).

B. Module Construction:

1. Nominal Size: 30 inches wide by 78.7 inches long.
2. Weight: 42.8 lb.

C. Insulating Substrate Film: , polyester.

D. Conducting Substrate Film: Fluoropolymer,.

E. Encapsulant: Ethyl vinyl acetate.

F. Backing Material: 0.125-inch-thick glass; Refer to drawings for additional information..

G. Backing Material: PVC film.

1. Layers:3 .
2. Color: White.

H. Bypass Diode Protection: Internal.

I. Junction Box:

1. Size: 1.56 by 3.96 by 0.52 inch.
2. Fully potted, vandal resistant.
3. IP Code: IP67.
4. Flammability Test: UL 1703.

J. Output Cabling:

1. 0.158 inch.
2. Quick, multiconnect, polarized connectors.
3. Two-Conductor Harness: No traditional return wire is needed from the end of a row back to the source combiner.
4. Cable shall be capable of power line communication transmission.

K. Series Fuse Rating: Refer to drawings for rating information..

2.7 PV CAPACITIES AND CHARACTERISTICS

A. Minimum Electrical Characteristics: Refer to drawings for additional information on following items.

1. Rated Open-Circuit Voltage: 51.6 V dc.
2. Maximum System Voltage: 1500 V dc.
3. Maximum Power at Voltage (Vpm): 43.4V dc.
4. Short-Circuit Temperature Coefficient: 5.7mA/deg .
5. Rated Short-Circuit Current (Isc): 10.9amperage.
6. Rated Operation Current (Imp): 5.7amperage.
7. Maximum Power at STC (Pmax): 440watts.

B. PV panels shall be capable of power line communication over DC lines to inverter and shall be able to rapidly shutdown upon signal from inverter to comply with CEC.

2.8 PV MODULE FRAMING

A. PV laminates mounted in anodized extruded-aluminum frames.

1. Entire assembly shall be UL listed and labelled for electrical and fire safety, Class A, according to UL 1703, and complying with IEC 61215.
2. Frame strength exceeding requirements of certifying agencies in subparagraph above.
3. Finish: High-performance organic finish.

    a. Fluoropolymer Two-Coat System: Manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent PVC resin by weight.
    b. Color: As indicated by manufacturer's designations.

2.9 PV ARRAY CONSTRUCTION

A. Framing:

1. Material: Extruded aluminum
2. Maximum System Weight: Less than 4 lb/sq. ft..
3. Minimum Distance to Connectors: Refer to drawings for additional information.
4. Raceway Cover Plates: Aluminum.

B. Flat-Roof Mounting:

1. No roof penetrations.
2. Self-ballasting.
3. Wind-tunnel tested to 110-mph wind.
4. Service Life: 25 years.
5. Freestanding system.

2.10 INVERTER

A. Inverter Type: Central. Refer to drawings for inverter type.

1. SMA -63 or approved equal.

B. Control Type: Maximum power point tracker control.

C. Inverter Electrical Characteristics. Refer to drawings for additional information.

1. Maximum Recommended PV Input Power: 93.75kilowatts.
2. Maximum Open-Circuit Voltage: 1000V dc.
3. PV Start Voltage: 150/188V dc.
4. MPPT Voltage Range: 150-1000V dc.
5. Maximum Input Current: amperes.
6. Number of String Inputs: 2number.
7. Number of Independent MPPT Circuits: 6
8. Nominal Output Voltage: 480/277V ac.
9. CEC Rated Power: 62.5kilowatts.
10. Maximum Output Current: 64amperes.
11. Peak Efficiency: 97.5percent.
12. CEC Weighted Efficiency: 97.5percent.
13. CEC Night Tare Loss: 5watts.
14. DC/AC Terminal Range (AWG): 4 to 4/0 range of AWG values.
15. Communications Interface: RS 485 RS 232 Ethernet .
16. Utility Interface: Utility-interactive inverter.
17. UL1741SA listed and approved

D. Operating Conditions:

1. Operating Ambient Temperatures: Minus 4 to plus 122 deg F.
2. Storage Temperature: Minus 40 to plus 122 deg F.
3. Relative Humidity: Zero to 95 percent, noncondensing.

E. Charge controllers shall have the following:

1. Overcurrent protection.
2. Generator input breaker box.
3. Automatic transfer relay.
4. Digital display.
5. Transformer.
6. Disconnect switch.
7. Shunt controller.
8. Shunt regulator.
9. Surge overload protection.

F. Enclosure:

1. NEMA 250, Type 4X Stainless steel.
2. Enclosure Material: Stainless Steel.

3. Cooling Methods:

    a. Fan convection cooling.
    b. Passive cooling.

4. Protective Functions:

    a. AC over/under voltage.
    b. AC over/under frequency.
    c. Ground overcurrent.
    d. Overtemperature.
    e. AC and dc overcurrent.
    f. DC overvoltage.

5. Standard LCD, four lines, 20 characters, with user display and on/off toggle switch.

G. Disconnects: Rated for system voltage and conductor.

H. Regulatory Approvals:

1. IEEE 1547.1.
2. IEEE 1547.3.
3. UL 1741.
4. CEC rapid shutdown compliant

2.11 SYSTEM OVERCURRENT PROTECTION

A. Fuses: Refer to drawings for fuse rating.

B. Circuit Breakers: Circuit breakers shall be UL listed for reverse power and for use on Photovoltaic systems. Circuit breakers to be installed in existing switchboard/panel board shall be of the same manufacturer as the existing switchboard/panel board with minimum AIC matching the existing. Provide fully rated breakers. Series rated devices are not acceptable. Refer to drawings for additional information.

C. Refer to section 26 28 16 “Enclosed Switches and Circuit Breakers” for additional information on switches and breakers, testing etc.

2.12 MOUNTING STRUCTURES

A. Roof Mount: Extruded aluminum, two rails, tilt legs, and roof standoffs. Refer to additional information on drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrate areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Do not begin installation until mounting surfaces have been properly prepared.

C. If preparation of mounting surfaces is the responsibility of another installer, notify College Representative of unsatisfactory preparation before proceeding.

D. Examine modules and array frame before installation. Reject modules and arrays that are wet, moisture damaged, or mold damaged.

E. Examine roofs, supports, and supporting structures for suitable conditions where PV system will be installed.

F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with NECA 1.

B. Coordinate layout and installation of PV panels with roof and support assembly and other construction.

C. Support PV panel assemblies independent of supports for other elements such as roof and support assemblies, enclosures, vents, pipes, and conduits. Support assembly to prevent twisting from eccentric loading.

D. Install PV inverters, energy storage, charge controller, and system control in locations indicated on Drawings.

E. Install weather seal fittings and flanges where PV panel assemblies penetrate exterior elements such as walls or roofs. Seal around openings to make weather tight. See Section 07 92 00 "Joint Sealants" for materials and application.

F. Seismic Restraints: Comply with requirements for seismic-restraint devices specified in Section 26 05 48.16 "Seismic Controls for Electric Systems."

G. Wiring Method: Install cables in raceways.

H. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

3.3 CONNECTIONS

A. Coordinate PV panel cabling to equipment enclosures to ensure proper connections.

B. Coordinate installation of utility-interactive meter with utility.

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

D. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

3.4 IDENTIFICATION

A. Comply with requirements in Section 26 05 53 "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved laminated-plastic nameplate.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage an independent qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit. Test existing breaker and switch used under this project before connecting it to the system.
2. Test continuity of each circuit.
3. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors and conductors feeding the PV system equipment for compliance with requirements.
4. Tests shall be witnessed by College representative. Give minimum two (2) weeks advance notice prior to scheduling the testing.
5. In case of test failure, locate and replace faulty cable section and/or termination at no additional cost to College.

D. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical tests stated in latest edition of NETA Acceptance Testing Specification. Certify compliance with test parameters. Breakers shall be set based on settings calculated by the Coordination Study.
2. Correct malfunctioning items on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:

    a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.
    b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each enclosed switch and circuit breaker 11 months after date of Substantial Completion.
    c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

E. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports, including a certified report that identifies conductors, enclosed switches and circuit breakers and that describes scanning results. Include colored scan photos, notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION

SECTION 263323 - CENTRAL BATTERY EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes [slow-transfer] [fast-transfer] [UPS] central battery inverters with the following features:

1. Output distribution section.
2. Internal maintenance bypass/isolation switch.
3. External maintenance bypass/isolation switch.
4. Multiple output voltages.
5. Emergency-only circuits.
6. Remote monitoring provisions.

B. Related Sections:

1. Section 260548 “Vibration and Seismic Controls for Electrical Systems.
2. Section 262813 "Fuses
3. Section 264313 "Surge Protection for Low-Voltage Electrical Power Circuits."

1.3 DEFINITIONS

A. LCD: Liquid-crystal display.

B. LED: Light-emitting diode.

C. THD: Total harmonic distortion.

D. UPS: Uninterruptible power supply.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Central Battery Systems shall withstand the effects of earthquake motions determined according to [ASCE/SEI 7] <Insert requirement>.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified[and the unit will be fully operational after the seismic event]."

1.5 ACTION SUBMITTALS

A. Product Data: For the following:

1. Electrical ratings, including the following:

a. Capacity to provide power during failure of normal ac.
b. Inverter voltage regulation and THD of output current.
c. Rectifier data.
d. Transfer time of transfer switch.
e. Data for specified optional features.

2. Transfer switch.
3. Inverter.
4. Battery charger.
5. Batteries.
6. Battery monitoring.
7. Battery-cycle warranty monitor.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, components, and location and identification of each field connection. Show access, workspace, and clearance requirements; details of control panels; and battery arrangement.

1. Wiring Diagrams: Detail internal and interconnecting wiring; and power, signal, and control wiring. Differentiate between manufacturer installed and field installed wiring.
2. Elevation and details of control and indication displays.
3. Output distribution section.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Manufacturer Seismic Qualification Certification: Submit certification that central battery inverter equipment will withstand seismic forces defined in Section 260548 "Vibration and Seismic Controls for Electrical Systems." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
4. OSHPD Special Seismic Certification (OSP) pre-approval on OSHPD projects.

C. Source quality-control test reports. Submit certified test reports within two (2) weeks of completion of tests.

D. Field quality-control test reports.

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
4. Submit within two (2) weeks of completion of tests.

E. Warranty: Special warranty specified in this Section.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For central battery inverter equipment to include in emergency, operation, and maintenance manuals.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Deliver extra materials to Owner.

1. Fuses: One for every 10 of each type and rating, but no fewer than three (3) of each.
2. Cabinet Ventilation Filters: One complete set.
3. One spare circuit board for each critical circuit.

1.9 QUALITY ASSURANCE

A. If alternate manufacturer of products other than what are specified in this section are submitted, all necessary documents not limited to cut sheets, technical information, test reports from recognized testing labs and factory test reports shall be submitted to the satisfaction of the owner/engineer to ensure quality and conformance to the specifications. Additional testing shall be undertaken if it is concluded by the owner/engineer that the submitted test reports are either insufficient or do not include

all tests necessary for product acceptance. The tests shall be conducted by a recognized lab acceptable to the owner/engineer and all tests shall be witnessed by owner's/engineer's personnel. All testing procedures and test results shall be satisfactory to the owner/engineer. Contractor shall be responsible for arranging the tests, for transportation, food and lodging for minimum of one owner's/engineer's representative to witness the test at the testing lab. Include all costs for the above in the bid.

B. Contractor shall ensure that the manufacturer has a minimum of 10 years experience in the production of Central Battery Systems similar to the type and size specified in this project.

C. Manufacturer shall have ISO 9001 Certification.

D. Manufacturer shall have ability to readily provide replacement parts for a minimum period of ten (10) years, from the date of completion of the project. Furnish a letter from the manufacturer confirming the availability.

E. Central Battery Inverter Systems shall be assembled at the manufacturer's own manufacturing facility using its own major components for the assembly. These devices shall be normally carried by the manufacturer as standard catalog items.

F. Provide certified test reports of shake table test done by manufacturer on similar units.

G. Materials and equipment shall be new, modern in design and shall not have been in prior service except as required by factory tests. Central Battery Inverter Systems shall be manufactured within six months of installation.

H. Source Limitations: Obtain Central Battery Inverter Systems, overcurrent protective devices, components, and accessories, within same product category, through one source from a single manufacturer through a local distributor unless otherwise noted. Comply with NFPA 70.

I. Installer Qualifications: An employer of workers qualified as defined in NEMA PB 2.1 and trained in electrical safety as required by NFPA 70E.

J. Product Options: Drawings indicate size, profiles, and dimensional requirements of Central Battery Inverter Systems are based on the specific system indicated. Refer to Part 2 "Product Requirements."

K. Testing Agency Qualifications:

1. Testing agency shall be an independent company; shall have been a member of NETA for a minimum of last ten (10) years and has permanent in-house testing engineers and technicians involved with testing of Central Battery Systems, OCPDs, switches and breakers similar to those specified on this project.
2. Testing company shall be located with 50 miles radius of the project.
3. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing to supervise on-site testing specified in Part 3.

4. Field Testing technician and supervisor shall have minimum ten (10) years experience in field testing of Central Battery Systems, OCPDs, switches and circuit breakers similar to the type and rating specified on this project.

L. Electrical Components, Devices, and Accessories: UL Listed and labeled as defined in NFPA 70, Article 100, by a testing agency and marked for intended location and application.

M. Central Battery Inverter System: UL 924 and UL 1778 listed and labelled.

N. Comply with NFPA 70 and NFPA 101.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver equipment in fully enclosed vehicles.

B. Store equipment in spaces having environments controlled within manufacturers' written instructions for ambient temperature and humidity conditions for non-operating equipment.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace complete Central Battery Inverter Systems batteries that fail in materials or workmanship within a specified warranty period of minimum three (3) years. Special warranty, applying to batteries only, applies to materials only, on a prorated basis, for period specified. Warranties shall apply from the date of substantial completion.

1. Warranty Period: Include the following warranty periods, from date of Substantial Completion:

a. Premium, Valve-Regulated, Recombinant, Lead-Calcium Batteries:

1) Full Warranty: [One year] [<Insert number> years].
2) Pro Rata: [19] <Insert number> years.

b. Standard, Valve-Regulated, Recombinant, Lead-Calcium Batteries:

1) Full Warranty: [One year] [<Insert number> years].
2) Pro Rata: [**Nine**] <**Insert number**> years.

c. Nickel-Cadmium, Wet-Cell Batteries:

1) Full Warranty: [**Five**] <**Insert number**> years.
2) Pro Rata: [**15**] <**Insert number**> years.

d. Lead-Calcium, Wet-Cell Batteries:

1) Full Warranty: [One year] [<Insert number> years].
2) Pro Rata: [**Nine**] <**Insert number**> years.

e. Lead-Antimony, Wet-Cell Batteries:

1) Full Warranty: [One year] [<Insert number> years].
2) Pro Rata: [**Nine**] <**Insert number**> years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Bigbeam Emergency Systems, Inc.; Siltron Division.
2. Chloride Systems.
3. Cooper Industries, Inc.; Sure-Lites Division.
4. Myers
5. Crucial Power Products.
6. Dual-Lite.
7. Hubbell Incorporated; Hubbell Lighting.
8. Lightguard/Chloride Systems.
9. Lithonia Lighting; Emergency Lighting Systems.
10. Thomas & Betts Corporation; Emergi-Lite Division.
11. Thomas & Betts Corporation; Lightalarms Division.
12. <Insert manufacturer's name.>

2.2 INVERTER PERFORMANCE REQUIREMENTS

A. The inverter shall be fully automatic and include a linear transformer. The inverter output voltage is generated by sinusoidal pulse width modulation (PWM).

B. Manual and Automatic Testing:

1. Automatic monthly and annual self-diagnostic test.
2. Automatically records the last twenty (20) events in the test result log.
3. Manual user initiated test at any time.

C. Provide historical data for one year which can be downloaded.

D. Slow-Transfer Central Battery Inverters: Automatically sense loss of normal ac supply and use an electromechanical switch to transfer loads. Transfer in one second or less from normal supply to battery-inverter supply.

1. Operation: Unit supplies power to output circuits from a single, external, normal supply source. Unit automatically transfers load from normal source to internal

battery/inverter source. Retransfer to normal is automatic when normal power is restored.

E. Fast-Transfer Central Battery Inverters: Automatically sense loss of normal ac supply and use a solid-state switch to transfer loads. Transfer in [0.004] <Insert number> second or less from normal supply to battery-inverter supply.

1. Operation: Unit supplies power to output circuits from a single, external, normal supply source. Unit automatically transfers load from normal source to internal battery/inverter source. Retransfer to normal is automatic when normal power is restored.

F. UPS-Type Central Battery Inverters: Continuously provide ac power to connected electrical system.

1. Automatic Operation:

a. Normal Conditions: Supply the load with ac power flowing from normal ac power input terminals, through rectifier-charger and inverter, with battery connected in parallel with rectifier-charger output.
b. Abnormal Supply Conditions: If normal ac supply deviates from specified and adjustable voltage, voltage waveform, or frequency limits, battery supplies constant, regulated, inverter ac power output to the load without switching or disturbance.
c. If normal power fails, battery continues supply-regulated ac power through the inverter to the load without switching or disturbance.
d. When power is restored at normal supply terminals of system, controls automatically synchronize inverter with the external source before transferring the load. Rectifier-charger then supplies power to the load through the inverter and simultaneously recharges battery.
e. If battery becomes discharged and normal supply is available, rectifier-charger charges battery. When battery is fully charged, rectifier-charger automatically shifts to float-charge mode.
f. If any element of central battery inverter system fails and power is available at normal supply terminals of system, static bypass transfer switch transfers the load to normal ac supply circuit without disturbance or interruption of supply.
g. If a fault occurs in system supplied by central battery inverter and current flows in excess of the overload rating of central battery inverter system, static bypass transfer switch operates to bypass fault current to normal ac supply circuit for fault clearing.
h. When fault has cleared, static bypass transfer switch returns the load to central battery inverter system.
i. If battery is disconnected, central battery inverter continues to supply power to the load with no degradation of its regulation of voltage and frequency of output bus.

2. Manual Operation:

a. Turning inverter off causes static bypass transfer switch to transfer the load directly to normal ac supply circuit without disturbance or interruption.
b. Turning inverter on causes static bypass transfer switch to transfer the load to inverter.

G. Maximum Acoustical Noise: 54db <Insert value> dB, "A" weighting, emanating from any UPS component under any condition of normal operation, measured [39 inches (990 mm)] <Insert distance> from nearest surface of component enclosure.

2.3 SERVICE CONDITIONS

A. Environmental Conditions: Inverter system shall be capable of operating continuously in the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. Ambient Temperature for Electronic Components: [32 to 98 deg F (0 to 37 deg C)] <Insert temperature>.
2. Relative Humidity: [0 to 95] <Insert value> percent, noncondensing.
3. Altitude: Sea level to [4000 feet (1220 m)] <Insert altitude>.

2.4 INVERTERS

A. Description: Solid-state type, with the following operational features:

1. Automatically regulate output voltage to within plus or minus 5 percent.
2. Automatically regulate output frequency to within plus or minus 1 Hz, from no load to full load at unit power factor over the operating range of battery voltage.
3. Output Voltage Waveform of Unit: Sine wave with maximum 10 percent THD throughout battery operating-voltage range, from no load to full load.

    a. THD shall not exceed 5 percent when serving a resistive load of 100 percent of unit rating.

4. Output Protection: Output circuit breakers with proper AIC and short-circuit protection based on maximum available fault current. Verify available fault levels from Short Circuit and Coordination Study.
5. Output Protection: Ferroresonant transformer to provide inherent overload and short-circuit protection.
6. Surge Protection: [Panelboard] [Auxiliary panel] suppressors specified in Section 264313 "Surge Protection for Low-Voltage Electrical Power Circuits."
7. Overload Capability: 125 percent for 10 minutes; 150 percent surge.
8. Brownout Protection: Produces rated power without draining batteries when input voltage is down to 75 percent of normal.

2.5 BATTERY CHARGER

A. Description: Solid-state, automatically maintaining batteries in fully charged condition when normal power is available. With LED indicators for "float" and "high-charge" modes.

2.6 BATTERIES

A. Description: [Premium, valve-regulated, recombinant, lead-calcium] [Standard, valve-regulated, recombinant, lead-calcium] [Nickel-cadmium, wet-cell] [Lead-calcium, wet-cell] [Lead-antimony, wet-cell] batteries.

1. Capable of sustaining full-capacity output of inverter unit for minimum of [90 minutes] at rated voltage during emergency mode.

2.7 ENCLOSURES

A. NEMA 250, Type 1 steel cabinets with access to components through hinged doors with flush tumbler lock and latch.

B. Finish: Manufacturer's standard baked-enamel finish over corrosion-resistant prime treatment.

C. All components shall have modular design and quick disconnect to facilitate field service.

2.8 SEISMIC REQUIREMENTS

A. Central battery inverter assemblies, subassemblies, components, fastenings, supports, and mounting and anchorage devices shall be designed and fabricated to withstand seismic forces. The term "withstand" is defined in the "Manufacturer Seismic Qualification Certification" Paragraph in Part 1 "Informational Submittals" Article.

2.9 CONTROL AND INDICATION

A. Description: Group displays, indications, and basic system controls on common control panel on front of central battery inverter enclosure. All alarms shall be automatically recoded and displayed. The front panel shall include a 2 line 20 character display and key pad for system input. To ensure only authorized persons have access, the system is multilevel password protected for all system functions and parameter changes.

B. Minimum displays, indicating devices, and controls shall include those in lists below. Provide sensors, transducers, terminals, relays, and wiring required to support listed items. Alarms shall include an audible signal and a visual display.

C. Indications: [Labeled LED] [Plain-language messages on a digital LCD or LED].

1. Quantitative Indications:

    a. Input voltage, each phase, line to line.
    b. Input current, each phase, line to line.
    c. System output voltage, each phase, line to line.
    d. System output current, each phase.
    e. System output frequency.
    f. DC bus voltage.
    g. Battery current and direction (charge/discharge).
    h. Elapsed time-discharging battery.

2. Basic Status Condition Indications:

    a. Normal operation.
    b. Load-on bypass.
    c. Load-on battery.
    d. Inverter off.
    e. Alarm condition exists.

3. Alarm Indications:

    a. Battery system alarm.
    b. Control power failure.
    c. Fan failure.
    d. Overload.
    e. Battery-charging control faulty.
    f. Input overvoltage or undervoltage.
    g. Approaching end of battery operation.
    h. Battery undervoltage shutdown.
    i. Inverter fuse blown.
    j. Inverter transformer overtemperature.
    k. Inverter overtemperature.
    l. Static bypass transfer switch overtemperature.
    m. Inverter power supply fault.
    n. Inverter output overvoltage or undervoltage.
    o. System overload shutdown.
    p. Inverter output contactor open.
    q. Inverter current limit.

4. Controls:

    a. Inverter on-off.
    b. Start.
    c. Battery test.
    d. Alarm silence/reset.
    e. Output-voltage adjustment.

D. Dry-form "C" contacts shall be available for remote indication of the following conditions:

1. Inverter on battery.
2. Inverter on-line.
3. Inverter load-on bypass.
4. Inverter in alarm condition.
5. Inverter off (maintenance bypass closed).

E. Include the following minimum array:

1. Ready, normal-power on light.
2. Charge light.
3. Inverter supply load light.
4. Battery voltmeter.
5. AC output voltmeter with minimum accuracy of 2 percent of full scale.
6. Load ammeter.
7. Test switch to simulate ac failure.

F. Enclosure: Steel, with hinged pad-lockable doors, suitable for [wall] [floor] mounting. Manufacturer's standard corrosion-resistant finish.

2.10 OPTIONAL FEATURES

A. Multiple Output Voltages: Supply unit branch circuits at different voltage levels if required. Transform voltages internally as required to produce indicated output voltages.

B. Emergency-Only Circuits: Automatically energize only when normal supply has failed. Disconnect emergency-only circuits when normal power is restored.

C. Maintenance Bypass/Isolation Switch: Load is supplied, bypassing central battery inverter system. Normal supply, electromechanical transfer switch, and system load terminals are completely disconnected from external circuits.

D. Maintenance Bypass/Isolation Switch: Switch is interlocked so it cannot be operated unless static bypass transfer switch is in bypass mode. Switch provides manual selection among the following three conditions without interrupting supply to the load during switching:

1. Full Isolation: Load is supplied, bypassing central battery inverter system. Normal ac input circuit, static bypass transfer switch, and central battery inverter load terminals are completely disconnected from external circuits.
2. Maintenance Bypass: Load is supplied, bypassing central battery inverter system. Central battery inverter ac supply terminals are energized to permit operational checking, but system load terminals are isolated from the load.
3. Normal: Normal central battery inverter ac supply terminals are energized, and the load is supplied either through static bypass transfer switch and central battery inverter rectifier-charger and inverter or through battery and inverter.

2.11 OUTPUT DISTRIBUTION SECTION

A. Panelboard: Comply with Section 262416 "Panelboards" except provide assembly integral to equipment cabinet.

2.12 SYSTEM MONITORING AND ALARMS

A. Remote Status and Alarm Panel: Labeled LEDs on panel faceplate shall indicate [five] <Insert quantity> basic status conditions. Audible signal indicates alarm conditions. Silencing switch in face of panel silences signal without altering visual indication.

1. Cabinet and Faceplate: Surface or flush mounted to suit mounting conditions indicated.

B. Provisions for Remote Computer Monitoring: Communication module in unit control panel provides capability for remote monitoring of status, parameters, and alarms specified in Part 2 "Control and Indication" Article. Remote computer and connecting signal wiring will be provided by Owner. Include the following features:

1. Connectors and network interface units or modems for data transmission via RS-232 link.
2. Software shall be designed to control and monitor inverter system functions and to provide on-screen explanations, interpretations, diagnosis, action guidance, and instructions for use of monitoring indications and development of reports. Include capability for storage and analysis of power-line transient records. Software shall be compatible with requirements in Section 260913 "Electrical Power Monitoring and Control" and the operating system and configuration of Owner-furnished computers.

C. Battery Ground-Fault Detector: Initiates alarm when resistance to ground of positive or negative bus of battery is less than 5000 ohms.

1. Annunciation of Alarms: At inverter system control panel.

D. Battery-Cycle Warranty Monitoring: Electronic device, acceptable to battery manufacturer as a basis for warranty action, for monitoring charge-discharge cycle history of batteries covered by cycle-life warranty.

1. Basic Functional Performance: Automatically measures and records each discharge event, classifies it according to duration category, and totals discharges according to warranty criteria, displaying remaining warranted battery life on integral LCD.
2. Additional monitoring functions and features shall include the following:

a. Measuring and recording of total voltage at battery terminals; providing alarm for excursions outside proper float voltage level.
b. Monitoring of ambient temperature at battery and initiating an alarm if temperature deviates from normally acceptable range.
c. Keypad on device front panel provides access to monitored data using front panel display.

d. Alarm contacts arranged to provide [local] [remote] alarm for [battery discharge events] [abnormal temperature] [abnormal battery voltage or temperature].
e. Memory device to store recorded data in nonvolatile electronic memory.
f. RS-232 port to permit downloading of data to a portable personal computer.
g. Modem to make measurements and recorded data accessible to remote personal computer via telephone line. Computer will be provided by Owner.

2.13 SOURCE QUALITY CONTROL

A. Factory test complete inverter system[, including battery,] before shipment. Include the following:

1. Functional test and demonstration of all functions, controls, indicators, sensors, and protective devices.
2. Full-load test.
3. Transient-load response test.
4. Overload test.
5. Power failure test.

B. Observation of Test: Give 14 days' advance notice of tests and provide access for Owner's representative to observe tests at Owner's option.

C. Report test results. Include the following data:

1. Description of input source and output loads used. Describe actions required to simulate source load variation and various operating conditions and malfunctions.
2. List of indications, parameter values, and system responses considered satisfactory for each test action. Include tabulation of actual observations during test.
3. List of instruments and equipment used in factory tests.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions for compliance with requirements for ventilation, temperature, humidity, and other conditions affecting performance.

1. Verify that manufacturer's written instructions for environmental conditions have been permanently established in spaces where equipment will be installed, before installation begins.

B. Examine roughing-in for electrical connections to verify actual locations of connections before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install system components on [floor] [concrete base] and attach by bolting.

1. Design each fastener and support to carry load indicated by seismic requirements and according to seismic-restraint details. See Section 260548 "Vibration and Seismic Controls for Electrical Systems" for seismic-restraint requirements.
2. Concrete Bases: 4 inches (100 mm) high, reinforced, with chamfered edges. Extend base no more than 3 inches (75 mm) in all directions beyond the maximum dimensions of switchgear unless otherwise indicated or unless required for seismic anchor support. Construct concrete bases according to Section 260529 "Hangers and Supports for Electrical Systems."
3. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
5. Use [3000-psi (20.7-MPa)] <Insert value>, 28-day compressive-strength concrete and reinforcement as specified in [Section 033000 "Cast-in-Place Concrete.] [Section 033053 "Miscellaneous Cast-in-Place Concrete."]

B. Maintain minimum clearances and workspace at equipment according to manufacturer's written instructions and NFPA 70.

3.3 CONNECTIONS

A. Connections: Interconnect system components. Make connections to supply and load circuits according to manufacturer's wiring diagrams, unless otherwise indicated.

B. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

1. Separately Derived Systems: Make grounding connections to grounding electrodes and bonding connections to metallic piping systems as indicated; comply with NFPA 70.

C. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.4 IDENTIFICATION

A. Identify equipment and components according to Section 260553 "Identification for Electrical Systems."

B. Label each cabinet indicating electrical, chemical and fire hazards.

C. Identify each cabinet indicating manufacturer, model no., serial no., voltage, current rating and date of installation.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: [Owner will engage] [Engage] a qualified testing agency to perform tests and inspections and prepare test reports.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.

C. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Tests and Inspections:

1. Inspect interiors of enclosures for integrity of mechanical and electrical connections, component type and labeling verification, and ratings of installed components.
2. Test manual and automatic operational features and system protective and alarm functions.
3. Test communication of status and alarms to remote monitoring equipment.
4. Perform a 90 minute full load test to verify the functioning of the complete system including batteries after loss of normal power. Verify that all loads on Central Battery System are maintained during the 90 minute test. Test shall be witnessed by owner’s representative. Provide 14 days advance notice.
5. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specifications. Certify compliance with test parameters.
6. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Remove and replace malfunctioning units and retest as specified above.

3.6 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

B. Verify that central battery inverter is installed and connected according to the Contract Documents.

C. Verify that electrical wiring installation complies with manufacturer's submittal and installation requirements.

D. Complete installation and startup checks according to manufacturer's written instructions.

3.7 ADJUSTING AND CLEANING

A. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

B. Install new filters in each equipment cabinet within 14 days from date of Substantial Completion.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain central battery inverters. Refer to Section 017900 "Demonstration and Training." Training shall be held at site after the system is complete and functional.

END OF SECTION

SECTION 263600 - TRANSFER SWITCHES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes transfer switches rated 600 V and less, including the following:

1. Open Transition Automatic Transfer Switches.

1.3 DEFINITIONS

A. ATS: Automatic Transfer Switch

B. BP/IS: Bypass switch and Isolation Switch

C. EMI: Electromagnetic interference.

D. LCD: Liquid-crystal display.

E. LED: Light-emitting diode.

F. NETA: InterNational Electrical Testing Association.

G. PC: Personal computer.

H. THD: Total harmonic distortion.

I. UPS: Uninterruptible power supply.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Transfer switches shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, weights, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: Dimensioned plans, elevations, sections, and details showing minimum clearances on all sides, conductor entry provisions, gutter space, installed features and devices, and material lists for each switch specified. Drawings shall be drawn to scale (1/4”=1’-0”).

1. Single-Line Diagram: Show connections between transfer switch, bypass/isolation switch, power sources, and load; and show interlocking provisions for each combined transfer switch and bypass/isolation switch.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer and testing agency.

B. Manufacturer Seismic Qualification Certification: Submit certification that transfer switches accessories, and components will withstand seismic forces defined in Section 260548 "Vibration and Seismic Controls for Electrical Systems." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Field quality-control test reports.

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Features and operating sequences, both automatic and manual.

2. List of all factory settings of relays; provide relay-setting and calibration instructions, including software, where applicable.
3. All software and accessory cables (e.g. serial or USB cables) required to program or adjust the operation of the transfer switch and accessories thereto.
4. All usernames and passwords for the controller, ATS, and all accessory devices.

1.8 QUALITY ASSURANCE

A. American made products have been acceptable to the Owner. If non-domestic products are submitted, notice is hereby given that extensive testing shall be required to insure quality and conformance to the Specifications. Testing shall be done by a recognized lab acceptable to the Owner and all tests shall be witnessed by Owner's personnel. Testing procedures and test results shall be satisfactory to the Owner. Contractor shall be responsible for arranging the tests, for transportation, food and lodging for minimum of one Owner's representative to witness the test at the testing lab. Include all costs for the above in the bid.

B. Manufacturer Qualifications: A qualified manufacturer. Maintain, within 75 miles of Project site, a service center capable of providing training, parts, and emergency maintenance repairs within 8 hours from the time of notification.

C. Contractor shall ensure that the manufacturer has a minimum of 15 years experience in the production of Emergency/Standby Engine Generators similar to the type and size specified in this project. Furnish a list of three (3) contacts for the three (3) similar projects completed within the last 5 years. Include name, tele no and email of the facility engineers.

D. Manufacturer shall have ISO 9001 or 9002 Certification.

E. Manufacturer shall have ability to readily provide replacement parts for a minimum period of ten (10) years, from the date of completion of the project. Furnish a letter from the manufacturer confirming the availability.

F. Transfer Switch shall be assembled at the manufacturer's own manufacturing facility using its own major devices (e.g., contactors) for the assembly. These devices shall be normally carried by the manufacturer as standard catalog items.

G. Transfer Switch shall comply with seismic zone applicable to the project. Unless otherwise indicated, verify requirements with Architect or Structural Engineer of Record (SEOR). Provide certified test reports of shake table test done by manufacturer on similar units.

H. Materials and equipment shall be new, modern in design and shall not have been in prior service except as required by factory tests. Major components (e.g. contactors, controls) shall be manufactured within six months of installation.

I. Source Limitations: Obtain automatic transfer switches, bypass/isolation switches, remote annunciators, and remote annunciator and control panels through one source from a single manufacturers which, and accessories through one source from a single manufacturer through a local distributor.

J. Product Options: Drawings indicate size, profiles, and dimensional requirements of engine generators and are based on the specific system indicated. Refer to Part 2 Section 016000 "Product Requirements."

K. Electrical Components, Devices, and Accessories: UL Listed and labeled as defined in NFPA 70, Article 100 and marked for intended location and application.

L. Testing Agency Qualifications: Member of NETA;

1. Testing agency shall be an independent company; shall have been a member of NETA for a minimum of ten (10) years and has permanent in-house testing engineers and technicians involved with testing of transfer switches, switchboards, panelboards and OCPDs similar to those specified on this project.
2. Testing company shall be located with 50 miles radius of the project.
3. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing to supervise on-site testing specified in Part 3.

M. Comply with NEMA ICS 1.

N. Comply with NFPA 70.

O. Comply with NFPA 99.

P. Comply with NFPA 110.

Q. Comply with UL 1008 unless requirements of these Specifications are stricter.

1.9 PROJECT CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service:

1. Notify Construction Manager no fewer than fourteen days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Construction Manager's written permission.

1.10 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Section 033000 "Cast-in-Place Concrete."

B. Coordinate all BACnet and IP network addressing (including but not limited to IP address assignments, BACnet device instance numbers, and other) with Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers:

1. Contactor Transfer Switches:
2. Russellectric Inc
3. Emerson; ASCO Power Technologies, LP.
4. GE Zenith Controls.
5. Kohler Power Systems; Generator Division.
6. Onan/Cummins Power Generation; Industrial Business Group.

2.2 GENERAL TRANSFER-SWITCH PRODUCT REQUIREMENTS

A. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including tungsten filament lamp loads not exceeding 30 percent of switch ampere rating, unless otherwise indicated.

B. Tested Fault-Current Closing and Withstand Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.

1. Short-time withstand capability for 30 cycles.

C. Solid-State Controls: Repetitive accuracy of all settings shall be plus or minus 2 percent or better over an operating temperature range of minus 20 to plus 70 deg C.

D. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.41. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.

E. Electrical Operation: Accomplish by a non-fused, momentarily energized solenoid or electric-motor-operated mechanism, mechanically and electrically interlocked in both directions.

F. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.

1. Limitation: Switches using molded-case switches or circuit breakers or insulated-case circuit-breaker components are not acceptable.
2. Switch Action: Double throw; mechanically held in both directions.
3. Contacts: Silver composition or silver alloy for load-current switching. Conventional automatic transfer-switch units, rated 225 A and higher, shall have separate arcing contacts.
4. Surge Protective Device: Service rated.

G. Neutral Switching. Where four-pole switches are indicated, provide neutral pole switched simultaneously with phase poles.

H. Heater: Equip switches exposed to outdoor temperatures and humidity, and other units indicated, with an internal heater. Provide thermostat within enclosure to control heater. Thermostat shall be accessible for operator control. Heater must be powered internally from the ATS and shall not require any external power connections. Power to heater shall be maintained through the transfer process.

I. Annunciation, Control, and Programming Interface Components: Devices at transfer switches for communicating with remote programming devices, annunciators, or annunciator and control panels shall have communication capability matched with remote device.

J. Factory Wiring: Train and bundle factory wiring and label, consistent with Shop Drawings, either by color-code or by numbered or lettered wire and cable tape markers at terminations. Color-coding and wire and cable tape markers are specified in Section 260553 "Identification for Electrical Systems."

1. Designated Terminals: Pressure type, suitable for types and sizes of field wiring indicated.
2. Power-Terminal Arrangement and Field-Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated.
3. Control Wiring: Equipped with lugs suitable for connection to terminal strips.

K. Enclosures: Free standing. general-purpose NEMA 250, Type 1 (Indoors), 3R (Outdoors), complying with NEMA ICS 6 and UL 508, unless otherwise indicated.

1. Enclosure shall be fabricated from 12 gauge steel and shall be sized to exceed minimum bending space required by UL 1008. Doors shall have hinges and locking handle latch with provision for padlocks.
2. Contractors field wiring terminating within the enclosure shall comply with NFPA 70. Wires shall be permanently tagged near the terminal at each end with the wire number shown on approved shop drawings.
3. The enclosure shall be constructed for convenient removal and replacement of contacts, coils, springs and control devices from the front without removal of main power conductors or removal of major components. The enclosure housing the ATS and BP/IS shall be constructed to protect personnel from energized components of the BO/IS during maintenance of the ATS.

2.3 AUTOMATIC TRANSFER SWITCHES

A. Comply with Level 1 equipment according to NFPA 110.

B. Switching Arrangement: Double-throw type, incapable of pauses or intermediate position stops during normal functioning, unless otherwise indicated.

C. Manual Switch Operation: Under load, with door closed and with either sources energized. Transfer time is same as for electrical operation. Control circuit automatically disconnects from electrical operator during manual operation.

D. Signal-Before-Transfer Contacts: A set of normally open/normally closed dry contacts operates in advance of retransfer to normal source. Interval is adjustable from 1 to 30 seconds.

E. Digital Communication Interface: Matched to capability of remote annunciator or annunciator and control panel.

F. Failure of power source serving load initiates automatic break-before-make transfer.

G. Programmed Neutral Switch Position: Switch operator with programmed neutral position arranged to provide a midpoint between the two working switch positions, with an intentional, time-controlled pause at midpoint during transfer. Adjustable pause from 0.5 to 30 seconds minimum, and factory set for 0.5 second unless otherwise indicated. Time delay occurs for both transfer directions. Disable pause unless both sources are live.

H. Automatic Transfer-Switch Features:

1. Undervoltage Sensing for Each Phase of Normal Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage is adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.
2. Adjustable Time Delay: For override of normal-source voltage sensing to delay transfer and engine start signals. Adjustable from zero to six seconds, and factory set for one second.
3. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.
4. Time Delay for Retransfer to Normal Source: Adjustable from 0 to 30 minutes, and factory set for 10 minutes to automatically defeat delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.
5. Test Switch: Simulate normal-source failure.
6. Switch-Position Pilot Lights: Indicate source to which load is connected.
7. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.

    a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
    b. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."

8. Auxiliary Contacts: Two normally open, single-pole, double-throw contacts; one for for each transfer switch (normal/emergency) position, rated 10 A at 240-V ac.
9. Transfer Override Switch: Overrides automatic retransfer control so automatic transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.
10. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 32-V dc minimum. Contacts shall close to signal

engine start, remain closed through generator engine cooldown timer, and open to signal engine stop.

11. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods are adjustable from 10 to 30 minutes. Factory setting shall be no automatic exercise. Exerciser features include the following:

    a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
    b. Push-button programming control with digital display of settings.
    c. Integral battery operation of time switch when normal control power is not available.

2.4 REMOTE ANNUNCIATOR AND CONTROL SYSTEM

A. Functional Description: Include the following functions for indicated transfer switches:

1. Indication of sources available, as defined by actual pickup and dropout settings of transfer-switch controls.
2. Indication of switch position.
3. Indication of switch in test mode.
4. Indication of failure of digital communication link.
5. Key-switch or user-code access to control functions of panel.
6. Control of switch-test initiation.
7. Control of switch operation in either direction.
8. Control of time-delay bypass for transfer to normal source.

B. Malfunction of annunciator, annunciation and control panel, or communication link shall not affect functions of automatic transfer switch. In the event of failure of communication link, automatic transfer switch automatically reverts to stand-alone, self-contained operation. Automatic transfer-switch sensing, controlling, or operating function shall not depend on remote panel for proper operation.

C. Remote Annunciation and Control Panel: Solid-state components. Include the following features:

1. Controls and indicating lights grouped together for each transfer switch.
2. Label each indicating light control group. Indicate transfer switch it controls, location of switch, and load it serves.
3. Digital Communication Capability: Matched to that of transfer switches supervised.
4. Mounting: Flush, modular, steel cabinet, unless otherwise indicated.

2.5 SOURCE QUALITY CONTROL

A. Factory test and inspect components, assembled switches, and associated equipment. Ensure proper operation. Check transfer time and voltage, frequency, and time-delay

settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Design each fastener and support to carry load indicated by seismic requirements and according to seismic-restraint details. See Section 260548 "Vibration and Seismic Controls for Electrical Systems."

B. Floor-Mounting Switch: Anchor to floor by bolting.

1. Concrete Bases: 4 inches (100 mm) high, reinforced, with chamfered edges. Extend base no more than 4 inches (100 mm) in all directions beyond the maximum dimensions of switch, unless otherwise indicated or unless required for seismic support. Construct concrete bases according to Section 260529 "Hangers and Supports for Electrical Systems." Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."

C. Annunciator and Control Panel Mounting: Flush in wall, unless otherwise indicated.

D. Identify components according to Section 260553 "Identification for Electrical Systems."

E. Set field-adjustable intervals and delays, relays, and engine exerciser clock.

3.2 CONNECTIONS

A. Wiring to Remote Components: Match type and number of cables and conductors to control and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner if necessary to accommodate required wiring.

B. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

C. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform tests and inspections and prepare test reports.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.

C. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installation, including connections, and to assist in testing.
2. After installing equipment and after electrical circuitry has been energized, test for compliance with requirements.
3. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
4. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.

    a. Check for electrical continuity of circuits and for short circuits.
    b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
    c. Verify that manual transfer warnings are properly placed.
    d. Perform manual transfer operation.

5. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times.

    a. Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.
    b. Simulate loss of phase-to-ground voltage for each phase of normal source.
    c. Verify time-delay settings.
    d. Verify pickup and dropout voltages by data readout or inspection of control settings.
    e. Test bypass/isolation unit functional modes and related automatic transfer-switch operations.
    f. Perform contact-resistance test across main contacts and correct values exceeding 500 microhms and values for 1 pole deviating by more than 50 percent from other poles.
    g. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.

6. Ground-Fault Tests: Coordinate with testing of ground-fault protective devices for power delivery from both sources.

    a. Verify grounding connections and locations and ratings of sensors.

D. Testing Agency's Tests and Inspections:

1. After installing equipment and after electrical circuitry has been energized, test for compliance with requirements.
2. Perform each visual and mechanical inspection and electrical test stated in latest edition of NETA Acceptance Testing Specification. Certify compliance with test parameters.

3. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.

    a. Check for electrical continuity of circuits and for short circuits.
    b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
    c. Verify that manual transfer warnings are properly placed.
    d. Perform manual transfer operation.

4. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times.

    a. Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.
    b. Simulate loss of phase-to-ground voltage for each phase of normal source.
    c. Verify time-delay settings.
    d. Verify pickup and dropout voltages by data readout or inspection of control settings.
    e. Test bypass/isolation unit functional modes and related automatic transfer-switch operations.
    f. Perform contact-resistance test across main contacts and correct values exceeding 500 microhms and values for 1 pole deviating by more than 50 percent from other poles.
    g. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.

5. Ground-Fault Tests: Coordinate with testing of ground-fault protective devices for power delivery from both sources.

    a. Verify grounding connections and locations and ratings of sensors.

E. Coordinate tests with tests of generator and run them concurrently.

F. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.

G. Remove and replace malfunctioning units and retest as specified above.

H. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each switch. Remove all access panels so joints and connections are accessible to portable scanner.

1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switch 11 months after date of Substantial Completion.

2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
3. Record of Infrared Scanning: Prepare a certified report that identifies switches checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain transfer switches and related equipment as specified below. Refer to Section 017900 "Demonstration and Training." Training shall be held on site after the all transfer switches are completely installed, tested and fully functional.

B. Coordinate this training with that for generator equipment.

END OF SECTION

SECTION 265119 - LED INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes the following types of LED luminaires:

1. Cylinder.
2. Downlight.
3. Linear industrial.
4. Recessed, linear.
5. Strip light.
6. Surface mount, linear.
7. Surface mount, nonlinear.
8. Suspended, linear.
9. Suspended, nonlinear.
10. Track Mounted, monopoint.

B. Related Sections:

1. Section 260923 Network lighting control systems with low-voltage control wiring or data communication circuits.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. LED: Light-emitting diode.

F. Lumen: Measured output of lamp and luminaire, or both.

G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Arrange in order of luminaire designation.
2. Include data on features, accessories, and finishes.
3. Include physical description and dimensions of luminaires.
4. Include emergency lighting units, including batteries and chargers.
5. Include life, output (lumens, CCT, and CRI), and energy-efficiency data.
6. Photometric data and adjustment factors based on laboratory tests, complying with IES "Lighting Measurements Testing and Calculation Guides" for each luminaire type. The adjustment factors shall be for lamps and accessories identical to those indicated for the luminaire as applied in this Project IES LM-79 and IES LM-80.

    a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
    b. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Samples: For each luminaire and for each color and texture with standard factory-applied finish.

D. Samples for Initial Selection: For each type of luminaire with custom factory-applied finishes.

1. Include Samples of luminaires and accessories involving color and finish selection.

E. Samples for Verification: For each type of luminaire.

1. Include Samples of luminaires and accessories to verify finish selection.

F. Product Schedule: For luminaires and lamps, refer to light fixture schedule on plans.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Luminaires.

2. Suspended ceiling components.
3. Partitions and millwork that penetrate the ceiling or extend to within 12 inches of the plane of the luminaires.
4. Structural members to which equipment and or luminaires will be attached.
5. Initial access modules for acoustical tile, including size and locations.
6. Items penetrating finished ceiling, including the following:

    a. Other luminaires.
    b. Air outlets and inlets.
    c. Speakers.
    d. Sprinklers.
    e. Access panels.
    f. Ceiling-mounted projectors.

7. Moldings.

B. Qualification Data: For testing laboratory providing photometric data for luminaires.

C. Seismic Qualification Data: For luminaires, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Product Certificates: For each type of luminaire Product Test Reports: For each type of luminaire, for tests performed by manufacturer and witnessed by a qualified testing agency and as follows:

1. Test reports complying with LM-79 (IES approved method for electrical and photometric measurements of Solid-State Lighting) providing total luminous flux, luminous intensity distribution, electrical power characteristics, luminous efficacy and color characteristics (CRI, CCT) shall be submitted.
2. Test reports complying with LM-80 (IES approved standard for measuring lumen maintenance of LED light sources) providing lumen maintenance of LED light sources shall be submitted.
3. ISTMT (IN SITU TEMPERATATURE MEASUREMENT TEST) – It is the measure of the LED source case temperature within the LED system (luminaire or lamp or it is the temperature of the LED within the luminaire. This measurement should be performed according to the temperature measurement point (TMP) indicated by the particular LED package manufacturer. The temperature measured within the luminaire shall be within the temperature of the LM-80-08 LED source report.
4. All LED lifetime projections shall be made per TM-21-11 (approved method for taking LM-80 data and making useful LED lifetime projections).

E. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.

1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps: Ten for every 100 of each type and rating installed (where applicable). Furnish at least one of each type.
2. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
3. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

1.8 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.

C. Provide luminaires from a single manufacturer for each luminaire type.

D. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

E. Mockups: For interior luminaires in room or module mockups, complete with power and control connections.

1. Obtain Architect's approval of luminaires in mockups before starting installations.
2. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.10 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

B. Warranty Period: Five year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 Refer to light fixture schedule on plans

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

B. Seismic Performance: Luminaires and lamps shall be labeled vibration and shock resistant.

1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified."

C. Ambient Temperature: 41 to 104 deg F (5 to 40 deg C).

1. Relative Humidity: Zero to 95 percent.

D. Altitude: Sea level to 1000 feet.

2.3 LUMINAIRE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp characteristics:

a. "USE ONLY" and include specific lamp type.

b. Lamp diameter, shape, size, wattage, and coating.
c. CCT and CRI.

C. Recessed luminaires shall comply with NEMA LE 4.

D. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.

E. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

F. California Title 24 Residential and non-residential code compliant.

G. Standards:

1. ENERGY STAR certified.
2. RoHS compliant.
3. UL Listing: Listed for damp location.

H. Nominal Operating Voltage: 120V ac.

I. Diffusers and Globes, where applicable:

1. Tempered Fresnel glass, Prismatic glass, Diffuse glass, Clear glass, Prismatic acrylic, Clear, UV-stabilized acrylic.
2. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
3. Glass: Annealed crystal glass unless otherwise indicated.
4. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

2.4 LINEAR INDUSTRIAL

A. Lamp:

1. Minimum allowable efficacy of 100 lm/W.
2. CRI of minimum 80. CCT of 3000K.
3. Rated lamp life of 50,000 hours to L70.
4. Dimmable from 100 percent to 0 percent of maximum light output.
5. Internal driver.
6. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

B. Housings:

1. Corrosion resistant housing and heat sink.
2. Clear finish.

C. Housing and Heat Sink Rating:

1. Class 1, Division 2 Group(s) A B C and D.
2. NEMA 4X.

3. IP 54.
4. IP 66.
5. Marine and wet locations.
6. CSA C22.2 No 137.

D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

E. With integral mounting provisions.

2.5 RECESSED, LINEAR

A. Lamp:

1. Minimum allowable efficacy of 100 lm/W.
2. CRI of minimum 80. CCT of 3000K.
3. Rated lamp life of 50,000 hours to L70.
4. Dimmable from 100 percent to 0 percent of maximum light output.
5. Internal driver.
6. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

B. Housings:

1. Extruded-aluminum, stainless steel, or per plans housing and heat sink.
2. Clear anodized powder-coat finish.
3. With integral mounting provisions.

C. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

D. Standards:

1. NEMA LE 4.

2.6 STRIP LIGHT

A. Lamp:

1. Minimum allowable efficacy of 80 lm/W.
2. CRI of minimum 80. CCT of 3000K.
3. Rated lamp life of 50,000 hours to L70.
4. Dimmable from 100 percent to 0 percent of maximum light output.
5. Internal driver.

6. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

B. Housings:

1. Extruded-aluminum, stainless steel, or per plans housing and heat sink.
2. Clear, anodized, powder-coat, finish.
3. With integral mounting provisions.

C. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping of luminaire without use of tools. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

2.7 SURFACE MOUNT, LINEAR/CIRCULAR

A. Lamp:

1. Minimum allowable efficacy of 80 lm/W.
2. CRI of minimum 80. CCT of 3000K.
3. Rated lamp life of 50,000 hours to L70.
4. Dimmable from 100 percent to 0 percent of maximum light output.
5. Internal driver.

B. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

C. Housings:

1. Extruded-aluminum, stainless steel, or per plans housing and heat sink.
2. Clear, anodized, powder-coat, finish.
3. With integral mounting provisions.

D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

2.8 SUSPENDED, LINEAR

A. Lamp:

1. Minimum allowable efficacy of 80 lm/W.
2. CRI of minimum 80. CCT of 3000K.
3. Rated lamp life of 50,000 hours to L70.
4. Dimmable from 100 percent to 0 percent of maximum light output.
5. Internal driver.
6. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

B. Housings:

1. Extruded-aluminum, stainless steel, or per plans housing and heat sink.
2. Clear, anodized, powder-coat, finish.
3. With integral mounting provisions.

C. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

2.9 SUSPENDED, NONLINEAR

A. Nominal Operating Voltage: 120 V ac.

B. Lamp:

1. Minimum 1,500 lm.
2. Minimum allowable efficacy of 85 lm/W.
3. CRI of 80. CCT as specified on the drawings.
4. Rated lamp life of 50,000 hours to L70.
5. Dimmable from 100 percent to 0 percent of maximum light output.
6. Internal driver.
7. User-Replaceable Lamps:

    a. Bulb shape complying with ANSI C78.79.
    b. Lamp base complying with ANSI C81.61 or IEC 60061-1.

8. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

C. Housings:

1. Steel housing and heat sink.
2. Painted finish.
3. Universal mounting bracket.
4. Integral junction box with conduit fittings.

D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

E. Diffusers and Globes:

1. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
2. Glass: Annealed crystal glass unless otherwise indicated.
3. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

F. Standards:

1. ENERGY STAR certified.
2. RoHS compliant.
3. UL Listing: Listed for damp location.

2.10 DOWNLIGHT

A. Nominal Operating Voltage: 120 V ac.

B. Lamp:

1. Minimum 1000 lm.
2. Minimum allowable efficacy of 80 lm/W.
3. CRI of 80. CCT as specified on the drawings.
4. Rated lamp life of 50,000 hours to L70.
5. Dimmable from 100 percent to 0 percent of maximum light output.
6. Internal driver.
7. User-Replaceable Lamps:

    a. Bulb shape complying with ANSI C78.79.
    b. Lamp base complying with ANSI C81.61 or IEC 60061-1.

8. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

C. Housings:

1. Steel housing and heat sink.
2. painted finish.
3. Universal mounting bracket.
4. Integral junction box with conduit fittings.

D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

E. Diffusers and Globes:

1. Adjustable lens.
2. Wide light distribution.
3. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
4. Glass: Annealed crystal glass unless otherwise indicated.
5. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

F. Standards:

1. ENERGY STAR certified.
2. RoHS compliant.

3. UL Listing: Listed for damp location.
4. Recessed luminaires shall comply with NEMA LE 4.

2.11 HIGHBAY, NONLINEAR

A. Nominal Operating Voltage: 120 V ac.

B. Lamp:

1. Minimum 1000 lm.
2. Minimum allowable efficacy of 80 lm/W.
3. CRI of 80. CCT as specified on the drawings.
4. Rated lamp life of 50,000 hours to L70.
5. Dimmable from 100 percent to 0 percent of maximum light output.
6. Internal driver.
7. User-Replaceable Lamps:

    a. Bulb shape complying with ANSI C78.79.
    b. Lamp base complying with ANSI C81.61 or IEC 60061-1.

8. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

C. Housings:

1. Steel housing and heat sink.
2. painted finish.
3. With integral mounting provisions.

D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

E. Diffusers and Globes:

1. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
2. Glass: Annealed crystal glass unless otherwise indicated.
3. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

F. Standards:

1. ENERGY STAR certified.
2. RoHS compliant.
3. UL Listing: Listed for damp location.

2.12 MATERIALS

A. Metal Parts:

1. Free of burrs and sharp corners and edges.
2. Sheet metal components shall be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging.

B. Steel:

1. ASTM A 36/A 36M for carbon structural steel.
2. ASTM A 568/A 568M for sheet steel.

C. Stainless Steel:

1. 1. Manufacturer's standard grade.
2. 2. Manufacturer's standard type, ASTM A 240/240 M.

D. Galvanized Steel: ASTM A 653/A 653M.

E. Aluminum: ASTM B 209.

2.13 METAL FINISHES

A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.14 LUMINAIRE SUPPORT

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.

C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gauge.

D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 TEMPORARY LIGHTING

A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is sufficiently complete, clean luminaires used for temporary lighting and install new lamps.

3.3 INSTALLATION

A. Comply with NECA 1.

B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

C. Install lamps in each luminaire.

D. Supports:

1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and relamping.
3. Provide support for luminaire without causing deflection of ceiling or wall.
4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.

E. Flush-Mounted Luminaires:

1. Secured to outlet box.
2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
3. Trim ring flush with finished surface.

F. Wall-Mounted Luminaires:

1. Attached to structural members in walls ,Attached to a minimum 20 gauge backing plate attached to wall structural members, Attached using through bolts and backing plates on either side of wall.
2. Do not attach luminaires directly to gypsum board.

G. Suspended Luminaires:

1. Ceiling Mount:

   a. Two 5/32-inch diameter aircraft cable supports adjustable to 10 feet in length.
   b. Pendant mount Four-point pendant mount with 5/32-inch diameter aircraft cable supports adjustable to 10 feet in length.
   c. Hook mount.

2. Pendants and Rods: Where longer than 24 inches, brace to limit swinging.
3. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
4. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and tubing or rod (back of house), wire support (front of house) for suspension for each unit length of luminaire chassis, including one at each end.
5. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

H. Ceiling-Grid-Mounted Luminaires:

1. Secure to any required outlet box.
2. Secure luminaire to the luminaire opening using approved fasteners in a minimum of four locations, spaced near corners of luminaire.
3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

I. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.

2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

C. Prepare test and inspection reports.

3.6 STARTUP SERVICE

A. Comply with requirements for startup specified in Section 260943.16 "Addressable-Luminaire Lighting Controls."

B. Comply with requirements for startup specified in Section 260943.23 "Relay-Based Lighting Controls."

3.7 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.

1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
3. Adjust the aim of luminaires in the presence of the Architect.

END OF SECTION

SECTION 265619 - LED EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Exterior solid-state luminaires that are designed for and exclusively use LED lamp technology.
2. Luminaire supports.
3. Luminaire-mounted photoelectric relays.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color rendering index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. Lumen: Measured output of lamp and luminaire, or both.

F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of luminaire.

1. Arrange in order of luminaire designation.
2. Include data on features, accessories, and finishes.
3. Include physical description and dimensions of luminaire.
4. Lamps include life, output (lumens, CCT, and CRI), and energy-efficiency data.
5. Photometric data and adjustment factors based on laboratory tests, complying with IES Lighting Measurements Testing and Calculation Guides, of each luminaire type. The adjustment factors shall be for lamps and accessories identical to those indicated for the luminaire as applied in this Project and testing procedures and criteria required by IES LM-79 and LM-80.

a. Manufacturer's Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the NVLAP for Energy Efficient Lighting Products.
b. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.

6. Wiring diagrams for power, control, and signal wiring.
7. Photoelectric relays.
8. Means of attaching luminaires to supports and indication that the attachment is suitable for components involved.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Sustainable Design Submittals:

1. "BUG ratings" Light Pollution Reduction for both uplight and light trespass.

D. Samples: For each luminaire and for each color and texture indicated with factory-applied finish.

E. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Luminaires.
2. Structural members to which equipment and luminaires will be attached.
3. Underground utilities and structures.
4. Existing underground utilities and structures.
5. Above-grade utilities and structures.
6. Existing above-grade utilities and structures.
7. Building features.
8. Vertical and horizontal information.

B. Qualification Data: For testing laboratory providing photometric data for luminaires.

C. Seismic Qualification Data: For luminaires, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Product Certificates: For each type of the following:

1. Luminaire.
2. Photoelectric relay.

E. Test reports complying with LM-79 (IES approved method for electrical and photometric measurements of Solid-State Lighting) providing total luminous flux, luminous intensity distribution, electrical power characteristics, luminous efficacy and color characteristics (CRI, CCT) shall be submitted.Test reports complying with LM-80 (IES approved standard for measuring lumen maintenance of LED light sources) providing lumen maintenance of LED light sources shall be submitted.

F. ISTMT (IN SITU TEMPERATATURE MEASUREMENT TEST) – It is the measure of the LED source case temperature within the LED system (luminaire or lamp or it is the temperature of the LED within the luminaire. This measurement should be performed according to the temperature measurement point (TMP) indicated by the particular LED package manufacturer. The temperature measured within the luminaire shall be within the temperature of the LM-80-08 LED source report.

G. All LED lifetime projections shall be made per TM-21-11 (approved method for taking LM-80 data and making useful LED lifetime projections).

H. Product Test Reports: For each luminaire, for tests performed by a qualified testing agency as follows:

1. Test reports complying with LM-79 (IES approved method for electrical and photometric measurements of Solid-State Lighting) providing total luminous flux, luminous intensity distribution, electrical power characteristics, luminous efficacy and color characteristics (CRI, CCT) shall be submitted.
2. Test reports complying with LM-80 (IES approved standard for measuring lumen maintenance of LED light sources) providing lumen maintenance of LED light sources shall be submitted.
3. ISTMT (IN SITU TEMPERATATURE MEASUREMENT TEST) – It is the measure of the LED source case temperature within the LED system (luminaire or lamp or it is the temperature of the LED within the luminaire. This measurement should be performed according to the temperature measurement point (TMP) indicated by the particular LED package manufacturer. The temperature measured within the luminaire shall be within the temperature of the LM-80-08 LED source report.
4. All LED lifetime projections shall be made per TM-21-11 (approved method for taking LM-80 data and making useful LED lifetime projections).

I. Source quality-control reports.

J. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and photoelectric relays to include in operation and maintenance manuals.

1. Provide a list of all lamp types used on Project. Use ANSI and manufacturers' codes.
2. Provide a list of all photoelectric relay types used on Project; use manufacturers' codes.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps: Ten for every 100 of each type and rating installed. Furnish at least one of each type.
2. Glass, Acrylic, and Plastic Lenses, Covers, and Other Optical Parts: One for every 100 of each type and rating installed. Furnish at least one of each type.
3. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
4. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

1.8 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturers' laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products and complying with applicable IES testing standards.

C. Provide luminaires from a single manufacturer for each luminaire type.

D. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

E. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

F. Mockups: For exterior luminaires, complete with power and control connections.

1. Obtain Architect's approval of luminaires in mockups before starting installations.

2. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed work.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering prior to shipping.

1.10 FIELD CONDITIONS

A. Verify existing and proposed utility structures prior to the start of work associated with luminaire installation.

B. Mark locations of exterior luminaires for approval by Architect prior to the start of luminaire installation.

1.11 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures, including luminaire support components.
b. Faulty operation of luminaires and accessories.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Period: 5-years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

B. Seismic Performance: Luminaires and lamps shall be labeled vibration and shock resistant.

1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified and the luminaire will be fully operational during and after the seismic event."

2.2 LUMINAIRE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. NRTL Compliance: Luminaires shall be listed and labeled for indicated class and division of hazard by an NRTL.

C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

D. UL Compliance: Comply with UL 1598 and listed for wet location.

E. Lamp base complying with ANSI C81.61 or IEC 60061-1.

F. Bulb shape complying with ANSI C79.1.

G. CRI of minimum 80. CCT of 4000 K.

H. L70 lamp life of 50,000 hours.

I. Lamps dimmable from 100 percent to 0 percent of maximum light output.

J. Internal driver.

K. Nominal Operating Voltage: 120/208 V ac.

L. In-line Fusing: Separate in-line fuse for each luminaire.

M. Lamp Rating: Lamp marked for outdoor use and in enclosed locations.

N. Source Limitations: Obtain luminaires from single source from a single manufacturer.

O. Source Limitations: For luminaires, obtain each color, grade, finish, type, and variety of luminaire from single source with resources to provide products of consistent quality in appearance and physical properties.

2.3 LUMINAIRE-MOUNTED PHOTOELECTRIC RELAYS

A. Comply with UL 773 or UL 773A.

B. Contact Relays: Factory mounted, single throw, designed to fail in the on position, and factory set to turn light unit on at 1.5 to 3 fc and off at 4.5 to 10 fc with 15-second minimum

time delay. Relay shall have directional lens in front of photocell to prevent artificial light sources from causing false turnoff.

1. Relay with locking-type receptacle shall comply with ANSI C136.10.
2. Adjustable window slide for adjusting on-off set points.

2.4 LUMINAIRE TYPES

A. Area and Site:

1. Luminaire Shape: Round or Square
2. Mounting: Pole or Building with extruded-aluminum/stainless-steel rectangular/round arm, 11 inches in length.
3. Luminaire-Mounting Height: See plans.
4. Distribution: per plans.
5. Diffusers and Globes: per schedule
6. Housings:

    a. Extruded-aluminum housing and heat sink.
    b. Clear, anodized, powder-coat finish.

B. Bollard:

1. Shape: Round
2. Height Above Finished Grade: See plans.
3. Overall Height: See plans
4. Diameter: See plans.
5. Mounting: 3 point cast aluminum base.
6. Distribution: See plans.
7. Diffusers and Globes: As specified on the drawings
8. Housings:

    a. Extruded-aluminum housing and heat sink.
    b. Painted finish.

C. Decorative Post Top:

1. Luminaire-Mounting Height: See plans.
2. Mounting Type: Arm.
3. Distribution: per plans.
4. Diffusers and Globes: Tempered Fresnel glass, Prismatic glass Diffuse glass, Clear glass, Prismatic acrylic Clear, UV-stabilized acrylic Clear polycarbonate
5. Housings:

    a. Extruded-aluminum housing and heat sink.
    b. Clear, anodized, powder-coat finish.

2.5 MATERIALS

A. Metal Parts: Free of burrs and sharp corners and edges.

B. Sheet Metal Components: Corrosion-resistant aluminum, Stainless steel. Form and support to prevent warping and sagging.

C. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses.

D. Diffusers and Globes:

1. Acrylic Diffusers: 100 percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
2. Glass: Annealed crystal glass unless otherwise indicated.
3. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

E. Lens and Refractor Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

F. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.

G. Housings:

1. Rigidly formed, weather- and light-tight enclosure that will not warp, sag, or deform in use.
2. Provide filter/breather for enclosed luminaires.

H. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp characteristics:

a. "USE ONLY" and include specific lamp type.
b. Lamp diameter, shape, size, wattage and coating.
c. CCT and CRI for all luminaires.

2.6 FINISHES

A. Variations in Finishes: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

B. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.

C. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20 requirements; and seal aluminum surfaces with clear, hard-coat wax.
3. Class I, Clear-Anodic Finish: AA-M32C22A41 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
4. Class I, Color-Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker), complying with AAMA 611.

    a. Color: per plans.

D. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1 or SSPC-SP 8.
2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.

    a. Color: See plans, or as selected by Architect.

2.7 LUMINAIRE SUPPORT COMPONENTS

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for luminaire electrical conduit to verify actual locations of conduit connections before luminaire installation.

C. Examine walls, roofs, ceilings for suitable conditions where luminaires will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 TEMPORARY LIGHTING

A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is substantially complete, clean luminaires used for temporary lighting and install new lamps.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Comply with NECA 1.

B. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.

C. Install lamps in each luminaire.

D. Fasten luminaire to structural support.

E. Supports:

1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and relamping.
3. Support luminaires without causing deflection of finished surface.
4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.

F. Wall-Mounted Luminaire Support:

1. Attached to structural members in walls, Attached to a minimum 1/8 inch backing plate attached to wall structural members, Attached using through bolts and backing plates on either side of wall.

G. Wiring Method: Install cables in raceways. Conceal raceways and cables.

H. Install luminaires level, plumb, and square with finished grade unless otherwise indicated. Install luminaires at height and aiming angle as indicated on Drawings.

I. Coordinate layout and installation of luminaires with other construction.

J. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.

K. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" and Section 260533 "Raceways and Boxes for Electrical Systems" for wiring connections and wiring methods.

3.4 BOLLARD LUMINAIRE INSTALLATION:

A. Align units for optimum directional alignment of light distribution.

1. Install on concrete base with top above finished grade or surface at luminaire location per plans. Cast conduit into base, and shape base to match shape of bollard base. Finish by troweling and rubbing smooth. Concrete materials, installation, and finishing are specified in Section 033000 "Cast-in-Place Concrete."

3.5 INSTALLATION OF INDIVIDUAL GROUND-MOUNTED LUMINAIRES

A. Aim as indicated on Drawings.

B. Install on concrete base with top above finished grade or surface at luminaire location per plans. Cast conduit into base, and finish by troweling and rubbing smooth. Concrete materials, installation, and finishing are specified in Section 033000 "Cast-in-Place Concrete."

3.6 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Section 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.7 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.8 FIELD QUALITY CONTROL

A. Inspect each installed luminaire for damage. Replace damaged luminaires and components.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Verify operation of photoelectric controls.

C. Illumination Tests:

1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IES testing guide(s):

a. IES LM-5.
b. IES LM-50.
c. IES LM-52.
d. IES LM-64.
e. IES LM-72.

2. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.

D. Luminaire will be considered defective if it does not pass tests and inspections.

E. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.9 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain luminaires and photocell relays.

3.10 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.

1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
3. Adjust the aim of luminaires in the presence of the Architect.

END OF SECTION

SECTION 270500 - REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Provide a standard defining the structured communications cabling systems to be installed within customer facility. The goal is to accomplish this in the most economic and systematic fashion possible, and in a manner compliant with the latest codes, cabling standards and industry best practices.
2. Scope of Work Compliance.
3. Contractor Qualifications.
4. Warranty.
5. Safety.
6. Working Conditions.

1.2 GENERAL TERMS AND CONDITIONS.

A. General Contractor is responsible for all required Division 27 scope of work and shall ensure all communication sub-tier contractors adhere to the qualifications set forth in all project Division 27 specifications including project experience and certifications.

B. Prices quoted shall be all-inclusive and represent a complete fully-engineered system installation at the Project site as contemplated by and detailed in the drawing package and in accompanying specifications.

C. Omissions in the specification of any provision herein described shall not be construed as to relieve the contractor of any responsibility or obligation requisite to the complete and satisfactory delivery, installation, operation and support of any and all systems, equipment or services. Correction of any omission on the part of the contractor, either due to misinterpretation of this specification or any other conditions of the project, shall be the responsibility of the Contractor and shall not result in any contract modification or additional costs to Owner.

D. Where conflicts and/or irregularities occur between project documents, specifications, drawings, and/or applicable codes, rules, regulations, ordinances, standards, guidelines and practices, the more stringent requirement shall apply as reasonably determined by Owner or government agency inspector.

E. This specification represents the design intent for the project communicated by way of narrative descriptions of intended functionality and single line or detail drawings indicating likely equipment connectivity to achieve that functionality. The designs in this specification do not represent fully engineered technical solutions. Contractors are required to review the designs presented in the project documents closely, submit any questions and clarifications regarding the design intent through the RFI process and

develop their own engineered solutions representing a fully functional turn-key solution in their bid responses.

F. The scope of this project includes the complete system engineering, procurement, fabrication, installation, programming, testing, training and warranty.

G. Proposed solutions shall be based on the designs communicated in the specifications, but shall include any additional equipment, materials, software, licenses and/or labor required for the contractor to deliver a fully functional turn-key system solution that meets intended operational performance requirements.

H. It is the responsibility of the Contractor awarded this project to ensure that all quantities, materials, labor, licenses, permits, sales taxes and any and all other costs to provide a turnkey project are included in their bid.

I. Floor plans, drawings, elevation drawings, and other drawings received by the Contractor as part of the construction process are hereby incorporated into this document by reference. It is the responsibility of the Contractor to ensure that amounts and lengths of cabling and pathways are correct, and that all materials and labor are included to install the system per the drawings and these specifications.

J. Permits, licenses, applicable sales taxes, insurance requirements, payment/performance bond costs, and other miscellaneous costs are the responsibility of the Contractor and shall be included in the contract price and this scope of work. Such items are to be listed separately on pricing sheets, if provided. Copies of all required permits, licenses, insurance requirements and bond(s) are to be delivered to Owner prior to commencement of any work.

K. Installation Schedule and Coordination: Contractor shall take the fast-track nature of this project and potential requirement for installation/work schedule adjustments and quick turnarounds into consideration in constructing this project as Owner will NOT entertain or agree to added-cost change orders associated with scheduling changes.

L. Work will need to be closely coordinated with architect, City Personnel, GC, MEP contractors, structural contractor and all low-voltage contractors and each of their respective schedules.

M. This will be a turnkey Project. Any item of the equipment or material not specifically addressed on the drawings, specifications or elsewhere in Division 27 specifications documents, but required to provide complete and functional systems as contemplated and/or specified herein, shall be provided at no additional charge to owner in a quantity and quality consistent with other specified items.

N. Coordination with Project Design Team: The build contractor will be responsible for coordinating all communications cabling infrastructure requirements, including review of existing site conditions, review and coordination of electrical power and grounding requirements, conduits and back boxes, structural support requirements, and coordination.

O. Assembly: The contractor shall procure and assemble all hardware and equipment and any additional materials as required to deliver the completely functioning communications cabling system.

P. Installation: The contractor shall install all equipment, inter-rack and intra-rack cable, wiring of equipment, connectors, panels, plates, and other material at the Project site.

Q. Testing and Adjustment: The contractor shall perform all tests and adjustments, furnish all test equipment necessary and perform all work required to properly configure the systems and to verify their performance in accordance with the information in this document and the design-build integrator's approved engineered designs.

R. Warranty: The contractor shall warrant the installed system in accordance with the terms of this document and accompanying contractual documents.

1.3 RELATED DOCUMENTS

A. All divisions of the specification and general provisions of the Construction Documents.

B. Architectural, mechanical, electrical, and all technology drawings including but not limited to Telecommunication Drawings.

C. Refer to structural seismic requirement design documents specifications, if available, for Non-Structural Components for all structural bracing and support of telecommunications equipment.

1.4 REFERENCES

A. A.Abbreviations and Acronyms:

1.	A/E:	Architect / Engineer (designer)
2.	BICSI:	Building Industry Consulting Service International
3.	EIA:	Electronics Industry Alliance
4.	ELFEXT	Equal Level far End Cross Talk
5.	FTP	Foiled Twisted Pair
6.	IDF:	Intermediate Distribution Facility
7.	ILEC/LEC:	Incumbent Local Exchange Carrier
8.	ISP:	Inside Plant
9.	IT:	Information Technology
10.	BDF:	Building Distribution Frame
11.	LOMMF:	Laser Optimized Multi-Mode Fiber
12.	MDF:	Main Distribution Facility
13.	MPOE:	Minimum Point of Entry
14.	NEXT	Near End Cross Talk
15.	OSP:	Outside Plant
16.	PSELFEXT:	Power Sum Equal Level Far End Cross Talk
17.	PSNEXT:	Power Sum Near End Cross Talk
18.	RCDD:	Registered Communications Distribution Designer

19. TBD: To Be Determined
20. TCIM: Telecommunication Cabling Installation Manual
21. TDMM: Telecommunications Distribution Methods Manual
22. TIA: Telecommunications Industry Association
23. UTP: Unshielded Twisted Pair
24. WAP: Wireless Access Point

1.5 APPLICABLE REGULATORY REFERENCES

A. Contractor is responsible for knowledge and application of current versions of all applicable Standards and Codes. In cases where listed Standards and Codes have been updated, Contractor shall adhere to the most recent revisions, including all relevant changes or addenda at the time of installation.

1. ANSI/TIA:

a. TIA-526-7 (OFSTP-7) (July 2015) Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant
b. TIA-526-14-B (April 2015) (OFSTP-14) Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant
c. ANSI/TIA/EIA-598-C (July 2014) Optical Fiber Cable Color Coding
d. ANSI/TIA-568-C.0 (December 2015) Generic Telecommunications Cabling for Customer Premises
e. TIA-568-C.0-1 (September 2012) Generic Telecommunications Cabling for Customer Premises-Addendum 1, Updated Reference for Balanced Twisted-Pair Cabling
f. ANSI/TIA-568-C.1 (February 2012) Commercial Building Telecommunications Cabling Standards
g. TIA-568-C.1-2 (November 2014) Commercial Building Telecommunications Cabling Standard, Addendum 2 General Updates
h. ANSI/TIA-568-C.2 (June 2016) Balanced Twisted Pair Communications Cabling and Components Standards
i. ANSI/TIA-568-C.3 (June 2011) Optical Fiber Cabling Components Standard
j. ANSI/TIA-568-C.3-1 (December 2011) Optical Fiber Cabling Component Standard- Addendum 1, Addition of OM4 Cabled Optical Fiber and array connectors
k. ANSI/TIA-1183 (August 2012) Test Fixtures for Balun-Less Measurements of Balanced Components and Systems
l. ANSI/TIA-1183-1 (January 2016) Test Fixtures for Balun-Less Measurements of Balanced Components and Systems, Addendum 1 – Extending Frequency Capabilities to 2 GHz.
m. ANSI/TIA-568-C.4 (July 2011) Broadband Coaxial Cabling Components Standard
n. ANSI/TIA-942-A (August 2012) Telecommunications Infrastructure Standard for Data Centers
o. ANSI/TIA-942-A-1 (March 2013) Telecommunications Infrastructure Standard for Data Centers, Addendum 1 - Cabling Guidelines for Data Center Fabrics
p. TIA-569-D (April 2015) Telecommunications Pathways and Spaces

q. TIA-569-D-1 (October 2016) Telecommunications Pathways and Spaces Addendum 1- Revised Temperature and Humidity Requirements for Telecommunications Spaces
r. ANSI/TIA-606-B (December 2015) Administration Standard for Telecommunications Infrastructure
s. TIA-607-B (November 2015) Generic Telecommunications Grounding (Earthing) and Bonding for Customer Premises
t. TIA-607-B-1 (January 2017) Generic Telecommunications Grounding (Earthing) and Bonding for Customer Premises - External Grounding Addendum
u. TIA-758-B (April 2012) Customer-Owned Outside Plant Telecommunication Infrastructure Standard
v. TIA-1152 (November 2016) Requirements for Field Test Instruments and Measurements for Balanced Twisted-Pair Cabling
w. ANSI/TIA-862-B (February 2016) Structured Cabling Infrastructure Standard for Intelligent Building Systems.
x. TIA-570-C (August 2012) Residential Telecommunications Infrastructure Standard
y. TIA-1005-A (June 2012) Industrial Telecommunications Infrastructure Standard for Manufacturing, Process & Refining
z. ANSI/TIA-1005 (January 2015) Telecommunications Infrastructure Standard for Industrial Premises
aa. TIA-1005-1 (May 2012) Telecommunications Infrastructure Standard for Industrial Premises; Addendum 1 - Industrial Pathways and Spaces
bb. TIA-1179 (July 2010) Healthcare Facility Telecommunications Infrastructure Standard.

2. ISO/IEC

a. ISO 11801 (November 2010) - Generic Cabling for Customer Premises
b. ISO/IEC TR 14763-2-1:2012 - Information technology -- Implementation and operation of customer premises cabling -- Part 2-1: Planning and installation - Identifiers within administration system.

3. Electric Codes

a. California Electrical Code, CEC (2016)
b. ANSI/NFPA 70-2017, National Electrical Code© (NEC©)
c. ANSI/IEEE C2-207, National Electrical Safety Code®
d. National Electrical Code (NEC) (NFPA 70)

4. OSHA Standards and Regulations – all applicable
5. 2016 California Title 24

a. 2016 California Administrative Code, Title 24 Part 1
b. 2016 California Building Code, Title 24 Part 2
c. 2016 California Electrical Code, Title 24 Part 3
d. 2016 California Mechanical Code, Title 24 Part 4
e. 2016 California Plumbing Code, Title 24 Part 5
f. 2016 California Energy Code, Title 24 Part 6

g. 2016 California Fire Code, Title 24 Part 9
h. 2016 Green Building Standard Code, Title 24 part 11
i. 2016 California Standard Code, Title 24 Part 12

6. Local Codes and Standards – all applicable
7. BICSI

a. Telecommunications Distribution Methods Manual, 13th Edition
b. BICSI 004-2012, Information Technology Systems Design and Implementation Best Practices for Healthcare Institutions and Facilities
c. Information Technology Systems Installation Methods Manual (ITSIMM), 6th Edition
d. ANSI/BICSI 002-2014, Data Center Design and Implementation Best Practices
e. Network Systems and Commissioning (NSC) reference, 1st Edition
f. ANSI/NECA/BICSI 568-2006, Standard for Installing Commercial Building Telecommunications Cabling
g. NECA/BICSI 607-2011, Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings
h. ANSI/BICSI 001-2009, Information Transport Systems Design Standard for K-12 Educational Institutions
i. Network Design Reference Manual, 7th Edition
j. Outside Plant Design Reference Manual, 5th Edition
k. Wireless Design Reference Manual, 3rd Edition
l. Electronic Safety and Security Design Reference Manual, 3rd Edition.

8. Anywhere cabling Standards conflict with electrical or safety Codes, Contractor shall defer to NEC and any applicable local codes or ordinances, or default to the most stringent requirements listed by either.
9. Knowledge and execution of applicable codes is the sole responsibility of the contractor.
10. Any code violations committed at the time of installation shall be remedied at the contractor’s expense.

1.6 SCOPE OF WORK

A. General project information:

1. These Specifications and associated drawings are the governing document for the installation of the telecommunications infrastructure and includes project descriptions, specified and recommended products, installation and project management methods, the scope of work and elevation drawing specifications.
2. Through this division specification document, Compton Community College District will be referred to as the owner.
3. Owner wishes to contract with a General Contractor, who will sub-tier the supplier/contractor (“ICT-Information and Communication Technology“) to provide, install, test and warranty a complete turn-key a Cable Infrastructure System for the Owner’s New Residential Buildings, the “Project” per the scope of work and specifications stated herein. This inquiry implies no obligation on the part of

Owner. Contractor shall bear all costs and expenses incurred in preparing a response a Request for Proposal (“RFP”) and subsequent award of project, it being understood and agreed that Owner accepts no responsibility for any costs and/or expenses incurred by winning contractor in preparing and submitting such response.

4. The Owner is developing (3) Student Housing Buildings, located on the NVC campus. The buildings will be a newly developed site with (3) buildings, four levels of residential. The building will consist of the following:

    a. Three (4) level buildings with residential apartments and general residential living spaces. The new first floor MPOE/Server Rooms will support the network requirements.

B. Purpose:

1. This specification defines quality standards and practices common to all network cabling for New Residential Buildings project. In addition, said project will have Requests for Proposals (RFP), associated drawings and requirements pertaining to their specific environments. Such collateral will be referred to in this document as “Project Specific Documentation” or simply “Construction Documents”.
2. Voice and Data Networks encompass a broad spectrum of technologies and are distributed into project internal spaces. Installed cables will be used for Ethernet, high and low speed data applications, used in analog and digital voice, not to exclude other future Voice/Data technologies. This specification will include indoor/outdoor cable installations, and backbone cabling, telecommunications closet and equipment cabling, equipment hardware as well as routing and support infrastructure.
3. It is the responsibility of the installing contractor to evaluate these general recommendations and adapt them effectively to actual projects. Contractor is responsible for identifying and bringing to the attention of any design directions that may be in conflict or otherwise improved. All such conflict resolutions shall be in writing from A/E or owner.
4. Note that while many portions of this global specification are addressed to "The contractor", these requirements apply equally to anyone doing the network cabling and infrastructure work within, whether those persons are outside contractors or persons directly employed by the owner.
5. Contractor shall be solely responsible for all parts, labor, testing, documentation and all other associated processes and physical apparatus necessary to turn-over the completed system fully warranted and operational for acceptance by A/E.
6. This specification includes structured cabling design considerations, product specifications and installation guidelines for low-voltage network systems and associated infrastructure including, but not limited to:

    a. Cabling Sub-system 1 – Horizontal

        1) Category 6 cable
        2) Work area (equipment outlet) appliances and configuration
        3) Horizontal Pathways
        4) Copper Patching

b. Backbone Cabling

1) Interbuilding backbone – Copper and Fiber
2) Patching / Cross-connect – Copper and Fiber

c. Telecommunications Spaces

1) Telecommunications Room Requirements
2) Racks and Cabinets
3) Overhead Pathways

d. Communications Grounding Systems
e. Communications Labeling and Administration

C. Scheduling:

1. Contract Documents and the overall construction schedule must be carefully reviewed to determine all required interfacing and timing of the work. All such documents shall be available through the General Contractor or Construction Manager.
2. Project schedule shall include, but are not limited to, the following task sequence:

a. New Server Room, IDF Construction and buildout.
b. Conduit infrastructure; including vaults/pull box install and conduit duct banks.
c. Individual Building Pathway Installation.
d. Building Category 6 Cable installations; includes install, termination, labeling, testing, as-built and warranty documentation.
e. Wireless Access Points.
f. New backbone fiber optic cabling installations; includes install, termination, labeling, testing, as built and warranty documentation.
g. Service provider cabling and equipment installation.
h. Service provider completion and commissioning.

D. Coordination:

1. Install and coordinate the telecommunications cabling work in cooperation with other trades installing interrelated work. Before installation, make proper provisions to avoid interference in a manner accepted by the architect. Any repairs or changes made necessary in the contract work, caused by the sub-contractor's neglect, shall be made by the sub-contractor at their own expense.

1.7 CONTRACTOR QUALIFICATIONS

A. General:

1. Contractor shall have at least 5 years of experience installing and testing structured cabling systems.

2. Contractor shall employ at least one BICSI Registered Communication Distribution Designer (RCDD), and the RCDD shall sign-off on all designs offered, including stamping the design with their current BICSI/RCDD stamp.
3. Contractor shall have the responsibility to obtain any of the necessary permits, licenses, and inspections required for the performance of data, voice, and fiber optic cable installations.
4. Contactor shall be a current manufacturer Certified Installer certificate. A copy of corporate certificate shall be included with quote.
5. Contractor shall have service facilities within 50 miles of project location.
6. At least 75 percent of the technicians on the job shall have a current manufacturer Certified Copper Technicians certificate to install manufacturer Copper Distribution Systems.
7. At least 75 percent of the technicians installing any Fiber Distribution Systems shall have a current manufacturer Certified Fiber Technicians certificate to install Fiber Distribution Systems.
8. The Telecommunications contractor shall provide a project manager to serve as the single point of contact to manage the installation, speak for the contractor and provide the following functions:

    a. Initiate and coordinate tasks with the Construction Manager and others as specified by the project schedule.
    b. Provide day to day direction and on-site supervision of Contractor personnel.
    c. Ensure conformance with all contract and warranty provisions.
    d. Participate in weekly site project meetings.
    e. This individual shall remain project manager for the duration of the project. The contractor may change Project Manager only with the written approval of A/E.

B. References:

1. Communications Contractor shall provide with bid a list of three reference accounts where similar Data, Voice, Fiber Optic Cable, and related migration/cutover equipment installation work was performed within the last year or twelve-month period.

C. Insurance Requirements:

1. Contractor shall be insured and shall provide with bid a Certificate of Indemnification, Certificate of Insurance, and meet all required insurance and licensing policies as specified by A/E Risk Management Division and any Federal, State, and local organization pertaining to data, voice and fiber optic cable installation.
2. Contractor’s vehicles brought onto project properties, shall comply with all requirements of all Federal, State, and local agencies. Vehicles shall meet current DOT, state and local, safety inspections where required.

D. Termination of Services:

1. Owner or A/E reserves the right to terminate the Communication Contractor's services if at any time the A/E determines the Communication Contractor is not fulfilling their responsibilities as defined within this document.
2. Contractor's appearance and work ethics shall be of a professional manner, dress shall be commensurate with work being performed.
3. Dress displaying lewd or controversial innuendos shall strictly be prohibited.
4. Conduct on project property shall be professional in nature.
5. Any person in the Contractor's employ working on a project considered by to be incompetent or disorderly, or for any other reason unsatisfactory or undesirable, such person shall be removed from work on the project.
6. The Communications Contractor shall be restricted from the premises and compensated for the percentage of work completed satisfactorily.

E. Other Contractor Responsibilities

1. Contractor is responsible for the removal and disposal of all installation and construction debris created in the process of the job. All work areas shall be cleaned at the conclusion of the workday and no tools or materials shall be left in a manner as to pose a safety hazard.
2. Contractor shall remove all abandoned cable per Article 800 of the National Electrical Code and per TIA and BICSI standards, recycling these materials where possible. This is mandatory; Contractors shall consider this when placing bids.
3. Contractor shall abide by the regulations set by A/E or Owner Security Department pertaining to access to and conduct while on project property and shall obey speed limits and parking regulations.

1.8 SYSTEM PERFORMANCE WARRANTY

A. General

1. Contractor shall provide a manufacturer System Warranty on all copper and fiber permanent cabling links.
2. This is a system performance warranty guaranteeing for a minimum of 20 years from acceptance that the installed system shall support all data link protocols for which that copper Category or fiber OS designation is engineered to support according to IEEE and TIA standards.
3. The manufacturer System Warranty may be invoked only if the cabling channel links are comprised of manufacturer connectivity and approved by the manufacturer. Patch cords shall be same manufacturer of cable.
4. Upon acceptance of Warranty, manufacturer will mail a notification letter to the installer and a notification letter and warranty certificate to A/E.

B. Contractor Warranty Obligations

1. Installation firm shall be a current manufacturer Certified Installer in good standing and shall include a copy of the company certification with the bid.
2. Contractor shall name a supervisor to serve on site as a liaison responsible to inspect and assure all terminations are compliant to factory methods taught in

manufacturer Technician Certification Training and according to all Standards cited in the Regulatory References section of this document.

3. Contractor liaison shall have a current, up-to-date manufacturer Certified Technician certificate in both copper and fiber. Copies of the copper and fiber certificates of the manufacturer liaison shall be submitted with the bid.
4. Contractor agrees all components comprising active links shall be of the same copper Category or fiber OS/OM designation as the system being installed. Contractor shall under no circumstances mix different Categories or OS/OM classes of cable or termination devices (connectors) within the same link or system.
5. Contractor shall install all racking and support structures according to cited TIA Standards in such fashion as to maintain both Standards and Manufacturer recommendations for uniform support and protection, segregation of different cable types, maintenance of maximum pulling tensions, minimum bend radius, approved termination methods as well as adhering to industry accepted practices of good workmanship.
6. Contractor is responsible for understanding and submitting to manufacturer all documents required prior to project start to apply for this warranty. These include but are not limited to the project information form and SCS warranty agreement.
7. Contractor is responsible for understanding and submitting to manufacturer all documents required at project end. These include completed warranty forms, passing test reports and drawings of floor plans showing locations of links tested.
8. Test results shall be delivered in the tester native format (not Excel) and represent the full test report. Summaries shall not be accepted. Contact manufacturer for a current list of approved testers, test leads and latest operating systems.
9. The Communications Contractor shall correct any problems and malfunctions that are warranty-related issues without additional charge for the entire warranty period. The warranty period shall commence following the acceptance of the project by A/E and written confirmation of Warranty from manufacturer.

1.9 SAFETY

A. General

1. All cabling work being performed on project property or under contract to shall comply with Rules for safe operations, any state or local safety regulations and meet the requirements of OSHA Safety and Health Standards. The contractor Project Manager shall maintain a copy of Rules for Safe Operations for reference. It is the responsibility of the Communications Contractor to immediately correct any unsafe working practices on the part of contractor personnel. Unsafe working environments or conditions created by contractor personnel shall be reported immediately to the Construction Manager.
2. Any liability for correction of conditions created by the contractor’s personnel rests with the contractor.
3. The Communications Contractor shall be solely and completely responsible for conditions of the job site (as pertaining to the materials and equipment specified), including safety of persons and property during performance of work.
4. No act, service, drawing review or construction observance by any employee, representative or engineer may be construed as a review or approval of the

adequacy of the contractor(s) safety measures, in, on, or near the construction site.

1.10 WORKING CONDITIONS

A. Site Access

1. All cable installations shall be pre-approved by the Construction Manager to ensure that the necessary arrangements have been made for proper access to project sites.
2. A twenty-four-hour prior notice shall be submitted to the Construction Manager for any work schedule changes.
3. Communications Contractor shall display badges or passes as mandated by project property Security Department Rules and Regulations.

B. Scheduling

1. Coordination of site surveys and the issue of project owner owned materials and equipment shall be the responsibility of the Construction Manager. Once said equipment and materials are in the contractor’s possession, it is the contractors to safeguard the material and equipment from damage or theft.
2. Information required by the Contractor to price and complete a defined scope of work shall be furnished to the Communications Contractor by the A/E Project Manager in a Scope of Work document and at the time of the site survey (if necessary) and shall be maintained by the Communications Contractor until the completion of the job.
3. It is the contractor’s responsibility to begin work promptly according to the Start Dates and to complete work by the Proposed Completion Date listed on the Cable Run Request Form.
4. The Contractor shall notify the Construction Manager in writing of any delays; at that time, they shall come up with a mutually agreeable project schedule.
5. The Communications Contractor shall coordinate with the Construction Manager working hours and job site access issues.
6. The Communications Contractor shall coordinate with the Construction Manager to minimize outages to the existing systems.
7. Any service interruption required by the Communications Contractor shall be requested in writing and scheduled with the Construction Manager.
8. The Communications Contractor shall not proceed with the requested service interruption until written approval is granted by the Construction Manager.
9. All problems, and questions relating to a particular job, shall be referred to the Construction Manager and no changes shall be made without his/her written approval.

C. Harmony Clause

1. Contractor shall coordinate and work in harmony with other trades on the project as well as with A/E personnel.

1.11 COORDINATION

A. Coordinate layout and installation of voice and data communication cabling with other owner contractors and equipment suppliers.

1. Meet jointly with other contractors, equipment suppliers, and owner representatives to exchange information and agree on details of equipment arrangements and installation interfaces.
2. Record agreements reached in meetings and distribute to other participants.
3. Adjust arrangements and locations of distribution frames, cross-connect and patch panels in equipment rooms and telecommunications rooms to accommodate and optimize arrangement and space requirements of voice and LAN equipment.
4. When indicated on drawings, contractor shall reuse existing copper and fiber optic backbone cables.
5. Provide weekly progress reports and crew schedules to project representatives by 5:00 PM, Thursday (or agreed upon day) of each project work week.

1.12 ACTION SUBMITTALS

A. Product Data: For each product indicated.

1. Submit all product data in accordance with general requirements of the construction documents.
2. Submit product cut sheets and a detailed list of components a minimum of two (2) weeks prior to commencement of Division-27 work for A/E review and action.
3. Contractor shall provide product data and installation instructions for all fire stopping materials
4. Alternate and “Or Equal” designated products shall be submitted for review and judgment to the A/E prior to installation. The contractor proposed alternate products or components shall be verified by two (2) independent sources within the past 6 months. This request shall include the two (2) independent sources, the original Product’s specification sheet, the proposed substitute product cut sheet, and a written request to review the substitute product.
5. Any request of an alternate or substitution shall be submitted to the A/E for action no later than fourteen (14) calendar days after release of the original telecommunications bid documents.

1.13 Information & Communication Technology (ICT) components

A. The Contract Documents generally outline industry standard components to be installed as part of the project ICT installation requirements. Such identification is intended to be general in nature rather than exhaustive. All stated quantities are subject to validation by ICT contractor. ICT Contractor is reminded that differences between estimated quantities and those reasonably derived based from the Contract Documents (as well as through bid conferences, job walks, addendums, and other distribution of information) shall be the responsibility of the ICT contractor. There shall be no additional cost incurred by NVC – New Residential Buildings project for not complying with the specifications and requirements of the Contract Documents.

B. Any variance from those components identified on the drawings and/or below shall be submitted to NVC – New Residential Buildings project representatives for approval prior to ordering and installation; the risk for all costs incurred by the ICT Contractor for materials ordered prior to such written approval shall be borne entirely by the ICT contractor. Nonetheless, it is imperative that the ICT Contractor determine the availability of necessary materials and propose equivalent substitutes as necessary to meet all installation milestones. Delays in ICT installations due to lack of product availability are unacceptable. As catalog numbers change frequently, the ICT Contractor shall verify all part numbers prior to ordering materials. Clarifications shall be issued in response to written Requests for Information (RFI).

C. Fire Stop and firestopping requirements for the project include:

1. All conduits leaving the entrance room for other portions of the building shall be fire-stopped after the installation of cable.
2. The Contractor shall fire stop around the tray and, after installation of the cables, within the tray using removable pillow-style products following manufacturers' guidelines. Sound deadening material shall be provided and installed after installation of cable.
3. Strict adherence to the CEC/NEC NFPA 101 is required for any raceway penetrations of fire-rated walls. See section 07840 for UL system numbers and to construction drawings for details.
4. All riser conduits shall be sealed using a UL classified fire stop. The Contractor shall provide a copy of the fire seal manufacturer's installation instructions and rating information prior to inspection of the installed materials.
5. Integrally Fire Stopped Sleeves

    a. Integrally Fire Stopped Sleeves shall be used for Telecommunications cabling in locations where the cabling pathway penetrates a fire barrier. The IFSS shall replace the use of conduit used in conjunction with other fire stopping methods.
    b. All manufacture instructions and requirements shall be followed for the installation of the IFSS.
    c. Documentation shall include picture of completed assemble with time/date stamp.

D. All new fiber optic cabling shall be indoor/outdoor-Plenum rated. Unrated cable (such as filled ASP) shall not be installed within the structure except when placed within IMT, PVC or RGS conduit.

E. Throughout this specification, Corning, Superior Essex, Chatsworth Products, Inc. and other manufacturers are cited. These citations are for the purpose of establishing quality, performance and warranty certification criteria.

1.14 DELIVERY AND STORAGE

A. ICT Contractor shall provide a materials schedule prior to the start date of cable installation. Material schedule shall specify all material quantities and their delivery date for this project.

B. ICT Contractor shall provide protection from weather, moisture, dirt, dust and other contaminants for telecommunications cabling and pathway equipment placed in storage.

1.15 INFORMATIONAL SUBMITTALS

A. Coordination Drawings:

1. Submit all shop drawings in accordance with the general requirements of the construction documents.
2. Submit shop drawings a minimum of two (2) weeks prior to commencement of Division-27 work for A/E review and action.
3. Shop drawings shall include evidence of grounding and bonding components are coordinated with field conditions and the work of other trades.
4. This submittal may have a written component and a visual, drawn component for review and action by the A/E prior to installation.

B. Certificates:

1. Submit management and installation team reference documentation verifying:

    a. The project manager is a RCDD in good standing with BICSI and is qualified to manage the scope of work described in the contract documents and has five (5) years of experience managing similar projects in size and scope. The documentation shall include the RCDD registration number.
    b. The field supervisor is a BICSI trained technician that is qualified to perform and oversee the work described in the contract documents.

C. Qualification Statements:

1. The contractor shall submit documentation that within the past 12 months, a minimum of 75% of all installation personnel have been trained or certified by the manufacturer of the products they are installing.

1.16 CLOSEOUT SUBMITTALS

A. As-Built Drawings:

1. Submit all as-built drawings in accordance with the general requirements of the construction documents.

    a. The drawing notes shall define field conditions experienced not defined in sheet notes.
    b. The drawings shall identify all fire stop locations and digital picture shall accompany as-built package.

2. Submit as-built drawings a minimum of two (2) weeks after completion of all Division- 27 work for A/E and Owner reference.
3. Communication contractor to print, frame and mount approved as-built drawings in MPOE. Coordinate location with A/E.

1.17 QUALITY ASSURANCE

A. Qualifications – Manufacturer

1. Component manufactures shall be ISO 9001:2000 and offer products that are RoHS compliant.
2. Installers shall have manufacturer certificate of completion for the fire stop solution being proposed.

B. Qualifications – Installer:

1. At a minimum, seventy-five percent (75%) of the onsite contractor provided field technicians shall be factory certified within 12 months by the manufacturer of the selected telecommunications system components being installed. Proof of certification shall be available on site for review at all times for each field technician.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Check actual site conditions prior to start of any work. Ensure all preceding trade work associated with the telecommunications system is accurate and complete before proceeding with installation or use of products specified in this section.

B. Methodology for fire stop requirements that contractor shall comply with, include:

1. In any area in which a fire rated wall, partition, floor, or ceiling is penetrated, the Contractor shall be responsible for creating the pathway and sealing around all cables and sleeves with a UL classified fire seal sufficient to return the structure to its original rating. Creation of such openings as are necessary for cable passage between locations as shown on the drawings shall be the responsibility of the Contractor. Any opening in a rated structure created by the Contractor that is larger than one inch in diameter shall be equipped with a metal sleeve secured and fire-stopped in place.
2. Comply with requirements in Section 078413 "Penetration Firestopping."(Check Architect specifications for fire stopping)
3. Comply with TIA-569-B, Annex A, "Firestopping."
4. Comply with BICSI TDMM, "Firestopping Systems" Article.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

a. Seal annular space between sleeve and pathway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall, so no voids remain. Tool exposed surfaces smooth; protect material while curing.

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and pathway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
5. Install sleeves for floor penetrations. Extend sleeves installed in floors 4 inches above finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

3.2 RE-INSTALLATION

A. No additional burden to the owner regarding costs, network down-time, and end user interruption shall result from the re-installation of specified components. Scheduling for re- installation work shall be coordinated, in writing, with the owner prior to beginning any re- installation work

3.3 CLOSEOUT ACTIVITIES

A. Contractor shall provide documentation of all telecommunications system components under this section utilized throughout the site for review and reference by the Owner and A/E team.

B. Contractor to submit all as-built drawings and any test documentation required prior to acceptance by the Owner

END OF SECTION

SECTION 270526 - GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Specifications for grounding and bonding components utilized to provide proper grounding and bonding for telecommunications cabinets, racks, cable tray, ladder tray, cable and equipment.
2. Grounding and bonding components with design criteria.

1.2 RELATED DOCUMENTS

A. Section 270500 and all divisions of the specification and general provisions of the Construction Documents.

B. Architectural, mechanical, electrical, and all technology drawings.

C. Refer to Structural Seismic Requirement design documents Specifications, if available, for Non-Structural Components for all structural bracing and support of telecommunications equipment.

1.3 CLOSEOUT SUBMITTALS

A. As-Built Drawings

1. Submit all as-built drawings in accordance with the general requirements of the construction documents.
2. Submit as-built drawings a minimum of two (2) weeks after completion of all Division- 27 work for A/E and Owner reference:

1.4 QUALITY ASSURANCE

A. Qualifications – Manufacturer

1. Component manufactures shall be ISO 9001:2000 and offer products that are RoHS compliant.

B. Qualifications – Installer:

1. At a minimum, seventy-five percent (75%) of the onsite sub-contractor provided field technicians shall be factory certified within 12 months by the manufacturer of

the selected telecommunications system components being installed. Proof of certification shall be available on site for review at all times for each field technician.

PART 2 - PRODUCTS

2.1 GROUNDING AND BONDING

A. Basis-of-Design Product: Subject to compliance with requirements, provide manufacturer or comparable product by one of the following:

1. CPI
2. B-Line
3. Circa
4. Or Equal

B. Product Options:

1. The indicated manufacturers shall be the basis of the design and each component selected shall address the infrastructure requirement.

C. Description:

1. Sub-contractor is responsible for bonding to ground all newly placed equipment and installed racks or cabinets per the TIA 607-B Standard.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Check actual site conditions prior to start of any work. Ensure all preceding trade work associated with the telecommunications system is accurate and complete before proceeding with installation or use of products specified in this section.

3.2 INSTALLATION

A. Process:

1. All newly installed racks and cabinets shall have installed a vertical busbar mounted along one equipment rail to serve as a clean, low-resistance bonding place for any equipment not equipped with a designated grounding pad.
2. Smaller equipment without an integrated grounding pad shall be bonded to the vertical busbar using a thread-forming grounding screw that is anodized green and includes serrations under the head to cut through oxidation or paint on the equipment flange.

3. Larger equipment (chassis switches) with a designated grounding terminal shall be bonded to the vertical busbar with and EBC (equipment bonding conductor) kit built to that purpose.
4. All grounding wire shall be a minimum #6 AWG stranded annealed ground wire, PVC sheathed with nylon. Meets UL83 for THHN or THWN and UL1063.
5. All OSP cabling terminated with-in new campus MDF shall be terminated to a Building Entrance Terminal with gas fuses.
6. Sub-contractor shall take care to clean (wire brush, scotchbrite pads) any metallic surface to be bonded down to bare metal and apply a film of anti-oxidation paste to the surfaces prior to effecting the bond.
7. All bonding lugs on racks and busbars shall be of two-hole irreversible compression type. Mechanical lugs and single-hole lugs will not be accepted and shall be removed and replaced at Sub-contractor's expense.
8. Every rack or cabinet shall have an individual bonding conductor into the grounding network. Serially connecting (daisy-chaining) of racks is expressly forbidden and will not be accepted.
9. Rack Bonding Conductors (RBC) may tap into an overhead or underfloor aisle ground or may run to the wall-mounted grounding busbar in smaller Telecommunications rooms containing 5 racks or less.
10. Armored cables shall be properly bonded to the earthing system with a kit built to that purpose.
11. All metallic conduit stub-ups shall be grounded, and where multiple stub-ups are made within an equipment enclosure, they shall be equipped with grounding bushings and bonded together and to the enclosure and the enclosure ground bus.
12. Each metallic raceway, pipe, duct and other metal object entering the buildings shall be bonded together. The Sub-contractor shall use #6 AWG green insulated copper conductors.
13. Each identified telecommunications space within a building shall have a common signal reference ground. The signal reference ground shall conform to the following:

    a. Within the building, all communication spaces shall be separately bonded to each other and connected to the primary building ground in accordance with the provisions of EIA/TIA 607. The communication ground shall not ground any other equipment or be connected to any potential high voltage source. All racks, frames, drain wires, and all installed communication equipment shall only be grounded to this common reference ground with a minimum size #6 AWG green insulated copper wire.
    b. The Sub-contractor shall provide, as a minimum, a continuous #3/0 AWG copper electrical conductor connected to a 1/4" x 4" x 12" telecommunications grounding bus bar (TGB) 6" AFF on the plywood backboard of each IDF (or telecommunication space) to terminate chassis and other equipment grounds.
    c. The ground wires from each individual IDF shall be routed directly to the Building Distribution Frame (BDF), terminated and bonded together via a telecommunications main grounding bus bar (TMGB) of minimum 1/4" x 4" x 20" dimensions. This point of single reference for all closets in a building shall in turn be grounded with a minimum #3/0 AWG ground conductor to the main building ground. If a main building ground is unavailable, the ground wire from the BDF shall be grounded to the nearest electrical panel ground

bus bar. The building ground for signal reference shall be the building service entrance ground.

14. Ground Bus Bar Identification.

    a. The master ground bar shall be labeled as such.
    b. Each subsidiary ground bar shall be labeled as such and have a unique identifier.
    c. All ground bars shall have a warning label that states, “If this connector or cable is loose or shall be removed, please call the Telecommunications Manager.” All ground bars will be connected to the building ground with continuous “3/0” AWG wire.
    d. Each ground cable shall be labeled with a unique identifier.

3.3 RE-INSTALLATION

A. No additional burden to the owner regarding costs, network down-time, and end user interruption shall result from the re-installation of specified components. Scheduling for re- installation work shall be coordinated, in writing, with the owner prior to beginning any re- installation work

3.4 CLOSEOUT ACTIVITIES

A. Sub-contractor shall provide documentation of all telecommunications system components under this section utilized throughout the site for review and reference by the Owner and A/E team.

B. Sub-contractor to submit all as-built drawings and any test documentation required prior to acceptance by the Owner.

END OF SECTION

SECTION 270529 - HANGER AND SUPPORTS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Provides specifications for non-continuous cable support components utilized to provide pathways support to telecommunications cables traveling outside cable trays, conduits, or other continuous cable supports.
2. Non-continuous cable supports.

1.2 RELATED DOCUMENTS

A. Section 27 05 00 and all divisions of the specification and general provisions of the Construction Documents.

B. Architectural, mechanical, electrical, and all technology drawings.

C. Refer to Structural Seismic Requirement design documents Specifications, if available, for Non-Structural Components for all structural bracing and support of telecommunications equipment.

1. Anywhere cabling Standards conflict with electrical or safety Codes, Sub-contractor shall defer to NEC and any applicable local codes or ordinances, or default to the most stringent requirements listed by either.
2. Knowledge and execution of applicable codes is the sole responsibility of the Sub-contractor.
3. Any code violations committed at the time of installation shall be remedied at the Sub-contractor’s expense.

1.3 QUALITY ASSURANCE

A. Qualifications – Manufacturer

1. Component manufactures shall be ISO 9001:2000 and offer products that are RoHS compliant.

B. Qualifications – Installer:

1. At a minimum, seventy-five percent (75%) of the onsite sub-contractor provided field technicians shall be factory certified within 12 months by the manufacturer of the selected telecommunications system components being installed. Proof of certification shall be available on site for review at all times for each field technician.

1.4 WARRANTY

A. Warranty:

1. Sub-contractor shall provide a 25 year System Warranty on all copper and fiber permanent cabling links.
2. This is a system performance warranty guaranteeing for 25 years from acceptance that the installed system shall support all data link protocols for which that copper Category or fiber OM/OS designation is engineered to support according to IEEE and TIA standards.
3. The System Warranty may be invoked only if the cabling channel links are comprised of approved cable infrastructure connectivity and approved cable. Patch cords must be manufactured by same approved cable and/or connectivity system.
4. Upon acceptance of Warranty, manufacturer will mail a notification letter to the installer and a notification letter and warranty certificate to A/E.

PART 2 - PRODUCTS

2.1 NON-CONTINUOUS CABLE SUPPORTS

A. Basis-of-Design Product: Subject to compliance with requirements:

1. Erico – Caddy CableCat Support System
2. Copper/BLine – Cable Hook System
3. CEAS Attachments – Stiffy Series
4. Panduit – Jmod Cable Support System
5. Or Equal

B. Product Options:

1. The indicated manufacturers shall be the basis of the design and each component selected shall address the particular infrastructure requirement.

a. Stiffy Series 200 with comfort cradle Low Voltage supports
b. Four inch (0’4”) Cat214z34, two inch (0’2”) J-Hook Supports Cat324z34

C. Description:

1. Non-continuous cable supports shall be available in multiple sizes, styles and materials. Rigid supports shall be equipped with flared edges and pre-configured bend radius controls.
2. Provide drop wire supports and threaded rod assemblies in areas where structural mounting surfaces are non-functional or inaccessible.
3. Support assemblies shall provide a bearing surface of sufficient width to comply with required bend radii of high-performance UTP and optical fiber cables.
4. Non-continuous cable supports sized 1 5/16” and larger shall have a cable retainer strap to provide containment of cables within the hanger. The cable retainer strap shall be reusable.

5. Select approved non-continuous cable supports suitable for specific installation environments and/or air handling (plenum) spaces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Check actual site conditions prior to start of any work. Ensure all preceding trade work associated with the telecommunications system is accurate and complete before proceeding with installation or use of products specified in this section.

3.2 INSTALLATION

A. Process:

1. Follow manufacturer's instructions and recommended industry standards and guidelines.
2. The installed non-continuous support system must be an independent support structure for the voice/data communication system.
3. Draping cables over other structures in the ceiling is unacceptable. Water pipes, ceiling grid, sprinkler system, electrical supports, air ducts or any other in-ceiling structure may not be used for cable support.
4. Sub-contractor installed supports shall be used to supplement the main cable support system when any cabling leaves the main support system or is unsupported for more than three and one half feet (3'-5'-0") feet.
5. Non-continuous supports shall be installed with rod stock or threaded rod secured to the slab above to support the telecommunications cable infrastructure parallel to the slab throughout the cable plant, unless site conditions dictate a non-parallel installation.
6. Cable must be routed to follow existing corridors and parallel or 90 degree angles from all walls and the cable tray whenever possible.
7. Communication EMT conduit sleeves shall receive conduit waterfall to control bend radius of the communication cable to a minimum of a 4" radius.
8. All pathways shall avoid electromagnetic interference (EMI). Cable that is distributed in partially-enclosed metallic pathways shall be routed with the following minimum clearances:

    a. Four (4) feet from motors or transformers.
    b. One (1) foot from conduit and cables used for electrical power and distribution.
    c. Five (5) inches from fluorescent lighting.

3.3 RE-INSTALLATION

A. No additional burden to the owner regarding costs, network down-time, and end user interruption shall result from the re-installation of specified components. Scheduling for re- installation work shall be coordinated, in writing, with the owner prior to beginning

any re- installation work

3.4 CLOSEOUT ACTIVITIES

A. Sub-contractor shall provide documentation of all telecommunications system components under this section utilized throughout the site for review and reference by the Owner and A/E team.

B. Sub-contractor to submit all as-built drawings and any test documentation required prior to acceptance by the Owner.

END OF SECTION

SECTION 270533 - CONDUITS AND BOXES FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Provides specifications for conduit pathways, back boxes and pull box enclosures utilized for the distribution and housing of telecommunications cabling and components:
2. Telecom EMT conduit and boxes

1.2 RELATED DOCUMENTS

A. All divisions of the specification and general provisions of the Construction Documents.

B. Architectural, mechanical, electrical, and all technology drawings.

C. Refer to Structural Seismic Requirement design documents Specifications, if available, for Non-Structural Components for all structural bracing and support of telecommunications equipment.

PART 2 - PRODUCTS

2.1 CONDUIT AND BACKBOXES

A. EMT conduit

1. Wheatland Tube
2. Appleton
3. Crouse-Hinds
4. Or equal.

B. PVC conduit

1. JM Eagle
2. Electro Flex
3. Or equal

C. Pull boxes

1. Hoffman Engineering Co,
2. Or equal.

D. Back Boxes

1. Thomas & Betts
2. Hubbell Raco

2.2 TELECOMMUNICATIONS CONDUIT AND BACKBOXES

A. Electrical Metallic Galvanized Tubing and Fittings with natural finish for all conduits not exposed: ANSI C80.3 with compression-type fittings.

B. Communication EMT conduit sleeves shall receive conduit waterfall to control bend radius of the communication cable to a minimum of a 4” radius.

C. Indoor Pull boxes: Galvanized steel, screw cover pull box. Grey polyester powder coat finish inside and out. NEMA Type 1. Pull boxes to be sized per NEC code to accommodate the number of EMT conduits as shown on Telecom drawings with adequate clearances, access and cable management space.

D. Supporting devices: U channel trapeze assemblies, 1/2” Threaded rods, clamps, conduit straps, C-clamps and retainers.

E. Fasteners: 3/8” Carbon steel expansion anchors with 2 ½” embed into concrete slab for pull box U-channel support attachment to concrete slab. The anchors must be tested and approved under dual load conditions: Hilti Kwikbolt 3, Ramset/Redhead Trubolt. Or equal.

F. U-channel systems: 16-gauge steel channels. Provide fittings and accessories that match with the U-channel of the same manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Check actual site conditions prior to start of any work. Ensure all preceding trade work associated with the telecommunications system is accurate and complete before proceeding with installation or use of products specified in this section.

3.2 INSTALLATION

A. Pull boxes:

1. Install Pull boxes in easily accessible locations.
2. Install Horizontal cabling boxes immediately above suspended ceilings.
3. A pull box should not be used in lieu of a bend.
4. Conduits that enter the pull box from opposite ends with each other should be aligned.

Conduit Trade Size	Pull box Width (in.)	Pull box Length (in.)	Pull box Depth (in.)	Pull box Width for Additional Conduit
1	4	16	3	2
1	6	20	3	3
1	8	27	4	4
2	8	36	4	5
2	10	42	5	6
3	12	48	5	6
3	12	54	6	6
4	15	60	8	8

5. For direct access to a box located above inaccessible ceilings provide a suitable, marked, hinged access panel (or equivalent) in the ceiling. This access panel can also serve as the cover for the box.
6. Install conduit radius waterfall for all EMT conduit sleeves entering telecommunication room or through main pathway fire rated walls, quantity as shown on drawings.
7. Pull box sizing table:

B. Back Boxes

1. Provide 4-11/16” H X 4-11/16” W X 2-1/8” D outlet back boxes at all telecom outlet locations shown on drawings. Provide (1) 1-1/4” conduit from back box to telecom room or pull box except as otherwise noted. All connectors and couplings shall be zinc-plated steel set screw type. Die cast zinc fittings are not to be used. Provide bushing on ends of all conduits. Provide pull string in all conduits.
2. Provide single gang plaster ring on all communications outlet back boxes, unless indicated otherwise.
3. Provide bonding to cable tray pathways.

C. Conduit support and bracing:

1. Coordinate layout and installation of conduits and pull boxes with other trade conditions to ensure adequate clearances, access and cable management.
2. Install and provide support for EMT conduits and pull boxes in accordance with the latest edition of the NEC code, as well as all state and local codes and requirements. Coordinate installation and location with existing conditions. Notify and get the Owners Representative approval before installing conduits and pull boxes where the location needs to deviate from the contract documents.
3. Install conduits above ceilings at height to provide access to pull. Install conduits and pull boxes level and square and at proper elevations. Ensure adequate clearances, access and cable management.
4. Use fittings and support devices compatible with conduits and pull boxes and suitable for use and location. Strength of each support shall be adequate to carry present and future load multiplied by a safety factor of at least four.
5. Install individual and multiple trapeze hangers and riser clamps as necessary to support the conduits. Provide U-bolts, clamp attachments and other necessary hardware for hanger assemblies and for securing hanger rods and conduits. Space supports for conduits on maximum 10-foot centers.

6. Provide and install expansion or deflection fittings for conduits runs at all instances at seismic or expansion joints to allow for movement in any direction.

D. Conduit routing, bends and radius guidelines:

1. If the conduit has an internal diameter of 2 inches or less the bend radius must be at least 6 times the internal conduit diameter.
2. If the conduit has an internal diameter of more than 2 inches the bend radius must be at least 10 times the internal conduit diameter.
3. Conduit bends should be smooth, even, and free of kinks or other discontinuities that may have detrimental effects on pulling tension or cable integrity during or after installation.
4. If a conduit run requires more than two 90-degree bends, then provide a pull box between sections with two bends or less.
5. If a conduit run requires a reverse bend (between 100 degrees and 180 degrees) then insert a pull point or pull box at each bend having an angle from 100 degrees to 180 degrees.
6. Consider an offset as equivalent to a 90-degree bend.
7. A pull box shall not be used as a 90-degree bend.
8. Communication EMT conduit sleeves shall receive conduit waterfall to control bend radius of the communication cable to a minimum of a 4” radius.
9. Achieve the best direct route with no bend greater than 90 degrees or an aggregate of bends in excess of 180 degrees between pull points or pull boxes.
10. Contain no continuous sections longer than 100 ft.
11. For runs that total more than 100 ft. in length, pull points or pull boxes should be inserted so that no segment between points/boxes exceeds the 100 ft. limit.
12. Withstand the environment to which they will be exposed.
13. Conduits should not be routed through areas in which flammable material may be stored or over or adjacent to boilers, incinerators, hot-water lines and steam lines.
14. Keep conduits at least 6’ away from parallel runs of steam, hot water pipes or mechanical ductwork.

E. Conduit Terminations

1. Join conduits with fittings designed and approved for the purpose. Make the joints tight without protruding lips that can snag cable pulling inside the conduits.
2. Where conduits are terminated with locknuts and bushings align the conduit to enter squarely and install the locknuts with dished part against the box. Use two locknuts, one inside and one outside the box.
3. Ream all conduit ends and fit them with an insulated bushing to eliminate sharp edges that can damage cables during installation or service.
4. Conduits that enter a telecom room should terminate near the corners to allow for proper cable racking.
5. Terminate conduits that protrude through the structural floor 3 inches above the surface.
6. Maintain the integrity of all fire stop barriers for all floor or wall penetrations.

F. Provide grounding and bonding for conduits and pull boxes as indicated by NEC code and instructed by manufacturer.

G. Conduits shall be clearly labeled at both ends designating the opposite locations(s) served. The numbering scheme shall be room number plus a suffix to guarantee uniqueness, e.g., 143-1. Labeling must be machine generated.

H. Conduit Protection:

1. Remove burrs, dirt and construction debris from conduits and pull boxes.
2. Conduits should be left capped for protection.
3. Provide final protection and maintain conditions in a manner acceptable to the Owners Representative to ensure that coatings, finishes and pull boxes are without damage or deterioration at completion. Repair damage to galvanized finishes with zinc-rich paint recommended by the manufacturer.

3.3 ACCEPTANCE

A. All specified conduits and pull boxes indicated on the drawings and specifications shall be complete.

B. Specified shop drawings and product submittals shall have been submitted for review and all review comments and deficiencies shall have been resolved. Final shop drawings and product submittals shall have been submitted, reviewed and found to meet the requirements of the specifications.

C. Issues and deficiencies identified in field reports and punch lists shall have been resolved. Final as-built drawings shall have been submitted, reviewed and found to meet the requirements of the specifications.

D. Sub-contractor shall provide written notice of final completion of the telecom infrastructure. Upon receipt, the Owner’s Representative will review/observe the completed installation. Once the Owner’s Representative is satisfied that all work is in accordance with the Contract Documents, the Sub-contractor will be notified in writing.

3.4 RE-INSTALLATION

A. No additional burden to the owner regarding costs, network down-time, and end user interruption shall result from the re-installation of specified components. Scheduling for re- installation work shall be coordinated, in writing, with the owner prior to beginning any re- installation work

B. CLOSEOUT ACTIVITIES

C. Sub-contractor shall provide documentation of all telecommunications system components under this section utilized throughout the site for review and reference by the Owner and A/E team.

D. Sub-contractor to submit all as-built drawings and any test documentation required prior to acceptance by the Owner.

END OF SECTION

SECTION 270536 - CABLE TRAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Section 270500 and all divisions of the specification and general provisions of the Construction Documents.

B. Architectural, mechanical, electrical, and all technology drawings.

C. Refer to Structural Seismic Requirement design documents Specifications, if available, for Non-Structural Components for all structural bracing and support of telecommunications equipment.

1.2 SUMMARY

A. Section Includes:

1. Ladder cable trays.
2. Wire-basket cable trays.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of cable tray.

1. Include data indicating dimensions and finishes for each type of cable tray indicated.

B. Shop Drawings: For each type of cable tray.

1. Show fabrication and installation details of cable trays, including plans, elevations, and sections of components and attachments to other construction elements. Designate components and accessories, including clamps, brackets, hanger rods, splice-plate connectors, expansion-joint assemblies, straight lengths, and fittings. Drawings to match same scale as approved design or construction drawing set.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Floor plans and sections, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Include scaled cable tray layout and relationships between components and adjacent structural, electrical, and mechanical elements.

2. Vertical and horizontal offsets and transitions.
3. Clearances for access above and to side of cable trays.
4. Vertical elevation of cable trays above the floor or below bottom of ceiling structure.

B. Seismic Qualification Certificates: For cable trays, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Field quality-control reports.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Cable trays and supports shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the cable trays will remain in place without separation of any parts when subjected to the seismic forces specified."
2. Component Importance Factor: 1.5.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes in cable tray installed outdoors.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 GENERAL REQUIREMENTS FOR CABLE TRAYS

A. Cable Trays and Accessories: Identified as defined in 2016 CEC Article 392 and marked for intended location, application, and bonding per Article 800.100/A/1-6.

1. Source Limitations: Obtain cable trays and components from single manufacturer.

B. Sizes and Configurations: See drawings for specific requirements for types, materials, sizes, and configurations.

C. Structural Performance: See articles for individual cable tray types for specific values for the following parameters:

1. Uniform Load Distribution: Capable of supporting a uniformly distributed load on the indicated support span when supported as a simple span and tested according to NEMA VE 1.

2. Concentrated Load: A load applied at midpoint of span and centerline of tray.
3. Load and Safety Factors: Applicable to both side rails and rung capacities.

2.3 LADDER CABLE TRAYS (Ladder Racking)

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper B-Line, Inc.
2. Chatsworth Products Inc.
3. Hoffman Pentair

B. Description:

1. Configuration: Two 1-1/2'' x 3/8'' 16-gauge tubular steel side rails with transverse rungs welded to side rails.
2. Rung Spacing: 9 inches O.C.
3. Radius-Fitting Rung Spacing: 9 inches at center of tray's width.
4. Minimum Cable-Bearing Surface for Rungs: 1-inch width with radius edges.
5. No portion of the rungs shall protrude below the bottom plane of side rails.
6. Structural Performance of Each Rung: Capable of supporting a maximum cable load, with a safety factor of 1.5, plus a 200-lb concentrated load, when tested according to NEMA VE 1, Section 5.4.
7. Straight Section Lengths: 9 feet 11.5 inches except where shorter lengths are required to facilitate tray assembly.
8. Width: 12 inches unless otherwise indicated on Drawings.
9. Fitting Minimum Radius: 12 inches.
10. Splicing Assemblies: Bolted type using serrated flange locknuts.
11. Splice Plate Capacity: Splices located within support span shall not diminish rated loading capacity of cable tray.

2.4 WIRE-BASKET – CABLE TRAYS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cablofil/Legrand.
2. Cooper B-Line, Inc.
3. Snaketray.
4. Chatsworth Products Inc.

B. Description:

1. Configuration: Wires are formed into a standard 2-by-4-inch wire mesh pattern with intersecting wires welded together. Mesh sections must have at least one bottom longitudinal wire along entire length of section.
2. Materials: High-strength-steel longitudinal wires with no bends.

3. Safety Provisions: Wire ends along wire-basket sides (flanges) rounded during manufacturing to maintain integrity of cables and installer safety.
4. Sizes:

    a. Straight sections shall be furnished in standard 10 feet lengths.
    b. Wire-Basket Depth: 2-inch usable loading depth by 4 inches to 24 inches wide.
    c. Wire-Basket Depth: 4-inch usable loading depth by 4 inches to 24 inches wide.
    d. Wire-Basket Depth: 6-inch usable loading depth by 8 inches to 24 inches wide.

5. Connector Assemblies: Bolt welded to plate shaped to fit around adjoining tray wires and mating plate. Mechanically joins adjacent tray wires to splice sections together or to create horizontal fittings.
6. Connector Assembly Capacity: Splices located within support span shall not diminish rated loading capacity of cable tray.
7. Hardware and Fasteners: Steel, zinc plated according to ASTM B 633.

2.5 MATERIALS AND FINISHES

A. Steel:

1. Straight Section and Fitting Side Rails and Rungs: Steel complies with the minimum mechanical properties of ASTM A 1008/A 1008M, Grade 33, Type 2.
2. Fasteners: Steel complies with the minimum mechanical properties of ASTM A 510/A 510M, Grade 1008.
3. Finish: Mill galvanized before fabrication.

    a. Standard: Comply with ASTM A 653SS/A 653M, G90.
    b. Hardware: Chromium-zinc plated, ASTM F 1136.

4. Finish: Electrogalvanized before fabrication.

    a. Standard: Comply with ASTM B 633SS.
    b. Hardware: Galvanized, ASTM B 633SS.

5. Finish: Hot-dip galvanized after fabrication.

    a. Standard: Comply with ASTM A 123/A 123M, Class B2/ASTM A1008, Grade 33, Type 2.
    b. Hardware: Chromium-zinc plated, ASTM F 1136.

6. Finish: Powder-coat enamel paint.

    a. Powder-Coat Enamel: Cable tray manufacturer's recommended primer and corrosion-inhibiting treatment, with factory-applied powder-coat paint.
    b. Epoxy-Resin Prime Coat: Cold-curing epoxy primer, MPI# 101.
    c. Epoxy-Resin Topcoat: Epoxy, cold-cured, gloss, MPI# 77.
    d. Hardware: Chromium-zinc plated, ASTM F 1136.

7. Finish: Factory-standard primer, ready for field painting, with chromium-zinc-plated hardware according to ASTM F 1136.
8. Finish: Black oxide finish for support accessories and miscellaneous hardware according to ASTM D 769.

B. Aluminum:

1. Materials: Alloy 6063-T6 according to ANSI H 35.1/H 35.1M for extruded components and Alloy 6061-T6 according to ANSI H 35.1/H 35.1M for fabricated parts.
2. Hardware: Chromium-zinc-plated steel, ASTM F 1136.

2.6 CABLE TRAY ACCESSORIES

A. Fittings: Tees, crosses, risers, elbows, and other fittings as indicated, of same materials and finishes as cable tray.

B. Barrier Strips: Same materials and finishes as for cable tray.

C. Cable tray supports and connectors, including bonding jumpers, as recommended by cable tray manufacturer.

2.7 WARNING SIGNS

A. Lettering: 1-1/2-inch high, black letters on yellow background with legend "Warning! Not to Be Used as Walkway, Ladder, or Support for Ladders or Personnel."

B. Comply with requirements for fasteners in Section 260553 "Identification for Electrical Systems."

2.8 SOURCE QUALITY CONTROL

A. Testing: Test and inspect cable trays according to NEMA VE 1.

PART 3 - EXECUTION

3.1 CABLE TRAY INSTALLATION

A. Install cable trays according to NEMA VE 2.

B. Install cable trays as a complete system, including fasteners, hold-down clips, support systems, barrier strips, adjustable horizontal and vertical splice plates, elbows, reducers, tees, crosses, cable dropouts, adapters, covers, and bonding.

C. Install cable trays so that the tray is accessible for cable installation and all splices are accessible for inspection and adjustment.

D. Remove burrs and sharp edges from cable trays.

E. Join aluminum cable tray with splice plates; use four square neck-carriage bolts and locknuts.

F. Fasten cable tray supports to building structure and install seismic restraints.

G. Design fasteners and supports to carry cable tray, the cables, and a concentrated load of 200 lb. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems. “Comply with seismic-restraint details according to Section 260548 "Vibration and Seismic Controls for Electrical Systems."

H. Place supports so that spans do not exceed maximum spans on schedules and provide clearances shown on Drawings. Install intermediate supports when cable weight exceeds the load-carrying capacity of the tray rungs.

I. Construct supports from channel members, threaded rods, and other appurtenances furnished by cable tray manufacturer. Arrange supports in trapeze or wall-bracket form as required by application.

J. Support bus assembly to prevent twisting from eccentric loading.

K. Install center-hung supports for single-rail trays designed for 60 versus 40 percent eccentric loading condition, with a safety factor of 3.

L. Locate and install supports according to NEMA VE 2. Do not install more than one cable tray splice between supports.

M. Support wire-basket cable trays with center support hangers, trapeze hangers, or wall brackets as noted on construction drawings.

N. Support center support hangers and trapeze hangers for wire-basket trays with 3/8-inch-diameter rods.

O. Make connections to equipment with flanged fittings fastened to cable trays and to equipment. Support cable trays independent of fittings. Do not carry weight of cable trays on equipment enclosure.

P. Install expansion connectors where cable trays cross building expansion joints and in cable tray runs that exceed dimensions recommended in NEMA VE 2. Space connectors and set gaps according to applicable standard.

Q. Make changes in direction and elevation using manufacturer's recommended fittings.

R. Make cable tray connections using manufacturer's recommended fittings.

S. Seal penetrations through fire and smoke barriers. Comply with requirements in Section 078413 "Penetration Firestopping."

T. Install capped metal sleeves for future cables through firestop-sealed cable tray penetrations of fire and smoke barriers.

U. Install cable trays with enough workspace to permit access for installing cables.

V. Install barriers to separate cables of different systems, such as power, communications, and data processing; or of different insulation levels, such as 600, 5000, and 15 000 V.

W. Install permanent covers, if used, after installing cable. Install cover clamps according to NEMA VE 2.

X. Clamp covers on cable trays installed outdoors with heavy-duty clamps.

Y. Install warning signs in visible locations on or near cable trays after cable tray installation.

3.2 CABLE TRAY GROUNDING

A. Ground cable trays according to NFPA 70 unless additional grounding is specified. Comply with requirements in ANSI/NECA/BICSI-607, ITSM-2017, and Section 260526 "Grounding and Bonding for Electrical Systems."

B. Cable trays with communications cable shall be bonded together with splice plates listed for grounding purposes or with listed bonding jumpers.

C. Cable trays with control conductors shall be bonded together with splice plates listed for grounding purposes or with listed bonding jumpers.

D. When using epoxy- or powder-coat painted cable trays as a grounding conductor, completely remove coating at all splice contact points or ground connector attachment. After completing splice-to-grounding bolt attachment, repair the coated surfaces with coating materials recommended by cable tray manufacturer.

E. Bond cable trays to power source for cables contained within with bonding conductors sized according to ANSI/NECA/BICSI-607, ITSM-2017, and Section 260526 "Grounding and Bonding for Electrical Systems."

3.3 CABLE INSTALLATION

A. Install cables only when each cable tray run has been completed and inspected.

B. Fasten cables on horizontal runs with cable clamps or cable ties according to NEMA VE 2. Tighten clamps only enough to secure the cable, without indenting the cable jacket. Install cable ties with a tool that includes an automatic pressure-limiting device.

C. Fasten cables on vertical runs to cable trays every 18 inches.

D. Fasten and support cables that pass from one cable tray to another or drop from cable trays to equipment enclosures. Fasten cables to the cable tray at the point of exit and support cables independent of the enclosure. The cable length between cable trays or between cable tray and enclosure shall be no more than 72 inches.

E. Tie MI cables down every 36 inches where required to provide a 2-hour fire rating and every 72 inches elsewhere.

F. In existing construction, remove inactive or dead cables from cable trays.

3.4 CONNECTIONS

A. Remove paint from all connection points before making connections. Repair paint after the connections are completed.

B. Connect pathways to cable trays according to requirements in NEMA VE 2 and NEMA FG 1.

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. After installing cable trays and after electrical circuitry has been energized, survey for compliance with requirements.
2. Visually inspect cable insulation for damage. Correct sharp corners, protuberances in cable trays, vibrations, and thermal expansion and contraction conditions, which may cause or have caused damage.
3. Verify that the number, size, and voltage of cables in cable trays do not exceed that permitted by NFPA 70. Verify that communications or data-processing circuits are separated from power circuits by barriers or are installed in separate cable trays.
4. Verify that there are no intruding items such as pipes, hangers, or other equipment in the cable tray.
5. Remove dust deposits, industrial process materials, trash of any description, and any blockage of tray ventilation.
6. Visually inspect each cable tray joint and each ground connection for mechanical continuity. Check bolted connections between sections for corrosion. Clean and retorque in suspect areas.
7. Check for improperly sized or installed bonding jumpers.
8. Check for missing, incorrect, or damaged bolts, bolt heads, or nuts. When found, replace with specified hardware.
9. Perform visual and mechanical checks for adequacy of cable tray grounding; verify that all takeoff raceways are bonded to cable trays. Test entire cable tray system for continuity. Maximum allowable resistance is 1 ohm.

B. Prepare test and inspection reports.

3.6 PROTECTION

A. Protect installed cable trays and cables.

1. Install temporary protection for cables in open trays to safeguard exposed cables against falling objects or debris during construction. Temporary protection for cables and cable tray can be constructed of wood or metal materials and shall remain in place until the risk of damage is over.
2. Repair damage to galvanized finishes with zinc-rich paint recommended by cable tray manufacturer.
3. Repair damage to paint finishes with matching touchup coating recommended by cable tray manufacturer.

END OF SECTION

SECTION 270543 - UNDERGROUND DUCTS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Publications and Standards

B. Work Sequencing and Coordination

C. Telecommunications Submittals

D. Quality Assurance

1.2 PUBLICATIONS AND STANDARDS

A. National Electrical Code (NEC) (ANSI/NFPA 70):

1. Chapter 8: “Communications Systems”
2. Article 250: “Grounding”

B. Telecommunications Industry Association TIA 607 - Commercial Building Grounding and Bonding Requirements for Telecommunications

C. Federal Communications Commission (FCC) Part 15 and Part 68

D. Rural Utilities Services (RUS), formally REA

E. Lightning Protection Code - ANSI/NFPA 780-2017

F. American Society for Testing Materials (ASTM) Publications

G. National Electrical Manufacturer’s Association (NEMA) Publications

H. State of California Administrative Code, Title 24, Part 3, CCR, 1994 California Electrical Code

I. State of California Public Utilities Commission (Cal. P.U.C.) Publication: G.O. 92, 95, & 128 Rules for Construction of Underground Electrical and Communications Systems

J. Underwriters Laboratories Inc. (U.L.) Publications

1. 6-1981 (R86) Rigid Metallic Conduit
2. 514B-1982 Fittings for Conduit and outlet Boxes
3. 651-1981 Schedule 40 and 80 Rigid PVC Conduit
4. UL 467 “Grounding and Bonding Equipment”
5. UL 497, 497A, and 497B “Communications Circuit Protectors”

1.3 RELATED SECTIONS

A. Contract Terms and Conditions

B. Division 1 specification sections

C. Division 26 Related Electrical Underground Section(s)

D. Division 26 Related Bonding and Earthing Section(s)

1.4 SUBMITTALS

A. Submittals shall be made as defined in Section 270500.

1.5 QUALITY ASSURANCE

A. For products or workmanship specified by association, trade, Federal, or State Standards, the Contractor shall comply with the requirements of the standard. When more rigid requirements are specified or required by applicable (City) codes, the Contractor shall comply with City codes and local AHJ requirements.

B. The Contractor shall conform to reference standard by date of issue current on final design documents.

PART 2 - PRODUCTS

2.1 COMMUNICATIONS UTILITY VAULTS

A. All telecommunications vaults to be placed shall be specifically designed for telecommunications applications, with no exceptions.

B. Materials

1. The Contractor shall provide pre-cast utility vaults meeting ASTM C 478 with 28-day 5500 psi minimum compressive strength concrete and designed for AASHTO H-20 loading per AASHTO HB 14. The dimensions for each utility vault are specified on the construction drawings. Any questions the Contractor has about the size should be discussed with the owner’s representative and the telecommunications engineer.
2. Utility vaults shall have tongue-and-grove double sealed joints on mating edges of pre-cast components. The joints shall firmly interlock adjoining components and provide waterproof junctions and adequate shear transfer. Joints shall be sealed with approved watertight joint sealant as prescribed in the manufacturer’s installation specifications and conforming to AASHTO M198, Type B. Sealing material shall be installed in strict accordance with manufacturer’s printed instructions.
3. Conduit Entrances

a. Knockout panels or pre-cast individual conduit openings may be used.
b. On sides where no conduit is installed, 12-inch high by 12-inch wide (minimum) knockout panels for future raceway installation shall be provided. Knockouts are required on all four sides.
c. For existing utility vaults, new ducts shall enter the utility vault with factory-formed bell end of the conduit, and a seal around the conduit shall be applied after installation. Existing utility vaults shall be retrofitted with the required racking and grounding and bonding per the TIA Bonding and Grounding Standards.

4. Covers

a. The Contractor shall provide solid covers (traffic rated), with a 76.2 cm (30 in.) diameter clear opening. For vaults longer than 12' in length, (2) openings with covers are required.
b. Heavy-duty type frames and covers made of cast iron 10" high, suitable for H-20 loading, and having machined bearing surfaces shall be used.
c. The covers shall be of indented type with solid top design.
d. The upper side of each cover shall have the letters "Communications" cast or burned by welder, in integral letters no less than 2 inches high. Either the covers or the ring of the casting shall be field stamped with utility vault or pull box numbers.

C. Manufacturers

1. Utility Vault Company (Old Castle)
2. Jensen Precast
3. Approved equivalent product

2.2 COMMUNICATIONS PULL BOXES

A. Pre-cast pull boxes shall meet the standards defined in Subsection 2.1.B.(1).

B. Joints and seals shall be provided and installed as defined in Subsection 2.1.B.(2).

C. Conduit entrances shall be provided as defined in Subsection 2.1.B.(3).

D. Pull boxes shall be equipped with cable racking on both long walls suitable to support large copper cables as called for on the design documents.

E. All pull boxes shall be equipped with spring-loaded, traffic-rated, skid proof lids with a locking mechanism, unless otherwise specified in the drawings. All lids shall have the identification marking of "Communications" permanently affixed to the cover. The pull box number identification shall be stamped or welded on the cover per the Owner's specified numbering plan.

2.3 COMMUNICATIONS UTILITY VAULT/PULL BOX HARDWARE

A. Materials

1. Pulling irons shall be provided, as required for the size of utility vault/pull box (minimum of 4 per utility vault: 2 placed on each end wall, top and bottom). Pulling irons shall be placed opposite the terminators. All pulling irons shall be constructed of 2.2 cm (7/8 inch) hot-dip galvanized steel.
2. A sump of 30cm (12 in.) in diameter shall be provided in each utility vault, per the manufacturer's specifications.
3. Heavy-weight cable racks with adjustable arms shall be provided for all cables in each utility vault. The racks shall be attached with adjustable inserts set in the concrete walls (bolts or studs embedded in concrete will not be used). Racks and inserts shall be centered on the side walls that are utilized for the racking of splice cases in the utility vault, arranged so that all spare conduit ends are clear for future cable installation. The racks shall have a sufficient number of arms to accommodate cables for each conduit entering or leaving the utility vault.
4. Corner stand-off brackets 15cm to 20cm (6 in. to 8 in. from wall) shall be provided if the utility vault is equipped with center exit conduits. The bracket shall extend from 15cm (6 in.) off floor to 15cm (6 in.) below roof.
5. All utility vault and pull box hardware shall be steel that is hot dip galvanized after fabrication.
6. Each utility vault shall have a detachable galvanized steel ladder that can be removed to facilitate future work in the utility vault. The ladder shall be secured to a top support arm in the utility vault opening or chimney.

B. Manufacturers

1. Hardware: Alhambra Foundry (model No. A-3382 ladder with A-3383 support bar) or Inwesco Products, or an approved equivalent product.
2. Utility vault: Utility Vault, or Associated Concrete Products, or an approved equivalent product.

C. Materials

1. Conduit

    a. Schedule 40 PVC - 4 inch inside diameter.
    b. Type C telephone conduit - 4 inch inside diameter (if concrete encased).
    c. If directional boring: HDPE Conduit, 4" from Carlon or equal.
    d. Corrugated flexible orange inner duct, 1-inch ID diameter, will be placed for fiber optic cable protection. A minimum of 4 inner ducts shall be placed in a 4-inch conduit, unless otherwise directed in the drawings.

2. Conduit shall have a factory formed bell on one end for interconnecting segments.
3. Spacers: High impact spacers shall be used in all multi-duct systems, for both solely owned or joint telecommunications/power construction. They shall conform with NEMA TC-2, TC-6, TC-8, and ASTM F 512 dimensions.
4. All fittings shall be designed specifically for use with the type of conduit placed.
5. All conduits shall be equipped with seal plugs in all utility vaults/pull boxes and expansion rubber seal plugs within all buildings.
6. Manufacturer: CARLON or approved equivalent.

2.4 COMMUNICATIONS ENTRANCE CONDUIT

A. To prevent shear, all conduit entering a building shall transition from PVC to metal from a minimum distance of 24” beyond the exterior of the foundation. These conduits shall slope downward away from the building to reduce the potential of water entering the building.

2.5 DUCT-BANK LOCATING CABLE (DETECTABLE WARNING TAPE)

A. Warning tape shall be a minimum of 3” wide, orange in color, and shall have a nondegradable imprint as follows:

1. “Caution Joint Power and Telecom Cable Buried Below”

B. The tape shall be detectable.

C. Manufacturer:

1. Carlon
2. Approved equivalent product

2.6 PULL ROPE

A. Pull rope shall be new 1/4” polypropylene over polyester rope with a minimum 1700 lb. tensile strength or woven cotton cord with footage markings (mule tape).

B. Manufacturers: Carlon or approved equivalent.

2.7 BONDING/GROUNDING – VAULTS AND PULL BOXES

A. The reinforcing steel in the walls of the utility vault shall be bonded together and brazed to the bronze inserts of each section of the utility vault per the manufacturer’s utility vault specifications. Two ground rods at opposite corners shall be furnished and installed in each vault (one rod in vaults smaller than 3’ X 5’ X 4’). The ground inserts shall be attached to the steel rebar to provide a point of attachment for the ground wires or bonding ribbon. The inserts shall be bronze, flush mounted, and brazed (exothermic weld) to the rebar cage of all the sections of the utility vault (bottom, intermediate, and roof sections).

B. Materials

1. Bonding Ribbon: Shall be made of annealed solid copper 3/8-inch-wide x 1/16 inch thick, tin plated. Manufacturer: INWESCO Cat.12A55 or approved equivalent.
2. Bonding Ribbon Clamp: Shall be made of soft lead 1/2-inch-wide by 1/16-inch-thick and shall accept 1/4-inch diameter bolt. Manufacturer: INWESCO Cat. 12A56 or approved equivalent.
3. Fargo Clamp: Shall be cast from copper, silver plated, furnished with copper bolt. Manufacturer: INWESCO Cat.12A57 or approved equivalent.

4. Ground Rod: Shall be manufactured of high strength high carbon steel, with electrolytically bonded jacket of copper on surface, and shall meet UL spec. 467 and ANSI C-33.8-1072. Manufacturer: INWESCO Cat.12A60 or approved equivalent.
5. Ground Inserts: Shall be made of Cast Bronze W/1/4 Copper Rod. Manufacturer: INWESCO Cat.12H69 or approved equivalent.

2.8 RACEWAY TAGS

A. Permanent markers with raceway designations engraved onto the tag shall be provided. Tags relying on adhesives or taped-on markers shall not be used.

2.9 DUCT PLUGS

A. Provide duct plugs capping all empty conduit and at conduit with installed cabling. All ducts and duct plugs must be re-enterable.

PART 3 - EXECUTION

3.1 COMMUNICATIONS UTILITY VAULTS AND PULL BOXES

A. General

1. The Contractor shall obtain all required permits and notifications before commencing any work operations.
2. All state and local ordinances shall be complied with at all times.
3. All federal, state, and local safety rules, including OSHA, will be enforced at all times during the duration of the project. It is the responsibility of the Contractor to inspect the job site to ensure compliance.

B. Final location of all communications utility vaults and pull boxes shall be determined by the Contractor and owner’s representative.

C. All conduits entering a utility vault or pull box shall be placed at right angles to the short walls and shall be sealed to prevent seepage unless otherwise specified on the construction documents.

D. Excavation dimensions shall be verified with the utility vault supplier in advance so as to prevent delays in setting schedule. All utility vaults and pull boxes shall be placed on 12 inches of compacted bedding material.

E. Shoring shall be in accordance to prevailing underground construction codes, i.e., OSHA, G. O. 128, NESC, and all applicable local, state, and federal statutes.

F. All utility vaults shall be equipped with pulling irons and a ladder for access.

G. Finish grade shall be established prior to placing structures.

H. The Contractor and the owner's representative shall inspect all utility vaults prior to backfilling.

I. Backfill materials shall have been sifted to provide a sand equivalent of not less than 20, and a sieve size of No.4 Backfill material shall be mechanically compacted to a minimum relative compaction of 90 percent to a level six (6) inches above final grade. The excess material shall be excavated to the final grade upon acceptance of compaction.

J. Existing and/or new communications utility vaults/pull boxes may be placed near the existing power and signal vault system. The Contractor shall either place new or enlarge existing utility vaults/pull boxes and conduits in such a manner as to not disturb existing utilities while maintaining specified clearances from all obstructions. This may require clearing much of the area around the vaults by hand. The final placement and depth shall be determined by the Contractor and owner's representative.

K. The Contractor shall locate all existing utilities within 20 feet of the new and/or enlarged utility vault/pull box system. The Contractor and owner's representative shall review and approve any revised coordination schematics. Caution shall be used when working in this area.

L. The Contractor shall excavate around existing vaults using caution to identify and preserve all utilities in the area.

3.2 UTILITY VAULT COVERS AND HARDWARE

A. Pull boxes shall be equipped with a non-skid, spring-loaded traffic-capable lid with a locking mechanism.

3.3 DUCT BANKS AND CONDUITS

A. All communications conduit banks shall be encased in slurry (2 bag cement mix, minimum 1800 PSI) with at least 2 inches of concrete at the top and bottom and 2 inches on each side when deemed necessary based on one or more of the following: bending radius, weight bearing, mechanical stress, etc. A horizontal and vertical separation of 2 inches between the ducts shall be maintained by installing high impact spacers with horizontal and vertical locking intervals of ten feet. Concrete shall have ten pounds of red oxide added for color.

B. All communications conduit shall be placed in a uniform manner between vaults. Conduit in position #1 at one utility vault shall maintain its position within the duct run and terminate in the #1 position at the next utility vault. The position of all conduits between utility vaults shall be maintained. All conduits shall enter utility vaults using the lower most precast knockouts.

C. Long radius bends (over 40 feet) shall be used whenever possible to make changes in direction. If it is found to be necessary to place a 90-degree bend in the conduit run, a factory-made sweep of no less than 12' 6" radius shall be used. No conduit run shall exceed a total of 180 degrees of bend between any two points (such as utility vaults or buildings) considering both vertical and horizontal sweeps. Cold formed trench bends

shall have a radius of not less than 40 feet and shall pass mandrel integrity. Bend radius criteria for conduit size 2" or less is 6 times the diameter of the conduit and, for any conduit larger than 2", 10 times the diameter of the conduit.

D. All bends of less than 20-foot radius shall be encased in concrete when using Type C or Schedule 40 PVC conduits. Encasement shall start from 2 feet before curve to 2 feet past curve. Concrete shall be Type B at 2500 PSI, aggregate of no more than ¼" minus. Conduits shall be spaced at 2 inches minimum using high impact spacers at 2 feet on center.

E. The length and destination of all conduits shall be identified in each utility vault, pull box, and building. Embossed metal tags identifying each conduit shall be placed on end walls.

F. After installation of communications conduit, the Contractor shall prove all conduits by pulling a mandrel with a diameter ¼ inch smaller than the conduit and 6 inches long through each conduit end-to-end. An inspector designated by the Contractor and the owner's representative shall be notified 24 hours before this procedure. Each conduit shall be cleaned with a bristle brush to remove any debris.

G. All utility vault and pull box entrances shall be shear-blocked with standard concrete extending no less than 15 inches from the entry wall. All entering ducts shall be completely encased.

H. Utility marking tape (see 3.5.A) shall be buried 12 inches below the surface directly above the conduit.

I. All conduit structures shall be built with the telecommunications conduits placed above the power conduits unless otherwise called out on the construction drawings and approved by the campus. If this type of construction is required, it shall receive the prior approval of the Contractor, the owner's representative, and the Local Exchange Carrier.

J. All entrance conduits shall be securely fastened to the building. The end of the conduit located inside the building shall be sealed with expandable solid plugs to prevent rodents, water, or gases from entering the building.

3.4 ENTRANCE CONDUIT

A. The Contractor and the owner's representative shall determine the placement of all entrance conduit. All Applicable standards shall be adhered to, i.e., NEC, BICSI, Western Electric OSP, NESC or G.O. 128.

3.5 LOCATING DUCT BANK CABLE

A. Underground detectable warning tape shall be placed in all trenches at one foot below the final grade after the conduit and encasement is complete. The tape shall indicate the type of cable that will utilize the substructure system, e.g., fiber optic or copper cables. The detectable warning tape shall be installed according to manufacturer's specifications to ensure access to the tape for locating purposes.

3.6 PULL ROPE

A. Pull rope shall be new material that is free of knots, kinks, and abrasions.

B. Pull rope shall be placed as a single continuous length in every new duct section. (See Section 16730, 2.7.)

C. Pull rope shall be secured at each end.

3.7 BONDING/GROUNDING

A. Two ground rods shall be installed in each new manhole and one rod in a new pull box. All noncurrent-carrying metal parts in the utility vault and any metallic raceway grounding bushing shall be connected to this ground rod with a No. 4/0 bare copper ground conductor and approved ground clamp, as required per NEC.

B. The grounding system shall not rely on plumbing systems.

C. Bonding conductors shall be routed with a minimum number of bends. The bends placed in the conductor should be sweeping.

D. All bonding connections shall utilize listed bolts, crimp pressure connectors, clamps, or lugs. Exothermic welding may be used.

E. Multiple bus bars shall be directly bonded together with a No. 4/0 copper conductor.

F. Backbone cabling shall be bonded at each sheath opening with, minimally, a 6-AWG copper conductor.

END OF SECTION

SECTION 270553 - IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Provides specifications information for identification of the various components of the telecommunications infrastructure and pathway system.
2. Labeling and identification.

1.2 RELATED DOCUMENTS

A. Section 270500 and all divisions of the specification and general provisions of the Construction Documents.

B. Architectural, mechanical, electrical, and all technology drawings.

C. Refer to Structural Seismic Requirement design documents Specifications, if available, for Non-Structural Components for all structural bracing and support of telecommunications equipment.

1.3 CLOSEOUT SUBMITTALS

A. As-Built Drawings:

1. Submit all as-built drawings in accordance with the general requirements of the construction documents.
2. Submit as-built drawings a minimum of two (2) weeks after completion of all Division - 27 work for A/E and Owner reference:
3. Communication sub-contractor to print, frame and mount approved as-built drawings in MPOE. Coordinate location with A/E.

1.4 QUALITY ASSURANCE

A. Qualifications – Manufacturer

1. Component manufactures shall be ISO 9001:2000 and offer products that are RoHS compliant.

B. Qualifications – Installer:

1. At a minimum, seventy-five percent (75%) of the onsite sub-contractor provided field technicians shall be factory certified within 12 months by the manufacturer of

the selected telecommunications system components being installed. Proof of certification shall be available on site for review at all times for each field technician.

PART 2 - PRODUCTS

2.1 IDENTIFICATION LABELS

A. Basis-of-Design Product: Subject to compliance with requirements:

1. Panduit – Thermal Transfer
2. Brady Label System
3. Brother Label System
4. Or Equal

B. Product Options:

1. The indicated manufacturers shall be the basis of the design and each component selected shall address the infrastructure requirements.

C. Description:

1. In new installations, Sub-contractor shall develop and submit for approval a labeling strategy based on the TIA 606-B Circuit Designation and Labeling Standard.
2. All labels shall be machine-manufactured by a labeling machine. Handwritten labels will not be accepted for final labeling.
3. The intention of the labeling scheme is to be TIA/EIA 606-B compliant.
4. It is the responsibility of the sub-contractor to acquire, understand, and utilize the owner’s labeling scheme for all component of the voice data communications system.
5. It is the responsibility of the sub-contractor to provide labels sized to show the Owner’s labeling scheme in readable font size while still matching the specified hardware identification dimensions.
6. All labeling information shall be recorded on the as-built drawings and all test documents shall reflect the appropriate labeling scheme.

D. Indoor Copper and Fiber optic cables and grounding conductors:

1. The cable sheaths shall be labeled with laser-printed polyester self-laminating wrap around labels sized to fit the Owner’s labeling scheme in readable font size.

E. Horizontal cable outlet housings and faceplates:

1. Cable termination connectors at each position on the outlet housing shall be labeled with laser-printed polyester labels inserted into the outlet housing labeling window.

F. Copper patch panels:

1. The patch panels shall be labeled on the front and rear top left corner with a laser-printed polyester self-laminating label sequentially identifying the patch panel.

G. Copper patch termination blocks:

1. The termination blocks shall be labeled on the front rows with the termination block designation strip colored per the BICSI requirements identifying the copper cable pairs.

H. Fiber optic termination panels and housings:

1. The panels and housings shall be labeled on the outside front and rear top left corner with a laser-printed polyester self-laminating label sequentially identifying the panel.
2. Cable termination identifier and fiber positions inside the termination panels shall be made using the manufacturer's provided label card behind the plastic panel.

I. Equipment racks:

1. Bakelite plastic label engraved with rack label scheme attached to front and rear facing top angle bracket.
2. Label shall be adhesive backed for secure placement. Optional mounting with self-tapping screws will be at the discretion of owner.

J. Equipment cabinets:

1. Bakelite plastic label engraved with cabinet label scheme attached to top front and rear facing frame of cabinet.
2. Label shall be adhesive backed for secure placement. Optional mounting with self-tapping screws will be at the discretion of owner.

K. Indoor Conduits and pullboxes:

1. Each section of conduit shall be labeled on the outside facing and unobstructed view with a laser-printed polyester self-laminating label sequentially identifying the conduit and its origin and termination end (to and from).
2. Each pullbox shall be labeled on the outside door panel facing and unobstructed view with a laser-printed polyester self-laminating label sequentially identifying the pullbox and building location.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Check actual site conditions prior to start of any work. Ensure all preceding trade work associated with the telecommunications system is accurate and complete before proceeding with installation or use of products specified in this section

3.2 INSTALLATION

A. Process:

1. The Owner-provided labeling scheme is intended to comply with TIA/EIA 606-B standard for labeling and administration of a cable plant. It is the responsibility of the sub-contractor to acquire, understand, and utilize the owner's labeling scheme for all component of the voice data communications system including, but not limited to:
2. Indoor Horizontal copper and fiber optic cables (Identify at both ends within 6-inches of termination).
3. Indoor copper and fiber optic backbone cables (Identify at both ends within 12-inches of the point that the cable enters termination panels/blocks, within 12- of the point that the cable enters or exits pullboxes, wall and floor sleeves.
4. Workstation outlets, faceplates and individual outlet connectors.
5. Termination panels.
6. Termination blocks.
7. Racks, cabinets, and equipment enclosures. (front and rear).
8. Indoor conduit pathways and pullboxes.
9. Grounding conductors and ground bars.
10. Label each component with a specified label at an unobstructed view location and where it is accessible for administration.

3.3 RE-INSTALLATION

A. No additional burden to the owner regarding costs, network down-time, and end user interruption shall result from the re-installation of specified components. Scheduling for re- installation work shall be coordinated, in writing, with the owner prior to beginning any re- installation work.

3.4 CLOSEOUT ACTIVITIES

A. Sub-contractor shall provide documentation of all telecommunications system components under this section utilized throughout the site for review and reference by the Owner and A/E team.

B. Sub-contractor to submit all as-built drawings and any test documentation required prior to acceptance by the Owner.

END OF SECTION

SECTION 270800 - COMMISSIONING FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Provides specifications information for identification of the various components of the telecommunications infrastructure and pathway system.
2. Copper cable test device.
3. Optical fiber test device.
4. Coax test device.

1.2 RELATED DOCUMENTS

A. Section 270500 and all divisions of the specification and general provisions of the Construction Documents.

B. Architectural, mechanical, electrical, and all technology drawings.

C. Refer to Structural Seismic Requirement design documents Specifications, if available, for Non-Structural Components for all structural bracing and support of telecommunications equipment.

1.3 ACTION SUBMITTALS

A. Test Instrument Submittals:

1. All copper & fiber optic test instruments used on the site shall be capable of storing test data files and downloading these test results as data files. The copper cable number and fiber optic cable/strand number shall be used as the record identifier for each test.
2. Submit the model number, serial number, manufacturer, last date of calibration/certification as well as a copy of the certificate for each copper & fiber optic test instruments used on the site prior to any testing.

1.4 CLOSEOUT SUBMITTALS

A. Test and Evaluation Reports:

1. A complete set of test results verifying the installed link and channel performance parameter results for all cable types shall be presented to the A/E and the Owner at least one (1) week before the placement of any active electronics in technology rooms and/or spaces. The test result submittal shall contain the following:

a. Testing, verification and documentation of all performance specification parameters for voice, data cables in all IT spaces. The trade sub-contractor shall identify the types of cable tester(s) and interface adapters used during testing and certification when presenting the results for each type of cable and each test procedure.
b. Verification and test results in both paper and electronic formats printed directly from the testing device software application. Paper results must be neatly presented in a three (3) ring binder and sectioned according to floor and cable type; OSP, ISP, Category-6, 6A, Category-3, and optical fiber cables (backbone and workstation fiber) must be divided into separate sections for each floor. Electronic results must be presented on CD-ROM disc(s) in the testing device's native file type with a copy of the electronic software used to generate the test results.
c. Documentation indicating the last calibration/service record of each certification tester device.

1.5 QUALITY ASSURANCE

A. Qualifications – Manufacturer

1. Component manufactures shall be ISO 9001:2000 and offer products that are RoHS compliant.

B. Qualifications – Installer:

1. Seventy Five percent (75%) of the onsite sub-contractor-provided field technicians shall be factory certified within 12 months by the manufacturer of the selected telecommunications system testing components being used. Proof of certification shall be available on site for review at all times for each field technician.

PART 2 - PRODUCTS

2.1 COPPER CABLE TESTER

A. Basis-of-Design Product: Subject to compliance with requirements:

1. Fluke - Versiv

B. Product Options:

1. The indicated manufacturers shall be the basis of the design and each component selected shall address the particular infrastructure requirement.

a. Fluke DSX Cable Analyzer

C. Description:

1. Must meet or exceed TIA Level IV compliant network cable-testing device certification by an independent laboratory, such as Intertek, for verification of high speed, TIA/EIA T568 compliant cables.
2. Copper test equipment must be capable of certifying Category-3, Category-5e, Category-6 and Category-6A UTP links or channels independent of termination hardware configuration (RJ 45 port or 110-style) for each level of performance.
3. Provide full 2-way Autotest of Category-3, 5E, 6 and 6A twisted pair links.
4. All test equipment shall be capable of storing full frequency sweep data for all tests and printing color graphical reports for all swept measurements.

D. Accessory Products:

1. Interface Adapters
2. TIA Category-3, 5E,6 and 6(A): 100 ohm
3. Category/Class E permanent link adapters for TIA Cat 3, 5E, 6 and 6A unshielded and shielded cables.
4. DSX Cable Analyzer - VERSIV

2.2 COAXIAL CABLE TESTER

A. Manufacturer List:

1. Fluke
2. Gepco

B. Product Options:

1. Select analyzer to comprehensively Autotest each connection and record results verifying compliance with industry standards and manufacturer specifications.

    a. DSX or Equal Digital Cable Analyzer.

C. Description:

1. The tester’s Autotest function shall test and record cable resistance, length, impedance, insertion loss and propagation delay. Additionally, the tester shall provide a TDR function that provides extended troubleshooting capabilities.
2. All test equipment shall be capable of storing full frequency sweep data for all tests and printing color graphical reports for all swept measurements.

D. Materials: High impact plastic case with a shock absorbing over-mold.

E. Accessory Products:

1. Interface Adapters

    a. DSX-Coax Interface Adapters

2.3 OPTICAL FIBER TESTER

A. Manufacturer List:

1. Fluke

B. Product Options:

1. Select analyzer to comprehensively certify each optical fiber connection and record results verifying compliance with TIA/EIA performance standards and manufacturer specifications.

a. Versiv CertiFiber Pro Optical Loss Test Set

C. Description:

1. The optical fiber source shall permit full end to end testing of Multimode, Single-mode and LOMMF optical fiber cabling fully compliant with industry standards and manufacturer recommendations.
2. Available source types and wavelengths shall be as follows:

a. Multimode - 850nm LED and 1300nm LED.
b. Single-mode – 1310nm FP Laser and 1550nm FP Laser.
c. LOMMF – 850nm VCSEL and 1310nm FP Laser.

3. The built in power meter shall be calibrated to read 850, 1310 and 1550nm wavelengths.
4. All test equipment shall be capable of storing full frequency sweep data for all tests and printing color graphical reports for all swept measurements.

D. Accessory Products:

1. Interface Adapters

a. DSX Fiber Modules including Multimode, Single-mode and LOMMF adapters.

PART 3 - EXECUTIONEXAMINATION

A. Check actual site conditions prior to start of any work. Ensure all preceding trade work associated with the telecommunications system is accurate and complete before proceeding with installation or use of products specified in this section.

B. Verify telecommunications cabling is installed and supported, terminated, mounted in an appropriate housing or terminated on the applicable component and labeled prior to certification testing and documentation.

C. Verify certification tester universal interface adapters and manufacturer patch cords that enable permanent link verification are in new condition not indicating any twisting or kinking resulting from incorrect storage of the tester interface adapters.

D. Optical fiber patch cords shall be inspected to ensure connector surfaces are clean and free of defects that may affect testing results.

3.2 TESTING

A. Process:

1. Certification test 100% of the installed cabling plant including all backbone and horizontal four (4) pair UTP/MTP/STP copper, multi-pair UTP, and optical fiber connections.
2. Follow manufacturers' instructions and recommended industry standards and guidelines to complete all TIA/EIA 568-C testing procedures to verify performance levels.
3. All testing will utilize industry standard Method B parameters.
4. All optical fiber certification testing shall include dual frequency bi-directional reports.
5. Follow manufacturer requirements for self-calibration procedures.
6. Update tester software to show specific project information including but not limited to:
7. Date and time of testing
8. Project name
9. Field technicians name
10. Cable identification number
11. Cable manufacturer, type and part number

B. Repair:

1. Any connections failing to meet referenced standards or more stringent performance requirements stated above, must be removed and replaced with connections that prove, in additional testing, to meet or exceed the performance standards set forth.

3.3 CLOSEOUT ACTIVITIES

A. Sub-contractor shall provide documentation of all telecommunications system components under this section utilized throughout the site for review and reference by the Owner and A/E team.

B. Sub-contractor to submit all as-built drawings and any test documentation required prior to acceptance by the Owner.

END OF SECTION

SECTION 271116 - CABINETS, RACKS, ENCLOSURES FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Provides specifications for network cabinets, racks, and telecommunications enclosure components utilized to house various telecommunications infrastructure components and systems equipment.
2. Equipment Racks

1.2 RELATED DOCUMENTS

A. Section 270500 and all divisions of the specification and general provisions of the Construction Documents.

B. Architectural, mechanical, electrical, and all technology drawings.

C. Refer to Structural Seismic Requirement design documents Specifications, if available, for Non-Structural Components for all structural bracing and support of telecommunications equipment.

1.3 CLOSEOUT SUBMITTALS

A. As-Built Drawings:

1. Submit all as-built drawings in accordance with the general requirements of the construction documents.
2. Submit as-built drawings a minimum of two (2) weeks after completion of all Division- 27 work for A/E and Owner reference:

1.4 QUALITY ASSURANCE

A. Qualifications – Manufacturer

1. Component manufactures shall be ISO 9001:2000 and offer products that are RoHS compliant.

B. Qualifications – Installer:

1. At a minimum, seventy-five percent (75%) of the onsite contractor provided field technicians shall be factory certified within 12 months by the manufacturer of the

selected telecommunications system components being installed. Proof of certification shall be available on site for review at all times for each field technician.

PART 2 - PRODUCTS

2.1 CABINETS, RACKS, ENCLOSURES

A. Basis-of-Design Product: Subject to compliance with requirements:

1. Chatsworth Products Incorporated

    a. F-Series Part # TBD, or equal

2. Middle Atlantic

    a. Wall Mounted Floor Supported, SR Series #TBD

B. Product Options:

1. The indicated manufacturers shall be the basis of the design and each component selected shall address the particular infrastructure requirements.

C. Description:

1. New cabinet and cabinet components shall be black in color. Finish shall be powder coat.
2. Network equipment will mount on to a network equipment suited cabinet 45u or 40u rack units tall, 24 Wide, and 42” and/or32” deep.
3. Floor mounted racks shall be permanently attached, per structural engineer or manufacturer requirements, to the floor using lag bolt and lag shields for masonry type floors or appropriate fastening hardware for other types of flooring as approved by the owner. Racks installed adjacent to each other will be fastened together using proper bolt, nut, and washer combinations.
4. Rated load for equipment cabinets shall be no less than 2500 pounds.
5. Ladder rack shall be fastened using the proper hanging and connecting hardware, secured in a manner consistent with recommended weight load spacing recommendations.
6. Patch panels, wire cable management hardware, and other related passive equipment will be attached to racks and mounting rails with at least two screws per mounting bracket and located in accordance with the Rack/Cabinet Equipment Elevation Form contained in project documentation on a per job basis.
7. All equipment shall be free from imperfections and defects.
8. All cabinets and racks shall be grounded and bonded to specification of BICSI, Telecommunications Methods Manual and ANSI/NECA/BICSI 607 (2011) Bonding and Grounding Standard or BICSI-ITSM (2015). See grounding section in this document for details.
9. Active equipment shall be positioned in racks and cabinets to work in accordance of the “hot aisle/cold aisle” configuration of that room.

10. Equipment with intake/exhaust patterns other than front-to-back should be remediated with appropriate passive ducts to correct airflow to front-to-back pattern wherever possible.
11. Any rack/cabinet spaces not used should be filled with blank panels to minimize rogue backflow of air within the facility.
12. All racks and cabinets shall have a minimum of 3 feet clearance in the front, with 4 feet being preferable for the movement and installation of equipment. Some equipment may require more clearance. See project documentation or equipment manufacturer's guidelines for details.
13. All racks and cabinets shall have a minimum of 2 feet clearance in the rear, with 3 feet being preferable for the movement and installation of equipment.
14. Each cabinet enclosure shall have a rectangular frame with removable top panel, side panels and doors. Installed cabinets shall include thermal, power, and cable management accessories that control airflow through the cabinet and keep network and power cables separate and organized.
15. Provide various configurable size blanking panels for each equipment cabinet.
16. The cabinet frame shall be rectangular with four corner posts, manufactured from steel with welded and bolted frame construction. The horizontal frame members shall be steel extrusion with grooves that accept captive hardware to allow attachment of equipment mounting rails and thermal, cable and power management accessories. The captive hardware will slide within the groove allowing rails and accessories to be adjusted in depth without removal from the cabinet. The slide extrusions will be marked with a scale that allows easy top-to-bottom alignment of mounting rails and other accessories when adjusted in depth.
17. Each cabinet shall include two pairs of equipment mounting rails. Mounting rails shall bolt to the side of the cabinet frame at the top and bottom of the frame and shall be adjustable in depth to provide front and rear support for equipment.
18. Equipment Mounting Rails shall be spaced horizontally to support 19" wide EIA-310- D compliant rack-mount equipment. Each RMU will be marked and numbered on the front mounting rails.
19. Attachment points will be M5/M6cage nuts or 10-32/10-24 threaded rails. Mounting rails shall be square-punched according to the ANSI/EIA-310-D Universal hole pattern. The cabinet will include assembly and equipment-mounting hardware. Each cabinet will include (50) each combination pan head, pilot point mounting screws.
20. The cabinet shall include a solid top panel with four cable access ports located near the front and rear corners of the frame. Each cable access port shall be plastic with a brush seal to allow easy addition and removal of cables while limiting bypass airflow.
21. The cabinet shall include two locking solid side panels with spring loaded latches for easy installation and removal. The cabinet shall be designed to allow baying with or without side panels installed.
22. The sides of the equipment-mounting channels will be punched to allow attachment of equipment support rails, vertical power strips and cable managers along the sides of the rack or for rack-to-rack baying
23. The cabinet shall include a single front door with a high air flow perforated metal panel, hidden tamper-resistant hinges with quick-release hinge pins and a swing handle. The door shall be removable and reversible to open from the right or left. The door shall open to 150° when the cabinet is bayed with other cabinets. The front door shall have a single-point slam latch with a keyed lock.

24. The cabinet shall include a high flow perforated metal double rear door with a swing handle. The doors shall be removable. The doors shall open to 175° when the cabinet is bayed with other cabinets. The double rear door shall have a two-point cam latch with a keyed lock.
25. The mounting rails, top panel, side panels and doors shall be electrically bonded to the cabinet frame. The cabinet frame shall have a prepared location for attaching a grounding lug.
26. The cabinet shall be UL Listed. UL Listing will be stated in the manufacturer's product literature.
27. The cabinet shall include (4) leveling feet, (4) clamps for securing the leveling feet to the floor and a grounding lug for bonding the cabinet frame to the Telecommunications Grounding Busbar. The manufacturer of the cabinet shall sell compatible casters and equipment mounting hardware as an accessory.

D. Accessory Products:

1. Cabinet-mounted vertical power distribution units. Refer to the Division 27 11 26 specifications.

2.2 POWER REQUIREMENTS

A. Contractor shall be responsible for confirming cabinets containing active equipment have installed (2) PDUs (power strips) to provide sufficient number of receptacles and current capacity to support the equipment.

B. Minimum power configuration should be no less than 20 A, 120 Vac power, with 208 Vac where needed. All circuits shall be on the same phase of power, coordinate phase requirements when circuits are fed from UPS or transformer. Consult project documentation for details on power needs of specific racks and cabinets.

2.3 120Vac Power circuits should have dedicated neutral and ground conductors and no exposed on/off switch or breaker controls that might cause accidental shut-off.

2.4 EQUIPMENT RACKS

A. Basis-of-Design Product: Subject to compliance with requirements:

1. CPI or Middle Atlantic

a. 2-Post Part # TBD
b. 4-Post Part # TBD

B. Product Options:

1. The indicated manufacturers shall be the basis of the design and each component selected shall address the particular infrastructure requirements.

C. Description:

1. Equipment racks and rack components shall be black in color. Finish shall be powder coat.
2. Universal Free Standing 2-Post Relay Racks shall be aluminum, able to support and organize electronic equipment, cross-connection and/or termination hardware for fiber optic cabling, station cabling, riser cabling, or building entrance cabling as may be required by design.
3. Free Standing 4-Post Relay Racks shall be steel, aluminum, or combination of both steel and aluminum, able to support and organize electronic equipment, cross-connection and/or termination hardware for fiber optic cabling, station cabling, riser cabling, or building entrance cabling as may be required by design.
4. The assembled rack will measure 84”H x 20.3”W x 29 or 36””D. The sides of the equipment- mounting channels will be punched to allow attachment of vertical cable managers along the sides of the rack or for rack-to-rack baying.
5. Racks shall be manufactured from aluminum and/or steel extrusions.
6. Each rack will have two L-shaped top angles, two L-shaped base angles and two C- shaped equipment-mounting channels. The rack will assemble with bolt hardware. Equipment-mounting channels will be threaded for easy assembly. The base angles will be pre-punched for attachment to the floor.
7. Equipment mounting channels will be 3” deep and punched on the front and rear flange with the ANSI/EIA-310-D Universal hole pattern to provide 45 rack-mount spaces for equipment. Each mounting space will be marked and numbered on the mounting channel.
8. The rack will be UL Listed.
9. Network equipment will mount on to a network equipment suited cabinet 45u rack units tall.
10. Floor mounted racks shall be permanently attached to the floor using lag bolt and lag shields for masonry type floors or appropriate fastening hardware for other types of flooring as approved by the owner. Racks installed adjacent to each other will be fastened together using proper bolt, nut, and washer combinations.
11. Rated load for equipment cabinets shall be no less than 1000 pounds, equipment evenly distributed along height of rack.
12. Ladder rack shall be fastened using the proper hanging and connecting hardware, secured in a manner consistent with recommended weight load spacing recommendations.
13. Patch panels, wire cable management hardware, and other related passive equipment will be attached to racks and mounting rails with at least two screws per mounting bracket and located in accordance with the Rack Equipment Elevation Form contained in project documentation on a per job basis.
14. All equipment shall be free from imperfections and defects.
15. All racks shall be grounded and bonded to specification of BICSI, Telecommunications Methods Manual and ANSI/TIA 607-B Bonding and Grounding Standard. See grounding section in this document for details.
16. Active equipment shall be positioned in racks to work in accordance of the “hot aisle/cold aisle” configuration of that room.
17. Equipment with intake/exhaust patterns other than front-to-back should be remediated with appropriate passive ducts to correct airflow to front-to-back pattern wherever possible.
18. Any rack/cabinet spaces not used should be filled with blank panels to minimize rogue backflow of air within the facility.

19. All racks and cabinets shall have a minimum of 3 feet clearance in the front, with 4 feet being preferable for the movement and installation of equipment. Some equipment may require more clearance. See project documentation or equipment manufacturer's guidelines for details.
20. All racks shall have a minimum of 3 feet of clearance in the rear for the movement and installation of equipment.
21. Equipment Mounting Rails shall be spaced horizontally to support 19" wide EIA-310- D compliant rack-mount equipment. Each RMU will be marked and numbered on the front mounting rails.
22. Attachment points will be threaded with 12-24 roll-formed threads. The rack will include assembly and equipment-mounting hardware. Each rack will include (50) each combination pan head, pilot point mounting screws
23. The cabinet shall be UL Listed. UL Listing will be stated in the manufacturer's product literature.

D. Accessory Products:

1. Cabinet-mounted vertical power distribution units. Refer to the Division 27 11 26 specifications.

2.5 POWER REQUIREMENTS

A. Communication Contractor shall be responsible for confirming equipment racks containing active equipment have installed (TBD) PDUs (power strips) to provide sufficient number of receptacles and current capacity to support the equipment.

B. Minimum power configuration should be no less than 20 A, 120 Vac power, with 208 Vac where needed. All circuits shall be on the same phase of power. Consult project documentation for details on power needs of specific racks and cabinets.

C. Power circuits should have dedicated neutral and ground conductors and no exposed on/off switch or breaker controls that might cause accidental shut-off.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Check actual site conditions prior to start of any work. Ensure all preceding trade work associated with the telecommunications system is accurate and complete before proceeding with installation or use of products specified in this section.

3.2 INSTALLATION

A. Process:

1. Check actual site conditions prior to start of any work. Ensure all preceding trade work associated with the telecommunications system is accurate and complete

before proceeding with installation or use of products specified in this section. Examples of work which must be checked include, but are not limited to:

a. Electrical requirements (conduit installation and capacity).
b. The telecommunications rooms are the size indicated in the project drawings.
c. Adequate clearances of doors, riser spaces and ceilings for all component of the telecommunications system.
d. Examine and compare the telecommunications drawings and specifications with the drawings and specifications of other trades. Report any discrepancies between them to the A/E and obtain written instructions for changes or revisions.

2. Assemble racks and cabinets according to manufacturer's instructions. Verify that equipment mounting rails are positioned properly for rack-mount equipment before attaching the rack to the floor.
3. Anchor all racks and cabinets to the concrete floor per the structural requirements and cross brace to the cable runway system above.
4. Racks shall be grounded to the TGB using appropriate hardware provided by the contractor. The ground will meet local code requirements and will be approved by the Authority Having Jurisdiction (AHJ).
5. Ladder rack may be attached to the top of the rack to deliver cables to the rack. The rack should not be drilled to attach ladder rack. Use appropriate hardware from the ladder rack manufacturer.

3.3 RE-INSTALLATION

A. No additional burden to the owner regarding costs, network down-time, and end user interruption shall result from the re-installation of specified components. Scheduling for re- installation work shall be coordinated, in writing, with the owner prior to beginning any re- installation work.

3.4 CLOSEOUT ACTIVITIES

A. Contractor shall provide documentation of all telecommunications system components under this section utilized throughout the site for review and reference by the Owner and A/E team.

B. Contractor to submit all as-built drawings and any test documentation required prior to acceptance by the Owner.

END OF SECTION 271116

SECTION 271119 - TERMINATION BLOCKS AND PATCH PANELS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Provides specifications for wall and rack/cabinet-mounted blocks, termination panels and patch panel components utilized to terminate various telecommunications infrastructure cabling and connectivity.
2. Optical Fiber Termination panels.
3. Copper horizontal cabling Patch Panels.

1.2 RELATED DOCUMENTS

A. Section 270500 and all divisions of the specification and general provisions of the Construction Documents.

B. Architectural, mechanical, electrical, and all technology drawings.

C. Refer to Structural Seismic Requirement design documents Specifications, if available, for Non-Structural Components for all structural bracing and support of telecommunications equipment.

1.3 ACTION SUBMITTALS

A. Product Data: For each product indicated.

1. Submit all product data in accordance with general requirements of the construction documents.
2. Submit product cut sheets and a detailed list of components a minimum of two (2) weeks prior to commencement of Division-27 work for A/E review and action.
3. Alternate and “Or Equal” designated products must be submitted for review and judgment to the A/E prior to installation. The contractor-proposed alternate products or components must be verified by two (2) independent sources within the past 6 months. This request shall include the two (2) independent sources, the original Product’s specification sheet, the proposed substitute product cut sheet, and a written request to review the substitute product.
4. Any request of an alternate or substitution must be submitted to the A/E for action no later than fourteen (14) calendar days after release of the original telecommunications bid documents.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings:

1. Submit all shop drawings in accordance with the general requirements of the construction documents.
2. Submit shop drawings a minimum of two (2) weeks prior to commencement of Division-27 work for A/E review and action.
3. Shop drawings shall include evidence of grounding and bonding components are coordinated with field conditions and the work of other trades.
4. This submittal may have a written component and a visual, drawn component for review and action by the A/E prior to installation.

B. Certificates:

1. Submit management and installation team reference documentation verifying:

   a. The project manager is a RCDD in good standing with BICSI and is qualified to manage the scope of work described in the contract documents and has five (5) years of experience managing similar projects in size and scope. The documentation shall include the RCDD registration number.
   b. The field supervisor is a BICSI trained technician that is qualified to perform and oversee the work described in the contract documents

C. Qualification Statements:

1. The contractor shall submit documentation that within the past 12 months, a minimum of 75% of all installation personnel have been trained or certified by the manufacturer of the products they are installing.

1.5 CLOSEOUT SUBMITTALS

A. As-Built Drawings:

1. Submit all as-built drawings in accordance with the general requirements of the construction documents.
2. Submit as-built drawings a minimum of two (2) weeks after completion of all Division- 27 work for A/E and Owner reference:

1.6 QUALITY ASSURANCE

A. Qualifications – Manufacturer

1. Component manufactures shall be ISO 9001:2000 and offer products that are RoHS compliant.

B. Qualifications – Installer:

1. At a minimum, seventy-five percent (75%) of the onsite contractor provided field technicians shall be factory certified within 12 months by the manufacturer of the selected telecommunications system components being installed. Proof of certification shall be available on site for review at all times for each field technician.

PART 2 - PRODUCTS

2.1 OPTICAL FIBER TERMINATION PANELS

A. Basis-of-Design Product: Subject to compliance with requirements:

1. Corning
2. Or Approved

B. Product Options:

1. The indicated manufacturers shall be the basis of the design and each component selected shall address the particular infrastructure requirements.

C. Description:

1. 19-inch Rack mountable fiber optic termination shelf with maximum 12 panels slots with integrated splicing for termination inside Telecom rooms.
2. Minimum 1U rack units' height, maximum 4U rack units'.
3. Optical fiber termination panel housings shall be provided for cross-connecting or inter-connecting purposes between OSP, Indoor riser backbone, and/or distribution cables and the active network electronic switches, as noted in drawings.
4. Single mode termination: Fusion splice both ends of each single mode fiber optic strand onto factory connectorized single mode pigtails mounted in connector housings assembled by the manufacturer of the single mode fiber optic cable.

    a. Single-Mode splice-on Connector is acceptable.

5. Multimode termination: Terminate both ends of each multimode fiber optic strand onto field installable anaerobic type connectors.
6. All optical fiber housings shall be complete factory-provided assemblies that contain all components including LC duplex connector adapter panels and internal/external bend radius, strain relief and cable clamp components that are provided in a housing which includes an accessible rear access hatch.
7. All optical fiber patch panel trays and associated bulkhead inserts shall have factory numerical labeling included in the design and presentation to the user side of the panel.
8. The optical fiber patch panel bulkheads that house the terminating modules for the fiber backbone cabling and any horizontal optical fiber cabling shall accept TIA 568-C standard-compliant LC-connectors compatible with the optical fiber strands being terminated.

D. Accessory Products:

1. Provide any accessory products related to the optical fiber termination panels to provide a complete and functional infrastructure system.

2.2 COPPER HORIZONTAL CABLING PATCH PANELS

A. Manufacturer List:

1. Manufacturer (TBD)

   a. Category 6 24 Port
   b. Category 6 48 Port

B. Product Options:

1. The indicated manufacturers shall be the basis of the design and each component selected shall address the particular requirements for each situation.

C. Description:

1. All patch panels are to be rack/cabinet mountable within industry standard TIA/EIA 19” mounting rails unless otherwise noted.
2. All patch panels are to provide adequate space for individual port labeling on the front and cable/connector labeling on the back.
3. All installed station cable patch panels shall be Category 6 twenty-four (24) or forty-eight (48) port flat patch panels
4. All multi-pair backbone OSP cables terminated in a TR shall be terminated on a BEC protection block, unless otherwise noted on drawings. Reference Division 270526 specification.
5. The performance criteria for the patch panels must meet or exceed the performance parameters for frequency, attenuation, near end cross-talk (NEXT), attenuation to cross-talk ratio (ACR), power sum NEXT (PS-NEXT), power sum ACR (PS-ACR), equal level far end cross-talk (ELFEXT), power sum far end cross-talk (PS-FEXT), and return loss (RL) as set forth in TIA/EIA 568-C category standards.

D. Accessory Products:

1. Provide any accessory products related to the patch panels to provide a complete and functional infrastructure system.
2. Where required, provide RJ-45 jack block out device to safely secure access to unused ports and deter vandalism to jacks.
3. Provide complete with all required mounting hardware and fittings and cables needed.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Check actual site conditions prior to start of any work. Ensure all preceding trade work associated with the telecommunications system is accurate and complete before proceeding with installation or use of products specified in this section. Examples of work which must be checked include, but are not limited to:

1. Electrical requirements (conduit installation and capacity)
2. The telecommunications rooms are the size shown on the project drawings.
3. Adequate clearances of doors, riser spaces and ceilings for all component of the telecommunications system.
4. Examine and compare the telecommunications drawings and specifications with the drawings and specifications of other trades. Report any discrepancies between them to the A/E and obtain written instructions for changes or revisions.

3.2 INSTALLATION

A. Process:

1. Install all optical fiber and category copper termination panels/panels under the guidelines of the manufacturer’s recommended instructions and per all TIA/EIA 568-C standards and manufacturer-approved industry practices as shown in the drawings.
2. The installation and performance parameters of all installed cable termination panels shall be verified by the contractor through ANSI/TIA 568-C testing procedures.
3. Label all cable termination panels to identify each port and each specific panel in accordance with the TIA/EIA 606 labeling scheme approved by the Owner.

B. Installation description:

1. Contractor shall use existing cabling management pathways and take care to place cable like with like, maintaining original segregation strategies for separating fiber and copper cables as well as any separation necessary between different types of copper cables.
2. Cables shall be dressed neatly within patch management pathways with care taken to maintain minimum bend radius of not less than 1 times the cord outer diameter for copper and not less than a 1" bend radius for fiber jumpers as per ANSI/TIA 568-C.0
3. The installation and performance parameters of all installed cable termination panels shall be verified by the contractor through ANSI/TIA 568-C testing procedures.
4. Label all cable termination panels to identify each port and each specific panel in accordance with the TIA/EIA 606 labeling scheme approved by the Owner.

3.3 RE-INSTALLATION

A. No additional burden to the owner regarding costs, network down-time, and end user interruption shall result from the re-installation of specified components due to manufacturer defects or contractor poor performance. Scheduling for re- installation work shall be coordinated, in writing, with the owner prior to beginning any re- installation work.

3.4 CLOSEOUT ACTIVITIES

A. Contractor shall provide documentation of all telecommunications system components under this section utilized throughout the site for review and reference by the Owner and A/E team.

B. Contractor to submit all as-built drawings and any test documentation required prior to acceptance by the Owner.

END OF SECTION

SECTION 271123 - COMMUNICATIONS CABLE MANAGEMENT AND CABLE RUNWAY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Provides specifications for cable management components utilized inside each telecommunications distribution space to support the management of horizontal workstation cabling, backbone cabling, and patch cords.
2. Vertical Cable Management
3. Horizontal Cable Management
4. Cable Runway System

1.2 RELATED DOCUMENTS

A. Section 270500 and all divisions of the specification and general provisions of the Construction Documents.

B. Architectural, mechanical, electrical, and all technology drawings.

C. Refer to Structural Seismic Requirement design documents Specifications, if available, for Non-Structural Components for all structural bracing and support of telecommunications equipment.

1.3 CLOSEOUT SUBMITTALS

A. As-Built Drawings:

1. Submit all as-built drawings in accordance with the general requirements of the construction documents.
2. Submit as-built drawings a minimum of two (2) weeks after completion of all Division- 27 work for A/E and Owner reference:

1.4 QUALITY ASSURANCE

A. Qualifications – Manufacturer

1. Component manufactures shall be ISO 9001:2000 and offer products that are RoHS compliant.

B. Qualifications – Installer:

1. At a minimum, seventy-five percent (75%) of the onsite contractor provided field technicians shall be factory certified within 12 months by the manufacturer of the selected telecommunications system components being installed. Proof of certification shall be available on site for review at all times for each field technician.

PART 2 - PRODUCTS

2.1 VERTICAL CABLE MANAGEMENT

A. Basis-of-Design Product: Subject to compliance with requirements:

1. CPI

a. F-Series - Ring Cable Manager (for 24” wide cabinet)

1) Part Number TBD

b. Motive System 2-Post Cable Manager 6” and 10”

1) 6” Part Number TBD
2) 10” Part Number TBD

B. Product Options:

1. The indicated manufacturers shall be the basis of the design and each assembly selected shall address the particular infrastructure requirements.

C. Description:

1. All new Server Room/BDF/IDF cabinets and racks shall include vertical cable management as noted in the drawings.
2. All vertical cable management on cabinets and racks shall be full height of available rack units unless otherwise noted in the drawings.
3. Vertical cable management shall be placed on left and right side of cabinets, located on front and rear of cabinet. A total of four (4) vertical Ring Cable managers per cabinet.
4. All components of the cable management system shall be black in color.

D. Accessory Products:

1. Provide any accessory products related to the wire management components to provide a complete and functional infrastructure system.

2.2 HORIZONTAL CABLE MANAGMENT

A. Manufacturer List:

1. CPI

a. Motive System

1) 2 Unit -Part Number TBD
2) 1 Unit -Part Number TBD

B. Product Options:

1. The indicated manufacturers shall be the basis of the design and each assembly selected shall address the particular infrastructure requirements.

C. Description:

1. Where required, all horizontal cable management on 19” relay racks shall be provided in rack unit dimensions as noted in the drawings.
2. Horizontal managers must have sufficient depth and surfaces to allow for category-copper cables bend radii. Single sided horizontal managers to be maximum 8.2” deep.
3. Horizontal cable managers shall be single sided and shall provide sufficient depth to allow for category copper and fiber bend radii internally and when entering and/or leaving the wire management frame.
4. Horizontal cable management shall have dual hinged, removable covers.
5. Transition cable management shall be two rack unit (2 RU) deep upper jumper tray provided with a one and half inch (1.5”) bend radius component compliant with TIA/EIA bend radius requirements.
6. All components of the cable management system shall be black in color.

D. Accessory Products:

1. Provide any accessory products related to the wire management components to provide a complete and functional infrastructure system.

2.3 LADDER RACK

A. Manufacturer List:

1. CPI

a. Ladder Rack

1) 18” Part Number TBD
2) 12” Part Number TBD

b. Ground Cable Support

1) Part Number TBD

B. Product Options:

1. The indicated manufacturers shall be the basis of the design and each assembly selected shall address the particular infrastructure requirements.

C. Description:

1. The ladder rack routing system shall consist of pathway sections, splice connectors, sidewalls, waterfalls, supports, end caps, mounting brackets, and accessories designed to route and manage copper, fiber optic, grounding or power cables.
2. The pathway sections shall be provided in widths: 12” (305 mm).
3. Ladder rack shall be fastened using the proper hanging and connecting hardware, secured in a manner consistent with recommended weight load spacing recommendations.
4. All ladder rack will be connected and supported by ladder rack manufactures splice, junction, wall angle and tri-angle type braces per industry standard and authority having jurisdiction to meet local seismic codes.
5. All overhead ladder tray will be grounded and bonded per TIA standards.
6. Ladder rack sections will be supported every 4 feet, ladder rack spanning over areas that will not attach to a cabinet, rack or wall will be supported by threaded rods ceiling mount kits provided by ladder rack manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Check actual site conditions prior to start of any work. Ensure all preceding trade work associated with the telecommunications system is accurate and complete before proceeding with installation or use of products specified in this section. Examples of work which must be checked include, but are not limited to:

1. Electrical requirements (conduit installation and capacity)
2. The telecommunications rooms are the size shown on the project drawings.
3. Adequate clearances of doors, riser spaces and ceilings for all component of the telecommunications pathway.
4. Examine and compare the telecommunications drawings and specifications with the drawings and specifications of other trades. Report any discrepancies between them to the A/E and obtain written instructions for changes or revisions.

3.2 INSTALLATION

A. Process:

1. Inside telecom spaces the primary cable transport system shall be the overhead cable runway system, as shown in the drawings. Contractor-installed cable runway system shall include all components to complete the installation whether indicated in the contract documents or implied by the design.
2. Install all vertical and horizontal cable management per the manufacturer’s recommended installation instructions, as indicated in the drawings.
3. All cable bundles inside the telecommunications rooms shall be secured with Velcro™ cable wraps; plastic wire ties are not acceptable.

4. Cable ties and Velcro™ wraps shall not be pulled tight enough to kink the cable jacket.
5. Coordinate the cable runway rungs with the vertical cable manager locations to provide for an unobstructed opening above the vertical cable managers or cabinet top openings.
6. Install radius runway drop-out fittings at all instances of cable runway grids where cable bundles enter or exit the cable runway system. Multiple drop-out fittings need to be placed next to each other to accommodate large cable bundles. Install drop-out wing sections at the ends of the waterfall drop-out fittings to ensure cable radius requirements are met where cables exit or enter the cable runway grid from the sides of the runway stringers.
7. Install radius runway drop-out fittings at all instances on both sides above front end of vertical cable managers of cable runway to accommodate patch cord routing in both directions.
8. Install ground cable support fittings to the underside of the upper level cable runway grids to provide a separate pathway for all #6AWG telecom ground cables routed to the telecom ground bars. Neatly bundle ground cables together with Velcro strips and lay inside the ground cable support fitting pathway. Lash ground cable bundles to every second fitting with Velcro strips, reference specification section 270526.
9. Open ended cable runway sections shall be closed with runway termination kits.
10. Support vertical cable runway sections (if required) to the plywood backboards with runway hold down clamp kits.
11. Install all components of the cable runway system under the codes, standards, guidelines, and manufacturer recommendations.
12. Vertical support to the slab above shall be provided if a cable runway section spans a distance greater than four (4) feet.
13. Diagonal braces and threaded rod stiffeners shall be installed as additional structural support assembly as required by the Seismic Requirements for Non-Structural Components for all structural bracing and support of telecommunications equipment.

3.3 RE-INSTALLATION

A. No additional burden to the owner regarding costs, network down-time, and end user interruption shall result from the re-installation of specified components. Scheduling for re- installation work shall be coordinated, in writing, with the owner prior to beginning any re- installation work

3.4 CLOSEOUT ACTIVITIES

A. Contractor shall provide documentation of all telecommunications system components under this section utilized throughout the site for review and reference by the Owner and A/E team.

B. Contractor to submit all as-built drawings and any test documentation required prior to acceptance by the Owner.

END OF SECTION

SECTION 271313 - COMMUNICATIONS COPPER BACKBONE CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Provides specifications for high pair count UTP copper backbone cabling to distribute network signals between telecommunications distribution spaces.
2. Backbone Multi-Pair UTP Cable.

1.1 RELATED DOCUMENTS

A. Section 270500 and all divisions of the specification and general provisions of the Construction Documents.

B. Architectural, mechanical, electrical, and all technology drawings.

C. Refer to Structural Seismic Requirement design documents Specifications, if available, for Non-Structural Components for all structural bracing and support of telecommunications equipment.

1.1 CLOSEOUT SUBMITTALS

A. Warranty Documentation:

1. Submit manufacturers extended warranty certification documentation one (1) week after the warranty acceptance by the manufacturer. It shall be the contractor’s responsibility to facilitate the manufacturer-specific warranty requirements

B. As-Built Drawings:

1. Submit all as-built drawings in accordance with the general requirements of the construction documents.
2. Submit as-built drawings a minimum of two (2) weeks after completion of all Division- 27 work for A/E and Owner reference:

1.1 QUALITY ASSURANCE

A. Qualifications – Manufacturer

1. Component manufactures shall be ISO 9001:2000 and offer products that are RoHS compliant.

B. Qualifications – Installer:

1. At a minimum, seventy-five percent (75%) of the onsite contractor provided field technicians shall be factory certified within 12 months by the manufacturer of the selected telecommunications system components being installed. Proof of certification shall be available on site for review at all times for each field technician.

PART 2 - PRODUCTS

2.1 BACKBONE MULTI-PAIR CABLING

A. Basis-of-Design Product: Subject to compliance with requirements:

1. CommScope, Superior Essex or equal

B. Product Options:

1. The indicated manufacturers shall be the basis of the design and each component selected shall address the particular infrastructure requirements.

C. Description:

1. All voice and data ISP and OSP copper backbone cable is to be rated per the constructed conditions and verified by the contractor prior to installation. Per code, plenum cable is to be installed at all times when a communications cable is exposed in a plenum air space. It is the responsibility of the contractor to bid, purchase, install, and verify the rating of the ISP and OSP cable for the specific construction conditions.
2. Backbone cables that are exposed to moisture shall contain moisture-blocking materials to prevent moisture damage to cable performance.
3. Backbone multi-pair UTP cable shall be Category-3 copper UTP, twenty-four (24) AWG cable.
4. The performance criteria for the UTP backbone cable shall be in accordance with the specific standards for the particular cable’s rating. A category-3 rated cable must perform up to, or beyond the current specification parameters for the published category-3 rating by TIA/EIA 568-C.2.
5. Installed cable shall have appropriate cable construction, including external jacket properties, when installing cables in aerial, outdoor, underground and corrosive environments.

D. Accessory Products:

1. Provide any accessory products related to the UTP copper backbone cabling required to provide a complete and functional infrastructure system.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Check actual site conditions prior to start of any work. Ensure all preceding trade work associated with the telecommunications system is accurate and complete before proceeding with installation or use of products specified in this section. Examples of work which must be checked include, but are not limited to:

1. Electrical requirements (conduit installation and capacity)
2. The telecommunications rooms are the size shown on the project drawings.
3. Adequate clearances of doors, riser spaces and ceilings for all component of the telecommunications system.
4. Examine and compare the telecommunications drawings and specifications with the drawings and specifications of other trades. Report any discrepancies between them to the A/E and obtain written instructions for changes or revisions.

3.1 INSTALLATION

A. Process:

1. Install all copper backbone/station cable per the manufacturer’s recommended installation instructions, under the guidelines of TIA/EIA 568 C and BICSI, and in quantities indicated in the LV series drawings.
2. Install all cables with proper attention paid to bend radii, pulling method, attachment method, and pulling forces. The cable manufacturer's specifications for each particular cable type shall be followed exactly.
3. Backbone cable shall be visually inspected for insufficient bend radius during and after pulling. Damaged cables, or those installed under questionable methods and/or circumstances shall be replaced at no additional cost to the owner.
4. All cable shall be pulled using an appropriate measuring device to ensure that the specified force is not exceeded as noted in manufacture installation guidelines.
5. Install backbone cables with attention paid to aesthetic means and methods when routing cabling within IT spaces.
6. No backbone cable shall be left unsupported for more than four (4) feet, three (3) feet preferred, vertically or horizontally at any time.
7. All backbone cables shall be clearly labeled on both ends and in an accessible location no more than one (1) foot from each cable end.

3.1 RE-INSTALLATION

A. No additional burden to the owner regarding costs, network down-time, and end user interruption shall result from the re-installation of specified components. Scheduling for re- installation work shall be coordinated, in writing, with the owner prior to beginning any re- installation work

3.1 CLOSEOUT ACTIVITIES

A. Contractor shall provide documentation of all telecommunications system components

under this section utilized throughout the site for review and reference by the Owner and A/E team.

B. Contractor to submit all as-built drawings and any test documentation required prior to acceptance by the Owner.

END OF SECTION 271313

SECTION 271323 - COMMUNICATIONS OPTICAL FIBER BACKBONE CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Provides specifications for optical fiber backbone cabling to distribute optical network signals between telecommunications distribution spaces and equipment.
2. Backbone Single-mode Optical Fiber Cable
3. Backbone Multi-Mode Optical Fiber Cable

1.2 RELATED DOCUMENTS

A. Section 270500 and all divisions of the specification and general provisions of the Construction Documents.

B. Architectural, mechanical, electrical, and all technology drawings.

C. Refer to Structural Seismic Requirement design documents Specifications, if available, for Non-Structural Components for all structural bracing and support of telecommunications equipment.

1.3 CLOSEOUT SUBMITTALS

A. As-Built Drawings:

1. Submit all as-built documentation in accordance with the general requirements of the construction documents.
2. Cabling as-built drawings must contain detailed location and identification information coordinated with the as-built cable schedules.
3. All cabling must meet or exceed applicable TIA/EIA testing requirements and any additional parameters outlined in the Commissioning of Communications specification section 27 08 00.
4. Test results must be submitted for owner review and approval adhering to the General Contractor schedule milestones related to the projects active systems integration.

1.4 QUALITY ASSURANCE

A. Qualifications – Manufacturer

1. Component manufactures shall be ISO 9001:2000 and offer products that are RoHS compliant.

B. Qualifications – Installer:

1. At a minimum, seventy-five percent (75%) of the onsite contractor provided field technicians shall be factory certified within 12 months by the manufacturer of the selected telecommunications system components being installed. Proof of certification shall be available on site for review at all times for each field technician.

PART 2 - PRODUCTS

2.1 BACKBONE MULTI-MODE/SINGLE-MODE OPTICAL CABLING

A. Basis-of-Design Product: Subject to compliance with requirements:

1. Corning

B. Product Options:

1. The manufacturers noted above shall be the only manufacturers acceptable to the Owner and A/E. Cable construction shall be a hybrid multi-mode and single-mode fiber stands combined in a single protection jacket as indicated on the project drawings.

C. Description:

1. All backbone OM4 LOMMF cables shall be capable of 10 Gb/s Ethernet signal transmission to 550 meters at 3500/500 MHz/km effective modal bandwidth, while allowing the use of low-cost, 850 nm vertical cavity surface emitting laser (VCSEL). Maximum attenuation for a LOMMF cable shall be no greater than 3.0dB per kilometer using 850nm and 1.0dB per kilometer using 1300nm wavelengths respectively.
2. All backbone single-mode optical fiber cable shall be capable of 10 Gb/s Ethernet signal transmission to 10,000 meters in the 1310nm operating window. Maximum attenuation for a single-mode cable shall be no greater than 0.4dB per kilometer using 1310nm and 0.3dB per kilometer using 1550nm wavelengths respectively.
3. Each optical fiber strand shall be sufficiently free of surface imperfections and inclusions to meet the optical, mechanical, and environmental requirements of this specification and all EIA/TIA 568-C.3 and 568-C.3-1 performance parameters.
4. All optical fibers inside each individual cable shall be provided in counts indicated in the drawings and usable to the fullest capacity specified by the manufacturer and meet required specifications at all times.
5. Indoor/Outdoor backbone multi-mode/single-mode optical fiber cables shall be:

    a. Individual jacketed, tight buffered fiber type.
    b. Cable construction shall be a multi-mode/single-mode hybrid in a single protective outer sheath.
    c. The individual fibers are grouped in jacketed subunits color coded per TIA-598.
    d. Have integrated dielectric central and strength members.

6. The optical fiber cables shall be rated per the installation environment as required by the local Authority Having Jurisdiction and/or National Fire Codes. Select an appropriate cable construction, including external jacket properties, when installing optical fiber cables in aerial, outdoor, underground and corrosive environments.
7. All MMF/SMF shall meet or exceed TIA compliant network cable-testing device certification by an independent laboratory, such as ETL, for verification of high speed, TIA/EIA T568C-compliant performance.

D. Cable sizes defined in Contract Documents.

1. 96-strand Single-mode mode - OSP - Outdoor Rated
2. 24-strand Single-mode / 12-strand Multi-mode – ISP – Riser Rated
3. 6-strand Single-mode mode - ISP – Riser Rated

E. Accessory Products:

1. Provide any accessory products related to the optical fiber backbone cabling required to provide a complete and functional infrastructure system.

2.2 INNDERDUCT SYSTEMS

A. Description:

1. Outside plant shall be constructed with High Density Polyethylene-rated plastic (HDPE)
2. Inside Plant shall be constructed of riser rated Polyethylene-rated plastic.
3. Shall be 25mm or 32mm in diameter as called for on the drawings or as required to provide a maximum of 40% fill.
4. Orange is an acceptable color.
5. Shall be UL listed to 2024 standard.
6. Shall be corrugated in design.
7. Shall be available with two and three-way couplers to join two ends together at pull points.

B. Products:

1. Carlon
2. Endot
3. Premier

2.3 DUCT PLUGS

A. Description:

1. All Duct Plugs shall be constructed of high impact plastic components with durable elastic gaskets.
2. Shall be installed for all innerducts where water may be present.
3. Triplex and/or Quadplex Plugs shall be installed around each innerduct installed in an underground system to organize and support innerducts within

conduits.
4. Fiber Optic Duct Plugs shall be installed inside each innerduct surrounding installed fiber optic cabling.
5. Shall be sized for diameter of the innerduct and fiber optic cable.
6. Expandable Plugs shall be provided within buildings for all unused underground conduits.
7. All duct plugs shall be water and airtight.

B. Acceptable Manufacturer:

1. Triplex Plugs
2. Quadplex Plugs
3. Fiber Optic Duct Plugs
4. Expandable Plugs

PART 3 - EXECUTION

3.1 EXAMINATION

A. Check actual site conditions prior to start of any work. Ensure all preceding trade work associated with the telecommunications system is accurate and complete before proceeding with installation or use of products specified in this section. Examples of work which must be checked include, but are not limited to:

1. Electrical requirements (conduit installation and capacity)
2. The telecommunications rooms are the size shown on the project drawings.
3. Adequate clearances of doors, riser spaces and ceilings for all component of the telecommunications system.
4. Examine and compare the telecommunications drawings and specifications with the drawings and specifications of other trades. Report any discrepancies between them to the A/E and obtain written instructions for changes or revisions.

3.2 INSTALLATION

A. Process:

1. Install all backbone cable per the manufacturer’s required installation instructions, under the guidelines of TIA/EIA 568C and BICSI, and in quantities indicated in the drawings.
2. Install all cables with proper attention paid to bend radii, pulling method, attachment method, and pulling forces. The cable manufacturer's requirement specifications for each particular cable type shall be followed exactly.
3. Backbone cable shall be visually inspected for non-compliant bend radius during and after pulling. Damaged cables, or those installed under questionable methods and/or circumstances shall be replaced at no additional cost to the owner.
4. All cable shall be pulled using an appropriate measuring device to ensure that the specified force is not exceeded as noted in manufacturers requirements.
5. Install backbone cables with attention paid to aesthetic means and methods when

routing cabling within IT spaces. No backbone cable shall be left unsupported for more than three (3) feet vertically or horizontally at any time.

6. Fiber optic cables shall be placed in neat bundles separated from other communications cabling. Fiber optic cables shall be neatly placed and bundled with Velcro ties to the horizontal and vertical cable management and runways at minimum 4-foot intervals, not to exceed every 4th rung, plus all locations where the cables change direction.
7. Provide radius drop out fittings at all locations where fiber optic cables transition from vertical to horizontal cable management systems.
8. All backbone cable shall be securely fastened to the termination shelf with a manufacturers strain relief bracket and termination panel cable clamp in a way that does not damage the optical fiber strands or impede the performance of the media. This secure fastening method shall also serve to insure a secure termination environment.
9. A minimum of three feet (3'-0") of each optical fiber strand shall be left protected within the termination shelf for any future re-termination of a particular optical fiber strand.
10. All backbone cables shall be clearly labeled on both ends and in an accessible location no more than one (1) foot from each cable end.

3.3 RE-INSTALLATION

A. No additional burden to the owner regarding costs, network down-time, and end user interruption shall result from the re-installation of specified components. Scheduling for re- installation work shall be coordinated, in writing, with the owner prior to beginning any re- installation work

3.4 CLOSEOUT ACTIVITIES

A. Contractor shall provide documentation of all telecommunications system components under this section utilized throughout the site for review and reference by the Owner and A/E team.

B. Contractor to submit all as-built drawings and any test documentation required prior to acceptance by the Owner.

END OF SECTION 271323

SECTION 271513 - COPPER HORIZONTAL CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Provides specifications for four-pair UTP copper horizontal workstation cabling to distribute network signals from telecommunications distribution spaces to work area outlet locations.
2. Category 6 CMP rated, Four-Pair Copper Cabling.
3. RG6 Coaxial CMP rated Cabling.

1.2 RELATED DOCUMENTS

A. Section 270500 and all divisions of the specification and general provisions of the Construction Documents.

B. Architectural, mechanical, electrical, and all technology drawings.

C. Refer to Structural Seismic Requirement design documents Specifications, if available, for Non-Structural Components for all structural bracing and support of telecommunications equipment.

1.3 CLOSEOUT SUBMITTALS

A. As-Built Drawings:

1. Submit all as-built drawings in accordance with the general requirements of the construction documents.
2. Submit as-built drawings a minimum of two (2) weeks after completion of all Division - 27 work for A/E and Owner reference:
3. All cabling must meet or exceed applicable TIA/EIA testing requirements and any additional parameters outlined in the Commissioning of Communications specification section 27 08 00.
4. Test results must be submitted for owner review and approval adhering to the General Contractor schedule milestones related to the projects active systems integration.

1.4 QUALITY ASSURANCE

A. Qualifications – Manufacturer

1. Component manufactures shall be ISO 9001:2000 and offer products that are

RoHS compliant.

B. Qualifications – Installer:

1. At a minimum, seventy-five percent (75%) of the onsite contractor provided field technicians shall be factory certified within 12 months by the manufacturer of the selected telecommunications system components being installed. Proof of certification shall be available on site for review at all times for each field technician.

PART 2 - PRODUCTS

2.1 FOUR PAIR CATEGORY 6 CABLING

A. Basis-of-Design Product: Subject to compliance with requirements:

1. Superior Essex

a. Category 6 CMP Rated

2. Or approved equal

B. Product Options:

1. The indicated manufacturers shall be the basis of the design and each component selected shall address the particular infrastructure requirements.

C. Description:

1. All Category-6 performance four (4) pair cable shall consist of eight (8) twenty-four (23) gauge, or greater, thermoplastic insulated solid twisted conductors that utilize the industry standard color code designations.
2. The performance criteria for four (4) pair cable shall be above and beyond specific EIA/TIA 568-C.2 standards for the particular cable's rating and shall show stable performance with documented electrical characterization out to 500 MHz.
3. Four (4) pair cables must perform over and above each of the current specification parameters for the latest published twisted pair, 10Gb performance cable solution.
4. Cables shall be rated per the installation environment as required by the local AHJ and local codes.
5. Select an appropriate cable construction, including external jacket properties, when installing cables in aerial, outdoor, underground and corrosive environments.
6. Cable to be run continuous without splices.

D. Accessory Products:

1. The indicated manufacturers shall be the basis of the design and each component selected shall address the particular infrastructure requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Check actual site conditions prior to start of any work. Ensure all preceding trade work associated with the telecommunications system is accurate and complete before proceeding with installation or use of products specified in this section. Examples of work which must be checked include, but are not limited to:

1. Electrical requirements (conduit installation and capacity)
2. The telecommunications rooms are the size shown on the project drawings.
3. Adequate clearances of doors, riser spaces and ceilings for all component of the telecommunications system.
4. Examine and compare the telecommunications drawings and specifications with the drawings and specifications of other trades. Report any discrepancies between them to the A/E and obtain written instructions for changes or revisions.

3.2 INSTALLATION

A. Process:

1. Install all horizontal station cabling per the manufacturer’s recommended installation instructions, under the guidelines of TIA/EIA 568C and BICSI, and in quantities indicated in the drawings.
2. Locations requiring horizontal cable shall be, but not limited to, CCTV, Elevator control panels, work area outlet, POE Clocks, Mass Notification and Wi-Fi.
3. Install all cables with proper attention paid to bend radii, pulling method, attachment method, and pulling forces. All cable shall be pulled using an appropriate measuring device to ensure that the specified force is not exceeded as noted in BICSI installation guidelines. Also refer to the cable manufacturer's specifications for exact cable requirements per the particular cable type.
4. All cables shall be visually inspected for insufficient bend radius during and after pulling. Damaged cables, or those installed under questionable methods and/or circumstances shall be replaced at no additional cost to the owner.
5. Contractor shall ensure that all TIA/EIA and industry standards are met with special regards to maximum stripping length of cable jackets. No four (4) pair UTP cables shall have more than three-eight inch (3/8”) of cable jacket removed beyond the termination points.
6. Install the horizontal cabling with attention paid to aesthetic means and methods when routing cabling within IT spaces. All horizontal cabling shall terminate in their respective floor serving technology space; specifically cables from floor outlets need to terminate in their corresponding floor telecom room.
7. All cabling distributed horizontally through metal stud framing shall have plastic protective bushings inserted to protect cables prior to installation.
8. All cables shall be clearly labeled on both ends and in an accessible location no more than six inches (0’-6”) from the cable ends.
9. The owner reserves the right to specify a new location for any outlet or equipment without increasing contractor unit cost – providing that the new location is specified prior to roughing-in of technology cable and is not farther than ten (10) feet away from the original location specified.
10. Communication EMT conduit sleeves shall receive conduit waterfall to control

bend radius of the communication cable to a minimum of a 4” radius.

3.3 RE-INSTALLATION

A. No additional burden to the owner regarding costs, network down-time, and end user interruption shall result from the re-installation of specified components. Scheduling for re- installation work shall be coordinated, in writing, with the owner prior to beginning any re- installation work

3.4 CLOSEOUT ACTIVITIES

A. Contractor shall provide documentation of all telecommunications system components under this section utilized throughout the site for review and reference by the Owner and A/E team.

B. Contractor to submit all as-built drawings and any test documentation required prior to acceptance by the Owner.

END OF SECTION

SECTION 271543 - COMMUNICATIONS FACEPLATES AND CONNECTORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Provides specifications for horizontal workstation cable termination components and outlet housing component. Includes wall-mount, floor-mount, and ceiling-mount components to support the various workstation outlets throughout the cabling plant.
2. Copper Category 6 Connectors UTP
3. Multi-Mode Anaerobic connectors
4. Single-Mode Optical Fiber Pigtail Connector Assemblies/Splice-On Connectors
5. Outlet Housing Components (faceplates etc.)

1.2 RELATED DOCUMENTS

A. Section 270500 and all divisions of the specification and general provisions of the Construction Documents.

B. Architectural, mechanical, electrical, and all technology drawings.

C. Refer to Structural Seismic Requirement design documents Specifications, if available, for Non-Structural Components for all structural bracing and support of telecommunications equipment

1.3 CLOSEOUT SUBMITTALS

A. As-Built Drawings:

1. Submit all as-built drawings in accordance with the general requirements of the construction documents.
2. Submit as-built drawings a minimum of two (2) weeks after completion of all Division - 27 work for A/E and Owner reference:

1.4 QUALITY ASSURANCE

A. Qualifications – Manufacturer

1. Component manufactures shall be ISO 9001:2000 and offer products that are RoHS compliant.

B. Qualifications – Installer:

1. At a minimum, seventy-five percent (75%) of the onsite contractor provided field technicians shall be factory certified within 12 months by the manufacturer of the selected telecommunications system components being installed. Proof of certification shall be available on site for review at all times for each field technician.

PART 2 - PRODUCTS

2.1 COPPER UTP CONNECTORS

A. Basis-of-Design Product: Subject to compliance with requirements:

1. Category UTP Category 6 Connectors (warranty compliant)
2. Or approved equal

B. Product Options:

1. The manufacturers noted above shall be the only manufacturers acceptable to the Owner and A/E.

C. Description:

1. All UTP/STP connectors shall be rated to perform at or above current TIA/EIA performance parameters of the UTP cabling it is terminating within the communications system.
2. All UTP/STP connectors shall have an eight (8) position, eight (8)-conductor module that accepts RJ-45 plugs.
3. When utilized as part of a channel or permanent link, all high performance modular outlet connectors shall not decrease the horizontal cable elevated performance transmission requirements before and after installation as specified in ANSI/TIA/EIA 568-C Commercial Building Telecommunications Cabling Standard (horizontal cable section) in all noted performance parameters.

D. Accessory Products:

1. Provide any accessory products related to the UTP connectors required to provide a complete and functional infrastructure system.
2. Port RJ-45 jack block out device to safely secure access to unused ports and deter vandalism to jacks.
3. Provide complete with all required mounting hardware and fittings and cables needed.

2.2 SINGLE MODE OPTICAL FIBER PIGTAIL CONNECTORS ASSEMBLIES

A. Manufacturer List:

1. Corning

B. Product Options:

1. The manufacturers noted above shall be the only manufacturers acceptable to the Owner and A/E.

C. Description:

1. Single mode Optical fiber pigtail connector assemblies housed in manufacturers connector panels.
2. FuseLite Splice on Connector is acceptable.
3. Duplex LC style connectors.
4. Maximum insertion loss across mated pair shall be less than 0.3 dB, tested per FOTP-171 Method A. Typical Insertion loss should be maximum of 0.15 dB. Minimum return loss shall be less than 60.5 dB, tested per FOTP-171. Typical return loss should be 60 dB.
5. Pigtails shall have minimum 2 meters of attached cordage.
6. Pigtails shall be assembled and tested by the connector manufacturer.

D. Accessory Products:

1. Provide any accessory products and tool kits related to the termination of the optical fiber connectors to provide a complete and functional infrastructure system.

2.3 MULTIMODE OPTICAL FIBER CONNECTORS (FIELD TERMINATE)

A. Manufacturer List:

1. Corning:

a. Anaerobic adhesive connector
b. Or approved

B. Product Options:

1. The manufacturers noted above shall be the only manufacturers acceptable to the Owner and A/E.

C. Description:

1. All indoor multimode optical fiber connectors shall be OM4 LC-type connectors, rated and approved by the manufacturer to perform at the level designated by the optical fiber strands being terminated. Each connector shall allow rapid termination of inter- building, intra-building, and horizontal indoor optical fiber cables.
2. The connector shall be field installable type and contain a mechanical splice.
3. Connector shall have a fiber stub in the ceramic connector ferrule that is bonded in the ferrule micro-hole, the connector shall not require end face polishing in the field.
4. When tested in accordance with FOTP-171, the connector shall be consistently capable of insertion losses 0.1 dB (typical) and shall be 0.5 dB (maximum) when installed in accordance with the manufacturers recommended procedure.

D. Accessory Products:

1. Provide any accessory products and tool kits related to the termination of the optical fiber connectors to provide a complete and functional infrastructure system.

2.4 OUTLET HOUSING COMPONENTS

A. Manufacturer List:

1. Systimax

B. Product Options:

1. The manufacturers noted above shall be the only manufacturers acceptable to the Owner and A/E.

C. Description:

1. All outlet housings at the various technology outlet locations shall provide the designated number modular insert ports as indicated in the drawings.
2. All flush-mounted faceplates shall be provided per the port configurations shown on the telecom drawings.
3. Faceplates for wall-mounted phones shall be one (1) port single gang faceplates that have wall-mount lugs allowing vertical phone mounting.
4. Faceplates for flush floor mounted outlets shall be coordinated with the floor box or poke thru device that will be selected and installed outside the scope of this section.
5. System furniture faceplates shall be capable of fitting in the furniture system selected by the Owner. Furniture faceplates shall be provided per the port configurations shown on the telecom drawings. Furniture faceplate extenders shall be used (if required) to maintain proper bend radii within the furniture raceway/pathway.
6. Surface mounted boxes shall be capable of the quantity of outlet jack requirements at each outlet locations indicted in the drawings.
7. All outlet-housings shall provide a clear TIA/EIA 606-A labeling location for both the individual outlet port and the entire outlet housing location, unless otherwise indicated in the project drawings.

D. Accessory Products:

1. Provide any accessory products related to the workstation outlet housing components required to provide a complete and functional infrastructure system.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Check actual site conditions prior to start of any work. Ensure all preceding trade work associated with the telecommunications system is accurate and complete before proceeding with installation or use of products specified in this section. Examples of work

which must be checked include, but are not limited to:

1. Electrical requirements (conduit installation and capacity)
2. The telecommunications rooms are the size shown on the project drawings.
3. Adequate clearances of doors, riser spaces and ceilings for all component of the telecommunications system.
4. Examine and compare the telecommunications drawings and specifications with the drawings and specifications of other trades. Report any discrepancies between them to the A/E and obtain written instructions for changes or revisions.

3.2 INSTALLATION

A. Process:

1. Install all connectors and couplers under the guidelines of the manufacturers' recommended instructions and per all TIA/EIA 568C standards, BICSI guidelines, and manufacturer approved industry practices.
2. The installation and performance parameters of all installed couplers and connectors shall be verified by the trade contractor through TIA/EIA 568C testing procedures.
3. Color of all outlet housing components shall be coordinated with the Owner before purchase and installation.
4. All technology outlets located on walls shall be flush mounted, level and plumb.
5. All technology outlets shall be mounted at right angles and parallel to the floor, unless installation requirements or design dictate otherwise.
6. Install blank inserts in outlet housing spaces that are not being filled with cable termination modules. Blank inserts shall match the workstation housing color, unless otherwise indicated in the drawings.
7. All outlets located in systems furniture may be served from a wall adjacent to the furniture cluster or a floor box. If the cable is exposed prior to entering furniture raceway, install spiral wrap tubing to protect the cable per the manufacturer's recommendations.
8. All outlet housings as well as each individual utilized port must be labeled in accordance with the Owner-approved labeling scheme.

3.3 RE-INSTALLATION

A. No additional burden to the owner regarding costs, network down-time, and end user interruption shall result from the re-installation of specified components. Scheduling for re- installation work shall be coordinated, in writing, with the owner prior to beginning any re- installation work

3.4 CLOSEOUT ACTIVITIES

A. Contractor shall provide documentation of all telecommunications system components under this section utilized throughout the site for review and reference by the Owner and A/E team.

B. Contractor to submit all as-built drawings and any test documentation required prior to acceptance by the Owner.

END OF SECTION

SECTION 271619 - COMMUNICATION PATCH CORDS, STATION CORDS, AND CROSS CONNECT WIRE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Provides specifications for Category 6 and optical fiber horizontal cable patching to distribute network signals.
2. Copper Category 6 Patch Cords UTP.
3. Optical Fiber Patch Cords.

1.2 RELATED DOCUMENTS

A. Section 270500 and all divisions of the specification and general provisions of the Construction Documents.

B. Architectural, mechanical, electrical, and all technology drawings.

C. Refer to Structural Seismic Requirement design documents Specifications, if available, for Non-Structural Components for all structural bracing and support of telecommunications equipment.

1.3 CLOSEOUT SUBMITTALS

A. As-Built Drawings:

1. Submit all as-built drawings in accordance with the general requirements of the construction documents.
2. Submit as-built drawings a minimum of two (2) weeks after completion of all Division- 27 work for A/E and Owner reference:

1.4 QUALITY ASSURANCE

A. Qualifications – Manufacturer

1. Component manufactures shall be ISO 9001:2000 and offer products that are RoHS compliant.

B. Qualifications – Installer:

1. At a minimum, seventy-five percent (75%) of the onsite contractor provided field technicians shall be factory certified within 12 months by the manufacturer of the

selected telecommunications system components being installed. Proof of certification shall be available on site for review at all times for each field technician.

PART 2 - PRODUCTS

2.1 COPPER UTP/STP PATCH CORDS

A. Basis-of-Design Product: Subject to compliance with requirements:

1. Category 6 UTP.

B. Product Options:

1. The indicated manufacturers shall be the basis of the design and each assembly selected shall address the particular infrastructure requirements.

C. Description:

1. Category 6 UTP Copper patch cords for equipment patching (RJ-45 to RJ-45 Cords): Modular RJ45 male plug connector's equipped with (8) eight gold anodized pins shall be factory terminated at each end of the patch cords. Modular plug connectors will be snag free in design or will utilize a molded plastic boot to cover the modular plug tab. Category 6 UTP cords shall be 26 AWG.
2. All patch cords shall conform to the requirements of the EIA/TIA 568C.2 standard performance parameters and shall also guarantee headroom margin above the minimum EIA/TIA 568C standard NEXT and PSNEXT requirements; and shall provide positive ACR to 5000 MHz-km as part of the connectivity system.
3. All copper UTP patch cords shall have stranded conductors that match the EIA/TIA 568-C performance characteristics of the category cable specified.
4. Patch cord performance levels shall be equal to or greater than the performance level of the installed UTP cabling system.
5. All copper patch cord lengths for patching inside the telecom rooms are to be provided appropriate to patching from network equipment ports to the copper patch panels ports within the Data Center and IDF.

D. Accessory Products:

1. Provide any accessory products related to the UTP/STP connectors required to provide a complete and functional infrastructure system.
2. Port RJ-45 patch cord lock-in device to safely secure access to patched cords and deter accidental removal to network connection.
3. Provide complete with all required mounting hardware and fittings and cables needed.

2.2 OPTICAL FIBER PATCH CORDS

A. Basis-of-Design Product: Subject to compliance with requirements:

1. Corning

B. Product Options:

1. The indicated manufacturers shall be the basis of the design and each assembly selected shall address the particular infrastructure requirements.

C. Description:

1. All optical fiber patch cords shall conform to the requirements of the EIA/TIA 568C.3- 1 standard performance parameters for the multimode or single-mode optical fiber and shall have the same manufacturer, cable type, connector and polish as noted for the backbone fiber.
2. All optical patch cords shall have push-pull strain relief boot and duplex clip.
3. All optical fiber patch cord lengths are to be provided appropriate to patching from network equipment ports to the optical fiber patch panels ports within the Data Center and IDF.
4. It is the responsibility of the contractor to verify lengths and counts of optical fiber patch cords with the owner prior to purchase.
5. All single-mode patch cord colors are to be industry standard yellow and provided in a duplex configuration.
6. All multi-mode patch cord colors are to be industry standard aqua and provided in a duplex configuration.
7. Any optical fiber patch cords purchased without written authorization by the Owner are purchased at the contractor's own risk.

D. Accessory Products:

1. Provide any accessory products related to the optical fiber connectors required to provide a complete and functional infrastructure system.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Check actual site conditions prior to start of any work. Ensure all preceding trade work associated with the telecommunications system is accurate and complete before proceeding with installation or use of products specified in this section. Examples of work which must be checked include, but are not limited to:

1. Electrical requirements (conduit installation and capacity)
2. The telecommunications rooms are the size shown on the project drawings.
3. Adequate clearances of doors, riser spaces and ceilings for all component of the telecommunications system.
4. Examine and compare the telecommunications drawings and specifications with the drawings and specifications of other trades. Report any discrepancies between them to the A/E and obtain written instructions for changes or revisions.

3.2 INSTALLATION

A. Process:

1. Install all horizontal cable per the manufacturer's recommended installation instructions, under the guidelines of TIA/EIA 568 C and BICSI.
2. Category 6 equipment Patch cords: Provide (2) copper patch cords (one for each end of the cable termination) for every Category cable installed.
3. Fiber Optic Equipment Patch cords: Provide (2) fiber optic LC duplex patch cords (one for each end of fiber termination) for every pair of fiber strands installed.
4. All patch cord lengths are to be provided appropriate to patch from rack mounted network equipment ports to the rack mounted horizontal station outlet patch panel ports within the Data Center/IDF and from the workstation outlet to the computer/or other IP end device NIC card/RJ45 port.
5. Provide new, sealed patch cords in lengths, colors and counts approved in writing by the owner.
6. It will be the responsibility of the communication contractor to provide install all Category 6 and Fiber patch cords per direction and coordination of owner IT dept.

3.3 RE-INSTALLATION

A. No additional burden to the owner regarding costs, network down-time, and end user interruption shall result from the re-installation of specified components. Scheduling for re- installation work shall be coordinated, in writing, with the owner prior to beginning any re- installation work.

3.4 CLOSEOUT ACTIVITIES

A. Contractor shall provide documentation of all telecommunications system components under this section utilized throughout the site for review and reference by the Owner and A/E team.

B. Contractor to submit all as-built drawings and any test documentation required prior to acceptance by the Owner.

END OF SECTION

SECTION 274116 - INTEGRATED AUDIO-VIDEO SYSTEMS AND EQUIPMENT

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. The work under this section includes all final design, labor, material, equipment, supplies, alignment for displays, system testing, transportation, and accessories required to furnish and install a complete-seamless, AV Smart TV system as indicated on the drawings and as specified herein. The Audiovisual Systems shall also be defined as all cables, equipment, mounting hardware, products, etc., as shown on the drawings and mentioned in these specifications.

B. The Drawings and Specifications for the Audiovisual System Contractor intend to provide the final design, supply, and install a complete, fully operational, and tested Audiovisual System.

C. All miscellaneous system components including, but not limited to, plenum cables, speakers, signal converters, interface panels and components, termination equipment, patch panels, backboards, converters, matrix switchers, digital video extenders, controllers, digital signal processors, amplifiers, pre-amps, custom faceplates, mounting hardware, fasteners, racks, cabinets, and any other related items shall be furnished and installed completely under this section, such that the System shall perform all functions listed herein in compliance with all of the specified requirements.

D. The schedule is paramount to the Project's success. With this, the Contractor will have to be a team player, continually working with the team to facilitate expeditious design, procurement, and construction processes.

E. Project Summary – (Include a summary of types of rooms)

1. Common Areas: Lobby, Social Lounges, and Study Rooms, typical
   The area will have one (1) wall mounted Smart TV with a Cat6x Patch cable connection to the IP to access Hulu, Amazon, Netflix and can also be used as informational signage.

1.2 RELATED WORK, STANDARDS, DOCUMENTS, AND PUBLICATIONS

A. Documents affecting the work of this section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and sections of all Divisions of these specifications.

B. All applicable portions shall apply to this section as though written herein entirely.

C. The Contractor is responsible for referencing all Architectural, Mechanical, Electrical, and Structural Drawings for additional information about pathways and/or obstructions.

D. REFERENCES

1. National Electrical Manufacturer's Association (NEMA)
2. American National Standards Institute (ANSI)
3. Audiovisual and Integrated Experience Association (AVIXA)
4. National Electric Code (NEC)
5. Relevant State Electric and Fire Codes
6. Institute of Electrical and Electronic Engineers (IEEE)
7. Underwriters Laboratories, Inc. (UL.)
8. ANSI/TIA 568-C.0 Generic Telecommunications Cabling for Customer Premises
9. ANSI/TIA 568-C.1, Commercial Building Telecommunications Cabling Standard
10. ANSI/TIA 568-C.2, Balanced Twisted-Pair Telecommunications Cabling and Components Standard
    ANSI/TIA 568-C.2-1, Transmission Performance Specifications for 4-pair 100 Ω Category 6 Cabling, provided the accuracy requirements for Level III Field Testers;
11. ANSI/TIA 568-C.3, Optical Fiber Cabling Components, Standard
12. ANSI/TIA 569A, Commercial Building Standard for Telecommunications Pathways and Spaces
13. ANSI/TIA 598, Color Coding of Optical Fiber Cables
14. ANSI/TIA 606, The Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
15. ANSI/TIA 607, Commercial Building Grounding and Bonding Requirements for Telecommunications
16. TIA TSB 67 Transmission Performance Specifications for Field Testing of Unshielded Twisted-Pair Cabling System
17. BICSI – Building Industry Consulting Service International publications:
18. Telecommunications Distribution Methods Manual
19. LAN and Internetworking Design Manual
20. Telecommunications Cabling Installation Manual
21. The Owner's Outside Plant Design Manual
22. Manufacturer's recommendations and installation guidelines
23. All cabling shall comply with all appropriate requirements of NEC Articles 770 and 800 and shall comply with the State Fire Codes as interpreted by the California State Fire Marshall's Department.
24. All publications referred to in this document shall be the latest publicized edition thereof together with any amendments and/or addenda current ten days before the date fixed for the return of bids.

1.3 GENERAL REQUIREMENTS

A. Manufacturer: The term "manufacturer" shall be defined as the company, or group of companies, that produces the products meeting the requirements of Section 2 of this document. The Manufacturer shall have a minimum of ten (10) years experience in manufacturing products of this type and shall be ISO 9001 Certified.

B. Contractor: The term "Contractor" shall be defined as the company, or group of companies, that installs the products per Section 2 of this specification document. The Contractor selected shall provide the installation of this System and shall be certified by

the Manufacturer(s) in all aspects of the design, installation, and testing of the products described herein.

1. The Contractor shall hold a valid State of California C-7 Low-Voltage license, shall have completed at least five (5) projects of equal scope, and shall have been in the business of furnishing and installing systems of this scope and magnitude for at least five (5) years, with the capability of being bonded to assure the Owner's Project Manager of performance and satisfactory service during the guarantee period.
2. The Contractor shall hold all other licenses required by the legally constituted Authorities Having Jurisdiction (AHJ) over the work.
3. All work shall be performed under the supervision of a Contractor accredited by the Manufacturer and have certifications available for presentation to the build team.
4. The Contractor shall be a manufacturer's authorized distributor and warranty station for the equipment offered and shall maintain a fully equipped service organization capable of furnishing adequate repair service to the equipment. The Contractor must be certified by the Manufacturer a minimum of 180 days before the bid opening.
5. The Contractor selected for this Project must adhere to the engineering, installation, and testing procedures and utilize the authorized manufacturer components and distribution channels in provisioning this Project.
6. Personnel: Use adequate numbers of skilled workers who are thoroughly trained and experienced with the specified requirements and the methods needed for the proper performance of the Audiovisual Systems installation work specified herein.
7. Designated Project Engineer: The Contractor shall provide a designated Project Engineer in charge of the Design, CAD, In-House testing, and on-site commissioning of the Project during all phases of the work of this specification. This Project Engineer shall hold a current AVIXA CTS certification minimum at the time of the bid and shall be the same individual through the execution of the work unless illness, loss of personnel, or other circumstances reasonably beyond the control of the Contractor intervene.
8. Technicians: shall have at least three (3) years of direct experience in similar work. The AVS technicians assigned to this Project shall be fully trained and qualified and carry valid and current industry certifications regarding audiovisual systems' installation, operation, and testing. At least one AVIXA CTS certification at the bid time shall be assigned as the Lead Technician to the Project.
9. Designated Project Manager: Provide a designated Project Manager in responsible charge of the fabrication shop and on the Project Site during all phases of installation and testing of the work of this specification. The Project Manager shall hold current AVIXA CTS and shall be the same individual through the execution of the work unless illness, loss of personnel, or other circumstances reasonably beyond the control of the Contractor intervene.

1.4 QUALITY ASSURANCE

A. To maintain a high degree of quality assurance, the Contractor shall, without exception, use the parts and supplies as specified on the drawings and in this specification.

B. For any proposed product substitution or when the Contractor intends to include an "or equal" product in the bid pricing, provide a substitution request submittal to the Owner's Project Manager for review no later than fifteen (15) calendar days prior to Bid submittal. This report shall include:

1. Description of how the proposed product(s) will impact meeting the project completion date, indicated item(s) with lead times and expected delivery date(s).
2. Itemized cost comparisons between the proposed product(s) and the listed product(s).
3. Detailed technical analysis of the electrical and mechanical specification differences between the proposed product(s) and the listed product(s).
4. ETL "Verified" or UL "Verified" test lab documentation for the proposed product(s), component(s), and assemblies.
5. Proposed product identification and manufacturer literature (specifications and cut sheets).
6. Name, address, and contact information of several similar projects where the proposed product(s) have been used.
7. Name, address, and contact information of the proposed product(s) manufacturer's local representative.
8. Sample proposed product(s) manufacturer's warranty.

C. The Owner's Project Manager and Design Team must approve any proposed product(s) substitution item in writing. The Owner's Project Manager and Design Team reserves the right to require a complete sample of any proposed product(s) and may request a sample tested by an independent testing consultant to prove equality. The decision of the Owner's Project Manager and Design Team regarding the equality of proposed product(s) items will be final.

D. Suppose a proposed product(s) is given a final acceptance by the Owner's Project Manager. In that case, the Contractor shall reimburse the Owner's Project Manager and Design Team for the costs to review the proposed product(s) substitution(s), and for any additional engineering charges and shall pay all charges of other trades resulting from this product(s) use, at no cost to the Owner.

E. It is a mandatory requirement that a single Contractor perform the work described in this specification.

1.5 BID SUBMITTAL REQUIREMENTS

A. Pre-Qualification Certificates: Provide current training certificates for the design, engineering, installation, and testing of the proposed products.

B. Manufacturer Tests: The Contractor shall submit all manufacturer test information prior to installation. If the equivalent product(s) are substituted, the comparable product(s) must show demonstrated and documented equivalence to the product(s) specified.

C. Bid Forms: The Contractor shall submit the completed detailed bid forms provided with this specification. Lump sum bids will not be accepted.

D. Project Narrative: The Contractor shall submit a summary of the scope of work, in Contractor's own words, illustrating a complete and thorough understanding of the Project. The narrative shall include, but not be limited to, the room-by-room scope of work, project staffing and duration, quality assurance procedures and methodology, problem escalation procedures, and project schedule.

E. Proposed Solution: The Contractor shall provide manufacturers data or specifications sheets for all the proposed materials that meet the requirements listed/described in Section 2 of this specification. On each data or specification sheet, the Contractor shall provide an indicating arrow next to each part number of the proposed material.

F. A resume of qualifications shall be submitted with the Contractor's bid indicating the following:

1. The Contractor shall hold a valid State of California C-7 Low-Voltage license, shall have completed at least five (5) projects of equal scope, shall have been in the business of furnishing and installing systems of this scope and magnitude for at least five (5) years, and capable of being bonded to assure the Owner's Project Manager of performance and satisfactory service during the guarantee period.
2. The Contractor shall hold all other licenses required by the legally constituted authorities having Jurisdiction over the work.
3. The Contractor shall provide a technical resume listing the experience of the Contractor's Project Manager, who will be assigned to this Project. This individual will remain as Project Manager for the duration of the Project. The Contractor may change Project Managers only with the Owner's Project Manager's written approval.

G. The Contractor shall furnish a letter from the Manufacturer, which certifies that the Contractor is an Authorized Distributor and equipment is to be installed according to the Manufacturer's intended practices. The Contractor shall also furnish a written guarantee from the Manufacturer that they will have a service representative assigned to this area for the life of the equipment.

H. The Contractor shall submit a detailed Bill of Materials developed for the Project. The Bill of Materials shall contain a room-by-room list of every component, part, or device by part description, Manufacturer, and Manufacturer's part number, quantity, and unit of measure. See the example format below. The product data or the specification sheets shall be organized to match the order listed in the Bill of Materials. All cut sheets shall be numbered sequentially with matching page numbers indicated on the Bill of Materials. If more than one-part number appears on a cut sheet, the Contractor shall identify the proposed part with a RED arrow or RED circle.

Description	MFG & Part #	Quantity	Unit of Measure	Price
Smart TV/Display	Manufacturer	1	Each	$

I. This information may be used by the Owner to evaluate the Contractor's general understanding of the project scope during the bid evaluation. Errors/Omissions from this bill of material do not relieve the AVS contractor from providing all material, components, labor, etc., as outlined in this specification and on the drawings to provide a complete and useable AVS system.

J. Provide three (3) copies of the above information at bid time.

1.6 POST-AWARD SUBMITTALS: SUBMIT WITHIN THIRTY (30) DAYS OF THE AWARD.

A. Submittals shall be in two (2) deliverables.

1. The first submittal shall be created in PDF format with bookmarks. Contain a statement of any sub-contractors, franchises, distributorship, dealerships, arrangements, and agreements with equipment manufacturers to be used for this work.
A complete bill of materials (BOM) listing equipment room by room. The BOM shall include all materials, components, devices, and equipment required for this work. The BOM shall be constructed in the order of the specification section 2 and shall contain the following information for each item listed:

a. Room Name/Number
b. Quantity
c. Description
d. Manufacturer's name and model number
e. Manufacturer's data or specification sheet

2. The second submittal shall be electronic reproducible shop drawings. The drawings shall include single-line block drawings, equipment locations, and mounting details.

B. Coordinate submittal samples of all finishes/materials that will be visible to the public for approval by the Architect. Include Audiovisual System receptacles and controls with associate trim plate(s) and each type of loudspeaker baffle or grille.

C. Audiovisual System shop drawings: Provide single-line system diagram(s) showing the interconnection of all components, receptacles, terminal blocks, controls, and loudspeakers in addition to the active elements. Include terminal and cable numbers and Audiovisual System and component labels. Show detailed system component information including but not limited to the Manufacturer's name, model number, specialized part number option, and all input and output connection information for each piece of equipment. No drawing codes shall be permitted. Provide one (1) full-scale original or photograph (not blueprint) copy for each System. All shop drawings shall follow The CEA/CEDIA/INFOCOMM J-STD-710, Audio, Video, and Control Architectural Drawing Symbols Standard.

D. For Contractor fabricated items, provide detailed drawings showing all components, devices, and equipment, including dimensions, component values, terminal designations, types, locations, Manufacturer's name, and model number.

1.7 GENERAL SYSTEM PRODUCT, INSTALLATION, AND OVERALL SYSTEM WARRANTY

A. Before Owner acceptance, the Contractor shall provide the Owner's Project Manager with a manufacturer's product and performance warranty. This will require submitting

pre-job certification registration forms and the Project's necessary closing information. The Owner will only acknowledge acceptance upon submittal of a valid manufacturer's warranty.

B. Manufacturer's Site Certifications will not be accepted.

C. The warranty shall commence from the date of the Owner's final written acceptance of the completed Project.

D. All conditions for obtaining the Manufacturer's warranty shall be the sole responsibility of the Contractor.

E. The Contractor shall maintain a competent service organization and shall if requested, submit a service maintenance agreement to the Owner after the end of the guarantee period.

F. A typewritten notice shall be posted at the equipment rack that shall indicate the firm, address, and telephone number to call when service is necessary. This notice shall be mounted in a neatly finished metal frame with a clear plastic window and securely attached to the inside of the door.

1.8 SPECIFIC SYSTEM PRODUCT, INSTALLATION, AND OVERALL SYSTEM WARRANTY

A. Before the Owner's acceptance, the Contractor shall provide the Owner's Project Manager with a manufacturer's product and performance warranty. This will require the submittal of the required pre-job certification registration forms as well as the necessary Project closing information. The Owner will only acknowledge acceptance upon submittal of a valid manufacturer's warranty.

B. The warranty shall commence from the date of the Owner's final written acceptance of the completed Project.

C. All conditions for obtaining the Manufacturer's warranty shall be the sole responsibility of the Contractor.

D. The Contractor shall maintain a competent service organization and shall if requested, submit a service maintenance agreement to the Owner after the end of the guarantee period.

E. A typewritten notice shall be posted at the equipment rack, indicating the firm, address, and telephone number to call when service is necessary. The statement shall be mounted in a neatly finished metal frame with a clear plastic window and securely attached to the inside of the door.

PART 2 - PRODUCTS AND AUDIOVISUAL SYSTEM SCOPE OF WORK

2.1 ACCEPTABLE MANUFACTURERS

A. The bidder is responsible for ensuring that the proposed products meet or exceed every standard outlined in these specifications and the equipment's technical data sheets.

B. The functions and features specified are vital to the operation of this facility. Therefore, the inclusion of a component's Manufacturer in the list of acceptable manufacturers does not release the Contractor from strict compliance with the requirements of this specification.

2.2 SYSTEM FUNCTIONS AND CAPABILITIES:

2.3 AUDIOVISUAL SYSTEM PRODUCTS

A. The System shall utilize Audiovisual products as shown on the drawings and listed below. These products shall be the minimum quantity, performance, functionality, and quality levels. The Contractor shall include all costs for any upgraded components in the base bid and include additional and/or upgraded parts that are needed to meet the performance requirements of this system specification,

B. All Common Areas

1. Display System:

    a. 1-Each, Samsung QN65QN90BAFXZA, Neo QLED 4K Smart TV65" Smart TV/Display.
    b. 1-Each, Chief Mfg. PNRUB, Large Flat Panel Swing Arm Wall Display Mount - 25 Inch Extension.

2. Digital Video System:

    a. The Smart TV is to be Internet Connected.

3. Audio

    a. Speakers built into the Smart TV.

4. Control System:

    a. Hand-held Remote supplied by the TV manufacturer.

2.4 GENERAL PRODUCTS FOR SYSTEMS

A. CABLE – ALL SPACES

1. Data Patch Cable, CAT-6 Twisted Pair Cable, Plenum Rated: (Quantity as required). See Specifications Section 271619 – Communication Patch Cords, Station Cords, and Cross Connect Wire.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

A. The Audiovisual System's installation, wiring, configuration, and programming shall be executed per the drawings and the equipment manufacturer's diagrams. Should any variations in these requirements occur, the Contractor shall notify the Owner's Project Manager before making any changes. It shall be the responsibility of the manufacturer-authorized distributor of the approved equipment to install the equipment and guarantee the System operates as per plans and specifications.

B. Furnish all conductors, equipment plugs, terminal strips, etc., and labor to install a complete and operable system.

C. Splices of cables in underground pull boxes are not permitted unless otherwise noted on the drawings.

D. The labor employed by the Contractor shall be regularly used in the installation and repair of audiovisual systems and shall be acceptable to the Owner's Project Manager to engage in the installation and service of this System.

E. The Contractor shall thoroughly clean all equipment and materials. All exposed parts of the equipment, cabinets, and other equipment shall be left in a clean condition, unblemished, and free of all dirt, dust, smudges, spots, fingerprints, etc. The Contractor shall remove all debris and rubbish created in the course of this Project. The Contractor shall thoroughly clean all buildings of any dirt, debris, trash, marks, etc., caused by the performance of this work.

F. The System must meet all local and other prevailing codes.

G. All cabling installations shall be performed by qualified technicians.

H. All cabling shall be splice free unless otherwise noted on drawings.

I. In order to ensure the least amount of cable untwisting, it is required that all cables shall be stripped using a special tool recommended by the Manufacturer.

J. The use of lubricants (i.e., Yellow 77) to facilitate the installation of cables in conduits is highly discouraged. If such a lubricant must be used, the AVS Contractor shall verify the acceptability of the lubricant to be used with the cable manufacturer before using such a lubricant. Lubricants that harden after installation are not allowed.

K. Under no circumstance are "channel locks" or other pliers to be used.

L. Cables may be installed exposed above ceilings, provided the cabling is supported independently of other utilities such as conduits, pipes, and ceiling support systems. The Contractor shall include all costs in the base bid for any additional supports/seismic bracing required by the Local Authority having Jurisdiction. The cables shall not be laid directly on the ceiling panels. The use of hook and loop ties shall be used in accordance with the cable manufacturer's requirements. The cable jacket composition must meet local, and all other prevailing fire and safety codes – "Plenum Rated" cable shall be used.

M. All fire-rated walls penetrated by the Contractor shall be sealed by use of a non-permanent fire blanket or another method in compliance with the current edition of NFPA and the NEC or other prevailing code and must be a system listed by UL. The Contractor must not use concrete or other non-removable substances for fire stopping on cable trays, wire ways, or conduits. Contractors who use this method will be required to replace all cables affected and provide the specified initially access to each affected area. This requirement also applies to maintaining fire ratings of all floors penetrated by conduits or devices designated for use by voice and data cabling.

N. Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the Contractor before final acceptance at no cost to the Owner.

O. The cable's minimum bend radius and maximum pulling tension shall not be exceeded.

P. Cable raceways, when required, shall not be filled greater than 40% of the cross-sectional area.

3.2 SPECIFIC SYSTEM INSTALLATION REQUIREMENTS

A. All Audiovisual cabling used throughout this Project shall comply with the requirements as outlined in the NEC Articles 725, 760, 770, and 800 and the appropriate local codes. All copper cabling shall bear UL-listed type CMP (Plenum-Rated). All fiber optic cabling shall bear OFNP (Plenum-Rated). The Contractor is responsible for installing appropriately rated cable for the environment in which it is installed. For cables installed outside of a building to outdoor speakers, they shall be Indoor/Outdoor Plant Rated (OPR) or Direct Burial cable and must be run in conduit point to point. For longer cable runs between buildings, fiber optic cable shall be used, and the fiber cable shall be run in conduits.

B. Cable Pathways:

1. In the suspended ceiling and raised floor areas where duct, cable trays, or conduit are not available, the Contractor shall bundle cabling with half-inch wide hook and loop strips so as not to deform the cable geometry. All Cable bundles shall be supported via "J" hooks attached to the existing building structure and framework at a maximum of five (5) foot intervals. The Contractor shall use Plenum-rated hook and loop ties in all appropriate areas. The Contractor shall adhere to the manufacturers' requirements for bending radius and pulling tension of all cables.
2. Cables or J hooks shall not be attached to lift-out ceiling grid supports or laid directly on the ceiling grid.

3. Cables or J hooks shall not be attached to or supported by fire sprinkler heads or delivery systems or any environmental sensor located in the ceiling air space.
4. Where additional conduit(s)/sleeve(s) are required but not provided by the electrical Contractor, the Contractor shall be responsible for providing such conduit(s)/sleeve(s). Conduit(s) and sleeve(s) shall be of suitable material, sized, installed, fire-stopped, and grounded as required by the NEC, ANSI/TIA/EIA standards, and all other applicable codes and standards. Any conduit(s) and sleeve(s) added by the Contractor shall be approved by the Owner's Project Manager before rough-in.

C. The Contractor shall be responsible for damage to any surfaces or work disrupted due to his work. Repair of surfaces, including painting, shall be included, as necessary.

3.3 GENERAL INSTALLATION DESCRIPTION

A. The labor employed by the Contractor shall be regularly used in the installation and repair of Audiovisual Systems and shall be acceptable to the Owner and Architect to engage in the installation and service of this System.

B. The Contractor shall thoroughly clean all equipment and materials. All exposed parts of the equipment, cabinets, and other equipment shall be left in a clean condition, unblemished, and free of all dirt, dust, smudges, spots, fingerprints, etc., The Contractor shall remove all debris and rubbish occasioned by the work from the site. The Contractor shall thoroughly clean all buildings of any dirt, debris, rubbish, marks, etc., Caused by the performance of this work.

3.4 PROJECT DIRECTION

A. Single Point of Contact: The Contractor will provide a single point of contact, i.e., the Contractor's Project Manager, to speak for the Contractor and to provide the following functions:

1. Initiate and coordinate tasks with Owner's Project Manager and others as specified by Owner's Project Manager.
2. Provide day-to-day direction and on-site supervision of Contractor personnel.
3. Ensure conformance with all Contract provisions.
4. Participate in weekly site project meetings.
5. This individual will remain as Project Manager for the duration of the Project. The Contractor may change Project Managers only with the Owner's Project Manager's written approval.

3.5 PLANNING, ENGINEERING, AND SUBMITTALS

A. Planning meetings and schedule: Within thirty (30) calendar days after the date of award of the Contract, an initial planning meeting will be held with the successful bidder to clarify all requirements (systems, services, distribution methods, etc.), identify responsibilities, and schedule the events that will transpire during the implementation of the Project. Within one (1) week of this initial meeting, the Contractor shall provide a

written report and project schedule to clearly document the events and responsibilities associated with the Project.

B. Within Thirty (30) calendar days after the Contract's award date, the Contractor shall submit three copies of the complete submission to the Owner's Project Manager for review. The submission shall consist of four major sections with each section separated with index tabs. Each page in the submission shall be numbered chronologically and shall be summarized in the index.

1. The first section shall be the "index," which shall include the project title and address, the name of the firm submitting the bid, and the name of the Owner.
2. The second section shall contain the comparative specification listing, including a complete listing of the characteristics of the equipment to be furnished next to all of the specified equipment's features and functions as stated in the specifications and data sheets.
3. The third section shall contain an original manufacturer data sheet for every component listed in the drawings or specifications.
4. The fourth section shall contain a designation schedule for each system component location and complete "E" size (30" x 42"), unless otherwise specified, bond drawings showing system wiring plans. The drawings shall be professionally drafted and generated on AutoDesk AutoCAD 2018 computer design software.
5. These drawings shall also include:

    a. As-Built/Closeout Documentation: Within fifteen (15) days after the completion of work (signed off by Owner), the Contractor shall provide a complete Contractor-provided set of professionally drafted "E" size (30" x 42"), unless otherwise noted, reproducible bond as-built drawings, generated on Autodesk AutoCAD 2018 computer design software. The Contractor will supply to Owner one set of CDs or USB thumb memory drives with all documentation.
    b. As-Built shall be provided by the Contractor will provide to Owner with one set of CDs or USB thumb memory drives containing all as-built documentation.
    c. Testing Report: Provide a letter/report documenting the results of these preliminary tests, including amplifier gain/level settings, crossover filter settings, and AV equalization curves for review by the Owner and the AV Design Consultant.

C. Qualification for Acceptance: After completing preliminary testing, the Contractor shall furnish the Construction Manager with the letter/report documenting the results of the initial tests and five (5) copies of "as-built" wiring diagrams of the entire System, including the connection numbers, and their locations. The receipt of this documentation will constitute the Contractor's acknowledgment that the installation is complete, conforms to this specification, and is ready to be reviewed and tested by the Owner's representative and the Audiovisual System Design Consultant.

D. Acceptance Test: During acceptance testing, the Consultant, the Owner's Representative and/or Construction Manager will be present. For the acceptance testing, the Contractor shall provide personnel who participated in the installation, preliminary testing, and adjustment of the Audiovisual Systems.

1. Equipment cabinet keys and any tamper-proof fastener tools must be available to the Owner and the AV Design Consultant. Delays associated with failure to access the equipment will be back charged to the Contractor at the AV Design Consultant's current hourly rates.
2. Each major system component shall be shown to function as specified.
3. Measurements: Further electrical and acoustical measurements may be performed at the discretion of the Owner and/or Owner's Representatives. The acoustical test equipment will be supplied by the Contractor. Such measures may include sound pressure levels, uniformity of coverage, distortion, or other pertinent characteristics.

E. Tests shall be performed on all Audiovisual System equipment. In the event that the tests show the equipment or System is defective or does not comply with the specifications, the Contractor shall perform any and all remedies at his expense and pay the subsequent expenses of any retesting required.

F. Delays: If the acceptance of the System is delayed because it does not meet the specification requirements, the Contractor shall reimburse the Owner for all expenses of consultants retained to represent the Owner during the final acceptance testing. This will include costs associated with travel to the site and reimbursable business travel expenses.

3.6 INSTALLATION

A. All installation shall conform to ANSI/TIA/EIA and AVIXA standards and the Manufacturer's installation guidelines. The Contractor shall ensure that the maximum pulling tensions of the specified distribution cables are not exceeded and cable bends maintain the proper radius during the placement of the facilities. Failure to follow the appropriate guidelines will require the Contractor to provide, in a timely fashion, any additional material and labor necessary to properly rectify the situation to the satisfaction and written approval of the Owner's Project Manager. This shall also apply to all damages sustained to the cables by the Contractor during the implementation.

1. Miscellaneous Equipment: The Contractor shall provide any necessary screws, anchors, clamps, hook & loop ties, distribution rings, wire molding, miscellaneous grounding, and support hardware, etc., essential to facilitate the installation of the System.
2. Special Equipment and Tools: It shall be the responsibility of the Contractor to furnish any special installation equipment or tools necessary to correctly complete the System. This may include, but is not limited to, tools for terminating cables, testing and splicing equipment for copper/fiber cables, communication devices, and jack stands for cable reels or winches.

3.7 DAMAGES

A. The Contractor will be held responsible for all damages to portions of the building caused by it, its employees, or subcontractors, including but not limited to:

1. Damage to any portion of the building caused by the movement of tools, materials, or equipment.
2. Damage to any component of the construction of spaces.
3. Damage to the electrical distribution system.
4. Damage to the electrical, mechanical and/or life safety or other systems caused by inappropriate operation or connections made by the Contractor or other actions of the Contractor.
5. Damage to the materials, tools and/or equipment of the Owner, its consultants, agents, and lease tenants.

3.8 PENETRATIONS OF WALLS, FLOORS, AND CEILINGS

A. Unless specifically shown on the drawings, the Contractor shall make no penetration of floors, walls, or ceilings without the prior written approval of the Owner's Project Manager.

B. Any penetrations through acoustical walls or other walls for cable pathways shall be sleeved by the Contractor. Sleeves shall consist of metallic conduit deburred and grommeted on both ends, with flanges or other means to prevent the sleeve from slipping or falling out of the partition. Sleeves shall extend a minimum of 6" on both sides of the partition. The outside perimeter of sleeves shall be sealed against sound, air, heat, or as required by partition design. Inside of the sleeve shall be sealed similarly after the installation of all cabling. Cables shall be independently supported on either side of the sleeve. Sleeves shall not be used as cable supports. Additional requirements in compliance with the applicable code shall apply.

C. Any penetrations through fire-rated walls for cable pathways/cables shall be sealed by the Contractor as required by code and as directed by Owner's Project Manager. The Contractor shall be required to work with the General Contractor and the Electrical Contractor to coordinate and develop all fire-stopping methods before any cable installation. The Contractor shall also, prior to the commencement of on-site activities, submit to the Owner's Project Manager details of any special systems to be used.

3.9 TESTING/WARRANTY

A. The Contractor shall provide competent, factory-trained engineers and/or technicians, authorized by the Manufacturer of the AVS, to technically supervise and participate during all tests for the systems. All performance testing shall follow the AVIXA (InfoComm) 10:2013 Audiovisual Systems Performance Verification procedure.

3.10 COMPLETION OF WORK

A. At the completion of the System, the Contractor shall restore to its former condition all aspects of the project site and on a daily basis, shall remove all waste and excess materials, rubbish debris, tools, and equipment resulting from or used in the services provided under this Contract All clean up, restoration, and removal noted above shall be by the Contractor and at no cost to Owner. If the Contractor fails in its duties under this paragraph, the Owner may, upon notice to the Contractor, perform the necessary clean-

up and deduct the costs thereof from any amounts due or to become due to the Contractor. It shall be the Contractor's responsibility to remove trash from the areas it is working in and bring trash and debris to the Contractor-provided dumpster.

3.11 INSPECTION

A. On-going inspections shall be performed during construction by the Owner's Project Manager. All work shall be performed in a quality manner, and the overall appearance shall be clean, neat, and orderly.

3.12 MISCELLANEOUS PROJECT REQUIREMENTS SYSTEM DOCUMENTATION, TRAINING, AND FIELD SUPPORT

A. Operation and Maintenance Manuals: As part of the "Close Out" documents, for each System, provide five (5) copies of system manuals per System. Manuals shall be in adequately sized three-ring binders, clearly labeled on the spine. Manuals shall contain the following:

1. Service Reference Cover Sheet: Provide a cover sheet with the Audiovisual Contractor's name, address, Email, WEB Address, telephone, and Fax numbers.
2. System Operation Instructions: Step-by-step operating instructions based on the control system touch panel (if applicable) for the basic day-to-day use of the System, including power activation, the connection of source devices, adjustment of volume levels, selection of sources, etc. Include illustrations and references to individual equipment manuals, as necessary.
3. Equipment Manuals: Include copies of individual equipment operation manuals separated by tabbed dividers. Order the manuals in nominal signal path order (i.e., sources first, amplifiers/loudspeakers last), followed by control system manuals, followed by miscellaneous manuals.
4. Equipment List: List all the system equipment, including connectors and specialty hardware, by Manufacturer model and serial number.

    a. As-built Drawings: Provide reduced 11" x17" foldout "as built" functional diagrams in clear plastic binder sleeves. Fold and insert drawings so that the drawing title is clearly visible at the front of the sleeve. Five (5) half or full-size drawing sets are also to be provided for clearer system reference.

3.13 MISCELLANEOUS SUPPORT REQUIREMENTS

A. Upon approval of shop drawings and equipment submittals, Contractor shall immediately place orders for all required materials, components, and supplies especially long lead items. In addition, The Contractor shall secure and forward written confirmations (including orders and shipping dates) direct from each manufacturer/vendor to the Owner's Project Manager.

B. The Contractor shall expedite the shipment of all materials, components, and supplies, as necessary, to ensure the successful completion of the Project by the date required.

All costs for expediting shall be included within the Contractor's pricing as provided below.

C. Review of as-built documentation, including a site demonstration.

D. All warranty information.

3.14 AV SYSTEM AND/OR NETWORK TESTING

A. Upon completion of installation, the Contractor shall execute all required tests as summarized in this specification. When all such tests have been completed to Owner's satisfaction and Manufacturer's specifications, the Contractor shall give the Owner written notice.

B. The Contractor must assume responsibility for assuring that the AV system and/or network installed operates appropriately, including any required coordination with other suppliers.

3.15 FINAL ACCEPTANCE

A. The Owner or Owner's representative may visit the site during the System installation to ensure that correct installation practices are being followed.

B. The Owner or Owner's representative will conduct a final job review once the Contractor has finished the job. This review will occur within one week after the Contractor notifies the Owner.

C. Two copies of all certification data and drawings for all identifications shall be provided to the Owner before the Owner's review.

D. The Owner or Owner's representative will review the installation and certification data prior to the system acceptance.

E. The Owner or Owner's representative may test some of the System's features to ensure that the certification data is correct. If a substantial discrepancy is found, the Owner reserves the right to have an independent consultant perform certification of the entire System. If such a procedure is undertaken, the cost of the testing will be billed back to the Contractor.

F. In the event that repairs or adjustments are necessary, the AVS Contractor shall make these repairs at his own expense. All repairs shall be completed within five (5) days from the time they are discovered.

END OF SECTION

SECTION 275319 - DISTRIBUTED ANTENNA SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. The work shall include the design, installation and testing of a Distributed Antenna System (DAS) capable of supporting Public Safety Networks (PSN) also known as Public Safety, Emergency Responder Radio and/or First Responder Networks. The system shall provide reliable two-way radio communications for Napa Valley College Public Safety Network (PSN) on all channels in the frequency range currently being used.
2. Provide all labor, simulation modeling, calculations, materials, tools, equipment, appurtenances, and services necessary for a complete and operational system as described herein, and in accordance with provisions of Contract Documents.

B. The DAS contractor shall provide all system design (including iBwave or equal modelling), project management, coordination with Public Safety Networks services, coordination with Owner Entities (e.g. Facilities, IT/IS/IRMS, Telecommunications Voice Engineering and Spectrum Management) hardware, equipment, antennas, cabling, labeling, testing, configuration, programming, monitoring, alarming, coordination and documentation for a complete and operable system.

C. Drawings, the provisions of the Agreement, including bonds and certificates, the General Conditions, and Division 01 specification sections apply to all work of this Section.

1.2 SYSTEM DESCRIPTION

A. Overview

1. The DAS system shall reliably distribute RF signals throughout the required coverage areas, for the specified PSN frequencies.
2. The DAS equipment shall be located in a secure technology room, or in the fire control room (verify with the AHJ) to simplify maintenance and increase security. Locating active elements in or above ceilings is not acceptable; locations for active equipment shall be approved by the local AHJ and meet all standard code requirements.
3. Radiating coax or “leaky” coax systems are not acceptable.
4. The DAS contractor shall verify the frequencies are correct for the city/county prior, to starting work.
5. The DAS shall be able to simultaneously support the wireless services, applications, and technologies specified in this document.
6. System Management:

a. SMS: The DAS shall have a Systems Management System (SMS) capable of alarm, monitor, configuration and control of all active components.
b. SNMP Integration: The DAS NMS shall be capable of integration with 3rd party SNMP based NMS products for alarm purposes and provide alarming information.

7. Active signal handling: The DAS shall have active elements that filter and amplify signals on a frequency specific basis to consistently deliver wireless services at the appropriate power levels.
8. Frequency Range: The DAS shall be capable of supporting all frequencies between - TBD
9. The DAS shall comply with FCC's and Regional regulatory authorities' emission rules for wireless devices.
10. Interference: There shall be no interference between the applications and wireless operators specified in this Section.

B. Services: Upon commissioning, the DAS shall provide coverage for the PSNs listed below.

1. Coverage shall be provided as follows: TBD

Name	UPLINK	DOWNLINK

C. Performance Requirements:

1. Public Safety Network (PSN) DAS:

a. The PSN DAS shall comply with CFC 2010 and NFPA-72 2016 edition as enforced by the local AHJ.
b. Contractors shall state the assumed channel count for the PSN Frequency Bands identified above with submittal of bid response. Prior to installation, contractors shall confirm the channel count and frequencies with the AHJ and shall guarantee coverage for these channels per the criteria stated above.
c. The DAS shall deliver coverage throughout 95% of all occupied building spaces and 99% in critical areas as defined in NFPA 72, NFPA 1221.
d. The DAS shall be capable of upgrade, without additional hardware or software, to allow for changes to system frequencies within the deployed frequency band in order to maintain radio system coverage as originally designed.

D. PSN Approval: The Contractor shall propose and deploy a DAS system capable of receiving approval of the PSN Authority Having Jurisdiction (AHJ).

E. The DAS Contractor shall coordinate with each PSN provider to connect each system to the DAS. The DAS Contractor shall coordinate commissioning of each system with the inspectors and AHJ.

1.3 QUALITY ASSURANCE

A. All equipment provided to meet the requirements of this specification must be installed in accordance with and meet the requirements of the issue of the NEC in effect at the date of installation.

B. The system shall comply with Parts 15, 22, and 90, Federal Communications Commission Rules, pertaining to radiation limits and frequency usage.

C. All equipment provided that requires type acceptance as defined by Title 47 of the Code of Federal Regulations shall be listed as type accepted by the Federal Communications Commission prior to installation.

D. Materials shall have a UL label, shall be FM approved, and shall have evidence of approval by the local authority when such approval is required.

E. Qualification:

1. The contractor bidding the DAS system shall have a minimum of three years' experience in the design, construction, testing and servicing of systems of the type and magnitude specified herein. The contractor shall have completed at least five projects equal or larger in size to this project within the past three years.
2. The contractor shall provide manufacturer certification that their personnel have been trained on the passive and active components being installed. The Contractor shall be certified by the system manufacturer (or manufacturers) in the installation and testing of the DAS system.
3. The contractor shall hold a valid State Contractors License (if required by the State) for the duration of the project. The contractor shall be responsible for obtaining permits and other requirements for performing work on this project.
4. The contractor shall have an emergency 24-hour phone number for emergency repair.

1.4 MANUFACTURER'S COMPLETE SYSTEMS

A. The DAS specified in this document shall be an end to end solution that is sourced from a single manufacturer or partnered manufacturers unless explicitly noted within these specifications.

B. Where it is specified that a system be provided by "manufacturer Comba, GWave, Fiplex or equal", a substitution of another manufacturer's products will only be considered for a complete end to end solution of equal quality, as determined by the owner's representative, or DAS design consultant. All substitutions shall conform to the substitution requirements detailed in the specifications. In instances where these specifications do not include the statement "or equal" for a particular component or system, substitutions will not be entertained. In particular, no alternative component(s)

shall be accepted as equal to the components and manufacturers specified in this document unless the contractor demonstrates to the satisfaction of the owner's representative, or design consultant that the alternative component(s) are of equal, or superior specifications and quality, and that they have been used in similar projects of size and complexity for no less than 3-years.

1.5 REFERENCE CODES AND STANDARDS

A. Installation Standards: Equipment and cabling installation shall comply with the following codes and standards. All publications must be of the latest issue and addenda:

1. 2016 California Electrical Code, Title 24, Part 3
2. 2016 CFC – California Fire Code, Title 24, Part 9
3. Federal Communications Commission (FCC) - Title 47 of the Code of Federal Regulations, Part 90.
4. Federal Communications Commission (FCC) Rules, Parts 15 and 22
5. ANSI/TIA-568-C.3: Optical Fiber Cabling Components Standards
6. ANSI/TIA-569-B: Commercial Building Standard for Telecommunications Pathways and Spaces.
7. ANSI/TIA-606-B: The Administration Standard for the Telecommunications Infrastructure of Commercial Building.
8. ANSI/TIA-J-STD-607-B: Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications.
9. BICSI Telecommunications Distribution Methods Manual, 13th Edition
10. NFPA 72 2017, NFPA 1221-2019 Emergency Responder Radio.

B. Requirements set forth by first-responder code, ordinance, or the PSN AHJ shall supersede the requirements described herein and shall be met in their entirety. It is the contractor's responsibility to ensure that the DAS complies with local code, ordinances or requirements established by the PSN AHJ.

C. ABBREVIATIONS AND ACRONYMS

ACG:	Automatic Gain Control
AHJ:	Authority Having Jurisdiction
ATP:	Acceptance Test Plan
AWS:	Advanced Wireless Service
BDA:	Bi-Direction Amplifier
BOM:	Bill-of-Material
BRS:	Broadband Radio Service
BTS:	Base Transceiver Station
CDMA:	Code Division Multiple Access
C/N:	Carrier-to-Noise Ratio
CTCSS:	Continuous Tone-Coded Squelch System
CWDM:	Coarse Wave Division Multiplexing
DAS:	Distributed Antenna System
DWDM:	Dense Wave Division Multiplexing
EBS:	Educational Broadband Service
ESMR:	Enhanced Specialized Mobile Radio

FCC:	Federal Communications Commission
GUI:	Graphical User Interface
iDEN:	Integrated Enhanced Digital Network
LMR:	Land Mobile Radio
LTE:	Long Term Evolution
MTBF:	Mean Time Between Failure
NFPA:	National Fire Protection Association
NMS:	Network Management System
PCS:	Personal Communications System
PSN:	Public Safety Network
RF:	Radio Frequency
RoF:	Radio-over-Fiber
RoHS:	Restriction of Hazardous Substances
RSL:	Received Signal Level
SISO:	Single-Input, Single-Output
SMR:	Specialized Mobile Radio
SMS:	Short Message Service
SNIR:	Signal-to-Noise Interference Ratio
SNMP:	Simple Network Management Protocol
SOW:	Statement of Work
VSWR:	Voltage Standing Wave Ratio

1.6 DEFINITIONS

A. Federal Communications Commission (FCC): The United States government agency that is the controlling authority for title 47 of the Code of Federal Regulations and other statutory issues regarding radio (wireless) communication in the United States of America.

B. General Radio Operator: A valid General Radio Operators License issued by the Federal License (GROL): Communications Commission in accordance with title 47 of the Code of Federal Regulations.

C. Distributed Antenna System (DAS): A system of bi-directional amplifiers, cables, power supplies, antennas and other ancillary equipment that allows radio signals to pass to and from the interior of a structure for the purpose of facilitating radio communications with public safety radio systems and cellular service providers.

D. Acceptance: Expressed approval by the Owner.

E. Active: DAS components that require AC/DC power for operation.

F. Carrier Approval: Expressed approval to interconnect to the CSP macro network.

G. Channel: A path for an RF transmission between two points.

H. Component: A main system element of the DAS.

I. Contractor: The prime contractor bidding the project.

J. Passive: DAS components that do not require AC/DC power for operation.

1.7 PERFORMANCE REQUIREMENTS

A. PSN DAS:

1. The PSN DAS shall comply with NFPA 2016 Edition and the 2016 California Fire Code.
2. Prior to installation, contractors shall confirm the channel count and frequencies with the AHJ and shall guarantee coverage for these channels per the criteria stated above.
3. The DAS shall be capable of upgrade, without additional hardware or software, to allow for changes to system frequencies within the deployed frequency band in order to maintain radio system coverage as originally designed.

1.8 ADDITIONAL REQUIREMENTS

A. PSN Approval: When approval of the DAS deployment is required by code or ordinance, the Contractor shall be responsible for facilitating the AHJ approval(s) per the requirements of the code or ordinance.

B. Work by other trades: Applies to the fire alarm contractor connecting to the fire control panel and also includes monitoring contactor for remote system access.

C. The life safety contractor to provide a dedicated panel (LED Annunciation) when applicable and five monitoring points per NFPA 72 Chapter 24.5.2.6.2. The annunciator is to be separate from the main life safety annunciator located in the fire control center.

1.9 SUBMITTALS

A. Submit product data, contractor qualifications, Scope of Work, Acceptance Test Plan and shop drawings under provisions of Division 01 for submittal requirements. All submittals shall be submitted to the Owner Representative for approval. Partial submittals will not be considered.

B. Do not order equipment or start work until all submittals have been reviewed and approved.

C. Contractor Qualifications

1. Contractor shall provide documentation certifying that contractor is an authorized DAS system installer for the specified manufacturer and that all installation personnel are certified to install the DAS components, cabling infrastructure and DAS headend equipment.

D. Product Data

1. Submit manufacturer datasheets for all active and passive components, including but not limited to the following:

    a. Donor and Coverage Antennas
    b. Coaxial Cable and Connectors
    c. Splitters, Combiners and Couplers
    d. Bi-Directional Amplifiers (BDA)
    e. Enclosures
    f. Batteries
    g. Fiber-Optic Master Unit (if applicable)
    h. Fiber Optic Remote Units (if applicable)
    i. Lightning Protection
    j. Annunciator Panel

E. Statement of Work (SOW)

1. The contractor shall submit a SOW to be reviewed and approved by Architect/Engineer.

F. Acceptance Test Plan (ATP)

1. The contractor shall submit an ATP to be reviewed and approved by Architect/Engineer.

G. Shop Drawings: Submit the following items

1. Scale floor plans indicating cabling pathways and coverage antenna locations.
2. Donor antenna, grounding and lighting protection details.
3. Active component locations, layout and configuration and mounting details.
4. Riser diagram.
5. Signal to Noise Interference Ratio (SNIR) Map.
6. RF propagation modeling.
7. RF link budget.
8. Maintain a set of approved shop drawings on the job site, with revisions, acceptance and exception notations kept up to date.

H. Following submittal review by the Architect/Engineer and correction of deficiencies, with resubmittals and reviewed as necessary, submit the drawings and product data to the local AHJ for final review.

I. Bill of Materials (BOM)

J. Closeout Submittals

1. Make submittals in accordance with Section 013300, 017700 and 260013 as applicable.
2. Record Drawings:

    a. Prior to and as a condition of final acceptance, the Contractor shall submit record drawings for the approval of the Architect/Engineer. These documents shall be in accordance with the following.

1) The Record Drawings shall be the previously accepted submittal drawings, corrected to actual as-built conditions.
2) The Record Drawings shall include:

    a) Updated information regarding signal levels as required for the Shop Drawings.
    b) Locations of all DAS BDA, antennas, and associated components.
    c) Detailed cable schedules that describe all modules, connectors, terminations, cable pathways, and cable installation records, installed or modified in the course of the work performed.
    d) Riser diagram showing conduits, junction boxes, terminal cabinets, cabling and devices.

3) The Record Drawings shall be submitted in AutoCAD Version 2010 or newer versions of software, or as approved by the Owner, and in PDF format.
4) Provide an electronic copy of the record drawings in full-size PDF and AutoCAD format, on CD-ROM, in each O&M manual.

3. Test Results:

    a. The Contractor shall conduct and submit, in writing to the Architect/Engineer, the results of all tests, including a systems “commissioning” summary test.
    b. Submit accepted ATP report confirming specified coverage and performance requirements have been met.
    c. Submit sweep-testing results for all coaxial cable runs.

4. Operation, Maintenance and Service Manuals:

    a. Prior to final acceptance, complete sets of operation, maintenance, and service manuals shall be submitted for systems and equipment provided under this contract, including all software licenses. At a minimum, the manuals shall include the following.

        1) Complete maintenance instructions, control and wiring diagrams, troubleshooting
        2) instructions.
        3) System service instructions for Work which manufacturers recommend user service
        4) Complete parts lists for each major item of equipment and/or system supplied under this Section.
        5) Complete collection of manufacturers’ product and catalog literature for equipment and systems installed under this contract.
        6) Manufacturers’ warranties.
        7) Operating characteristics, performance data, ratings, and manufacturers’ specifications for each item of equipment or system.
        8) Name, address, and telephone number for emergency and non-emergency service for each item of equipment or system.

5. Warranty Documents:

    a. Contractors System Warranty.
    b. Manufacturer's Warranty.

1.10 SYSTEM REQUIREMENTS

A. Without replacing the Passive DAS Infrastructure, the DAS shall have expansion capabilities to support the CSP and PSN frequencies.

B. Broadband Active Distribution:

1. Coaxial cable will be used for active distribution. In-line amplifiers are not allowed.

C. Supervision:

1. The DAS shall have a Network Management System (NMS) capable of alarm, and remote monitoring, configuration and control of all active components.

D. The system shall include, but is not limited to the following components:

1. Donor antennas
2. Coverage antennas
3. Bi-Directional amplifiers (BDA)
4. Coaxial cable
5. Coaxial patch cords
6. Coaxial splitters, combiners, and couplers
7. Enclosures
8. UPS (battery backup)
9. Proper grounding and bonding of cabling and all components
10. Any other equipment necessary to furnish, install, terminate and test a fully functional system

E. Prior to installation, contractors shall confirm the channel count and frequencies with the AHJ.

F. Audio Quality:

1. A minimum Delivered Audio Quality of 3.0 (as defined by the National Telecommunication and Information Administration Technical Report TR-99-358) shall be received in 95% of the area of each floor of the building when transmitted from Public Safety Communications Systems of San Bernardino.
2. A minimum Delivered Audio Quality of 3.0 (as defined by the National Telecommunication and Information Administration Technical Report TR-99-358) shall be received by Public Safety Communications Systems of the City of Glendale when transmitted from 95% of the area of each floor of the building.

G. Signal Strength:

1. The system shall provide minimum signal strength of -95dBm in 95% of all areas on each floor the building. The coverage areas shall include stairwells and elevators.
2. A minimum signal strength of -100 dBm shall be received by the PSN radio system when transmitted from within the building.
3. The signal strengths shall be present at a 100% reliability factor at the -95dBm level.

H. When approval of the DAS deployment is required by code or ordinance, the Contractor shall be responsible for facilitating the AHJ approval(s) per the requirements of the code or ordinance.

I. Requirements set forth by local code, ordinance, or the AHJ shall supersede the requirements described herein and shall be met in their entirety. It is the Contractor's responsibility to ensure that the DAS complies with local code, ordinances or requirements established by the AHJ.

1.11 WARRANTY

A. Contractor Warranty:

1. Contractor shall warrant the system performance as specified for 1-year.

B. Manufacturer Warranty:

1. Splitters, Couplers and Coverage Antennas: 5-year limited warranty from date of system acceptance.
2. Coaxial Cable and Connectors: 10-year limited warranty from date of system acceptance.
3. Active Components: 1-year limited warranty from date of system acceptance.

C. Manufacturers Extended Warranty:

1. The DAS shall be covered by a two-part certification program provided by a single manufacturer and that manufacturer's certified contractor. The certification program covers a certified system defined as a DAS installation performed by a certified contractor using components conforming to Part 2 following all the manufactures recommendations, installation instructions and best practices. Manufacturer shall administer a follow-on program through the contractor to provide support and service to the Owner. The first part is an assurance program, which provides that the certified system will support current and future modulation formats in the frequency bands for which it is designed, during the 20-year warranty of the certified system.
2. The second portion of the certification is a 20-year warranty provided by the manufacturer and the contractor on all cabling products within the system (optical fiber, coaxial and associated connectors, etc.).
3. In the event that the certified system ceases to support the certified application(s), whether at the time of ATP, during normal use or when upgrading to additional

frequency bands, the manufacturer and Contractor shall commit to promptly implement corrective action.

4. Manufacturer shall maintain ISO Quality Control registration for the facilities that manufacture the products used in the DAS.

1.12 MAINTENANCE

A. The Contractor shall provide a maintenance service contract, covering a period of one year, including preventative maintenance, system monitoring, spares, fault mitigation, and equipment repair.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. The basis of design for this specification shall be a DAS system manufactured by TBD to establish a standard for quality and performance. Other manufacturers may be acceptable subject to the substitution process as specified in Division 01. The Contractor shall provide documentation that other proposed systems meet all the system quality, performance and warranty requirements included in this specification.

2.2 BROADBAND DONOR ANTENNA

A. Broadband Donor Antenna shall feature a multi-band design, accommodating Cellular, PCS, LMR and AWS frequencies in a single small antenna.

1. Electrical:

   a. Frequency bands, TBD
   b. VSWR ≤ 1.8
   c. Gain: TBD ≥ 10.0 dBi, 1710 - 2700 ≥ 12 dBi
   d. Maximum input power: 100 watts
   e. Polarization: Vertical
   f. Front-to-back ratio TBD ≥ 20 dB, 1710 - 2700 ≥ 20 dB
   g. Impedance: 50 Ω
   h. Azimuth Pattern: As proposed by the manufacturer to meet the performance specifications in this Section.

2. Mechanical:

   a. Radome material: UV-protected ABS
   b. Pigtail cable: RG58, plenum rated
   c. Connector: 50 Ω N Series Female
   d. Mounting: Pole

3. Environmental:

a. Temperature: -40 °C to +60 °C
b. Lighting protection: Direct ground
c. Waterproof level: IP 66
d. Wind Speed, maximum: 125 mph

4. Manufacturer is TBD or approved equal

2.3 LIGHTNING ARRESTOR

A. Provide dual band integrated DC passing surge arrestor for 7/8" cable. Surge arrestor shall have bulkhead body style with 7-16 DIN Female interface. Surge arrestor shall support 806-960MHz and 1700-2170MHz operating frequency bands.

B. Manufacturer is TBD or approved equal.

2.4 BROADBAND DONOR ANTENNA

A. Omni-Directional Coverage antennas shall feature a multi-band design, accommodating multiple frequency bands in a single small antenna.

1. Electrical Band 1:

a. Frequency Band: TBD MHz
b. VSWR: ≤ 1.8:1
c. Gain: ≥ 1.5 dBi
d. Maximum input power:
e. Impedance: 50 Ω
f. Beam width, Horizontal: 360° omnidirectional
g. Beam width, Vertical: 80° nominal
h. Return Loss: 10.9 dB.

2. Electrical Band 2:

a. Frequency Band: TBD MHz
b. VSWR: ≤ 1.5:1
c. Gain: ≥ 1.5 dBi @ TBD MHz
d. Maximum input power:
e. Impedance: 50 Ω
f. Beam width, Horizontal: 360° omnidirectional
g. Beam width, Vertical: 65° nominal
h. Return Loss: 13.9 dB.

3. Mechanical:

a. Connector: 50 Ω N Series Female
b. Mounting: Thru-hole ceiling mount
c. Radome material: ABS, UV resistant
d. Pigtail cable: KSR195, plenum rated

4. Environmental:

    a. Application: Indoor
    b. Operating Temperature: 40 °C to +60 °C (40 °F to +140 °F)
    c. Relative Humidity: Up to 100%

5. Regulatory Compliance/Certifications: RoHS 2002/95/EC.
6. Manufacturer is TBD or approved equal.

2.5 DIRECTIONAL COVERAGE ANTENNAS

A. Directional coverage antennas shall feature a multi-band design, accommodating multiple frequency bands in a single small antenna.

1. Electrical Band 1:

    a. Frequency Band: TBD MHz
    b. VSWR: ≤ 1.8:1
    c. Gain: ≥ 5.0 dBi @ TBD MHz
    d. Maximum input power: 50W
    e. Impedance: 50 Ω
    f. Beam width, Horizontal: 110° nominal
    g. Polarization: Vertical
    h. Return Loss: 10.9 dB.

2. Electrical Band 2:

    a. Frequency Band: TBD MHz
    b. VSWR: ≤ 1.5:1
    c. Gain: ≥ 5.0 dBi @ TBD MHz
    d. Maximum input power:
    e. Impedance: 50 Ω
    f. Beam width, Horizontal: 90° nominal
    g. Return Loss: 13.9 dB.

3. Mechanical:

    a. Connector: 50 Ω N Series Female
    b. Mounting: 4-hole wall mounting plate
    c. Radome material: ABS, UV resistant
    d. Pigtail cable: RG58, plenum rated

4. Environmental:

    a. Application: Indoor
    b. Operating Temperature: 40 °C to +60 °C (40 °F to +140 °F)
    c. Relative Humidity: Up to 100%

5. Regulatory Compliance/Certifications: RoHS 2002/95/EC.
6. Manufacturer is TBD or approved equal.

2.6 BI-DIRECTIONAL ANTENNA (BDA)

A. The BDA shall be of modular design and use digital filtering to mitigate interference and accommodate multiple services for PSNs.

1. Characteristics:

   a. Operating Temperature Range: -33 °C to +50 °C
   b. Modular design with up to 4 frequency bands per 19” chassis.
   c. Filtering: Digital
   d. FCC Part 90.219 Type Classification: Class A narrowband for LMR/SMR/ESMR frequency bands
   e. Remote alarming through SNMP or SMS using wireless modem
   f. Mounting Options: shall support rack, wall and pole mounting
   g. Frequency Bands Supported: 380 - 512 MHz LMR, 769 - 806 MHz LMR, 806 - 869 MHz LMR/SMR/ESMR, 896 - 941MHz LMR/SMR/ESMR, 824 - 894 MHz Cellular, 1710 – 1755 MHz AWS, 1900 - 1950 MHz PCS

2. Compliance:

   a. NFPA: The BDA shall comply with NFPA-1 2009 edition In-Building Public Safety Radio Enhancement Systems
   b. FCC: Shall be FCC type certified

3. Manufacturer is Comba, GWave, Fiplex, or approved equal.

2.7 COAXIAL CABLE

A. Air Dielectric, Plenum Rated Cable.

1. Material Characteristics:

   a. Jacket: Halogenated, Fire-Retardant
   b. Outer Conductor Material: Corrugated Aluminum
   c. Inner Conductor Material: Copper-Clad Aluminum Wire

2. Electrical Characteristics:

   a. Impedance: 50 ± 2.0 Ω
   b. Frequency Band: 1 - 8800 MHz
   c. Peak Power Rating: ≥ 40.0 kW

3. Mechanical Characteristics:

   a. Diameter Over Jacket: ≤ .627”
   b. Minimum Bending Radius: ≤ 5”
   c. One Time Minimum Bending Radius: ≤ 3”

4. Attenuation Characteristics:

Frequency (MHz)	Attenuation (dB/100ft)

150	≤ 0.848
450	≤ 1.53
800	≤ 2.105
2000	≤ 3.564

Standard Conditions: VSWR 1.0, ambient temperature 20 °C (68 °F)

5. Manufacturer is Andrew AL4RPV-50 or approved equal.

B. Splitters, Combiners, Couplers, Coax Jumpers and Connectors:

1. Manufacturer is Microlab, Comba or approved equal.

2.8 CONNECTORS

A. Provide 50 Ohm type N connectors for terminating ½" coaxial cabling specified herein.

B. Connector shall have a straight body style with an N Male interface.

1. Manufacturer: TBD, or approved equal

2.9 CONDUIT/RACEWAYS

A. Provide all pathways including but not limited to; cable tray, conduit, open cabling supports, and core penetrations as required for the systems. Pathway for telecommunications cabling, including cable tray and open cabling supports shall not be used for emergency response systems.

2.10 OPEN CABLING & DEVICE MOUNTING SUPPORTS

A. J-Hooks for Cabling

1. J-hooks shall comply with TIA requirements for structured cabling systems and pathway supports. Galvanized finish. Provide all hardware and hanger rod supports necessary for secure mounting to the structure. Follow manufacturer's recommendations for quantity of cables supported.
2. Manufacturer is Erico Caddy
3. J-Hook Support, Part No. CAT21

B. Provide all accessories and mounting hardware required for a complete and working installation of open cabling supports.

2.11 ENCLOSURE

1. The Bi-Directional Amplifier and any other active amplifiers shall be located in a single enclosure.
2. The primary controls and amplifiers shall be mounted in NEMA 4X painted steel cabinets and shall be painted Fire Engine Red and shall bear the lettering "FIRE

ALARM EQUIPMENT – DO NOT DISABLE" at least 1 inch high in white or yellow block letters.

3. The main equipment cabinet for the system shall also have a label indicating the name and a 24-hour contact telephone number for the maintainer under contract for the system.
4. Provide a 2-hour rated NEMA 4X enclosure with lock to house the BDA, UPS and alarm reporter with all necessary ventilation.

2.12 POWER SUPPLY

A. The system shall be provided with an internal backup battery and charger system or a commercial uninterruptible power supply (UPS) to provide a minimum of 2 hours of system operation at full power output.

B. The batteries will be serviced in accordance with the service that is required for fire alarm systems.

C. Primary power must have a supervised circuit provided for connection to the building fire alarm system for use as a system fault indicator.

2.13 LABELS

A. Labeling of the cabling components of the DAS shall be in accordance with Henry Mayo Newhall standards and EIA/TIA 606 for the Administration of the Telecommunications Infrastructure for Commercial Buildings.

B. Provide labels for connector panels, cables and equipment.

C. The lettering on each label shall be as large as is practicable. All labels shall be machine-produced. Hand-written labels will not be acceptable.

D. A standard relative orientation shall be adopted for all labels unless otherwise specified.

E. Labels shall be robust, durable, shall resist abrasion and shall be UV inhibiting, permanent and indelible. Labels shall be proof to 140 degrees Fahrenheit.

F. All labels shall be readily visible and shall be fixed so that they remain in a visible position wherever practical.

G. Cable and Innerduct Labels

1. Provide self-laminating wrap labels for cables with less than ½" diameter. The labels shall permanently fixed to each cable once they have been installed. Any labels that split, partially split or otherwise damaged shall be replaced.
2. Provide laminated, cable-tied labels for innerduct and cables of ½" or greater diameter. The labels shall be waterproof and shall be of sufficient size to include all identification letters or numbers. The label shall be punched with holes to allow two cable ties (one at each end) to be used to secure the label to the cable.

3. Horizontal Cabling: Label each cable so that the label is within 8" of the ends of the cable at the equipment end and within 6" of the end of the cable at the antenna end.
4. Backbone / External / Innerduct Cabling: Label each cable so that the label is within 40" of each end of the cable and is visible for inspection.

H. Connector Panel Labels

1. Provide labels for each connector panel (black letters on a white background.) Patch Panel: Provide labels to identify each connector. The labels shall be permanently fixed to the connector panel front cover.

I. Equipment

1. Equipment labels are to be a white and black engraved plastic sandwich material, i.e. black letters on white background. Provide sandwich style labels to identify the cabinet and/or rack. The sandwich style labels are to be neatly fixed in place with epoxy adhesive.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The contractor shall install the DAS in accordance with the accepted SOW.

B. Install DAS components, including all hardware, connectors, etc., as required to comply with hardware manufacturer's written instructions, with recognized ANSI/TIA standards, other relevant industry practices and the Contract Drawings and Specifications.

C. The system shall be installed to provide the coverage requirements as stated in these specifications and contract drawings.

D. The Contractor shall provide all labor, equipment, and materials required for project coordination, troubleshooting, testing, and documentation of the DAS elements required herein.

E. Hardware components and wiring shall be installed in a neat, workmanlike manner consistent with best industry practices.

F. The Public Safety DAS shall be integrated into the fire alarm panel, per AHJ requirements and manufacturers recommendations, and shall be monitored remotely.

G. Open Cable Support Installation:

1. The Contractor shall furnish and install supports for cables specified in this section.
2. Cable supports shall be spaced no further than 5 feet apart.
3. Provide additional cable management products, sleeves or conduit raceways as required to protect exposed cabling and complete the installation of cables in a neat workmanlike manner.

4. Cable supports shall be installed as tight to underside of deck as possible using a rigid support method (i.e.: threaded rod, beam clamps, etc.) Ceiling wire supports are not permitted.
5. Do not support cables from ductwork, sprinkler piping, water piping, waste piping, conduit, or other system supports.
6. Provide independent separate wire management for cabling of each low voltage cabling system. Systems are defined by specification section.

H. Cable Installation:

1. The Contractor shall provide all hand tools and test equipment required to install and test all cabling.
2. Maintain the following distances between cabling and other building systems:

    a. One foot from fluorescent lights.
    b. Four foot from motors and transformers.
    c. Three foot from hot water piping or other mechanical equipment.
    d. One foot from electrical conduits, electrical equipment and other systems cables.

3. Remove the minimum amount of cable insulation required to complete that cable termination.
4. The cabling shall be run exposed as "open cable" in ceiling spaces and ceiling plenums.
5. The cabling shall be run parallel or at right angles to building structural framework. Do not run cables diagonally across ceiling space.
6. Run cabling in continuous runs from termination locations at equipment or outlet locations; splices are not permitted.
7. Fire seal around cables running through rated floors and walls in accordance with requirements of Section [078400].
8. Install cables per manufacturer’s recommendations including but not limited to maximum tensile loading and maximum bend radius.

3.2 RACEWAYS

A. Furnish and install floor penetrations, raceways, wall penetrations, etc. not shown on the electrical floor plans but needed for the installation of cabling specified herein.

3.3 GROUNDING AND BONDING

A. All external antennas shall be provided with appropriate lightning protection in accordance with the appropriate sections of the National Electrical Code.

3.4 LABELING

A. General

1. Labeling shall be in accordance with ANSI/TIA-606-A, Administration Standard for Commercial Telecommunications Infrastructure.
2. All labels shall be permanent typewritten labels produced by a labeling machine.
3. Labels shall be installed on all cabling at each end. Ensure labels are securely fastened.
4. All labels shall be located within 6 inches of cable termination and placed so they can be easily read.
5. The font type for each type of label shall be Arial.
6. All labeling shall be completed prior to the substantial completion date of the project.

3.5 SPARE PARTS AND UNUSED COMPONENTS

A. The Contractor shall be responsible for replacing all spare parts used for warranty work, so that at the end of the warranty period, the Owner shall be left with a complete one-year's supply of spare parts. Any components purchased in accordance with these specifications and unused shall be documented and passed to the Owner's Representative on completion of the project.

3.6 CONNECTING TO SYSTEM

A. Manage FCC License: Acting as a representative of the Owner, the Contractor shall obtain required licenses for operation under FCC Regulations.

B. The DAS Contractor shall liaise with and coordinate with each public safety network provider and Owner-vendor to ensure each system listed in this specification is installed and connected to the DAS. The DAS Contractor shall be responsible for managing and coordinating commissioning activities for each of the service providers and demonstrating to the satisfaction of the Owner's Representative that each system is available and functioning throughout the building in accordance with this specification and associated documents.

3.7 SYSTEM TESTING

A. Coaxial Cabling Field Testing

1. All coaxial cabling, connections, and terminations installed by the Contractor or used to support the requirements of these Contract Documents shall be tested for VSWR, continuity, shorts, reversals and grounds, where applicable.

B. DAS System Testing

1. Initial system testing shall be performed by Contractor in coordination with the San Bernardino emergency responders and the local AHJ.
2. Testing shall be conducted under the direct supervision of a person holding a valid General Radio Operators License (GROL) as issued by the Federal Communications Commission The resulting test report shall be signed by that

person and the Serial Number of their FCC License shall be included with the signature.

C. ACCEPTANCE TESTING

1. Acceptance testing will be performed confirming the requirements of this specification have been met. The Contractor shall complete the acceptance testing as prescribed in the approved Acceptance Test Plan (ATP) submittal.
2. Provide test results for Public Safety in the format approved by the AHJ. Coordinate and conduct acceptance testing with AHJ.

    a. The testing is to show beyond reasonable doubt that there are no errors, damaged or incorrectly installed components, that the installation is correctly labeled and that all the installed components meet or exceed the criteria detailed in these specifications and applicable standards. Any test that does not show that a component is satisfactorily installed, as per these specifications, shall be repeated. If a test procedure needs to be modified to satisfactorily test some components, the modification shall be submitted for approval of the Owner's Representative, prior to the tests being conducted.
    b. Following optical fiber and data cable installation, including labeling and termination at both ends, undertake and record tests to ensure that the cabling system will perform satisfactorily in service. In addition to the tests detailed in this specification, the Installer shall carry out any additional tests that the Installer deems necessary to ensure the satisfactory operation of the telephone and data systems. The costs of these additional tests shall be borne by the Installer.
    c. All outlets, cables, patch panels and associated components shall be fully assembled and labeled prior to testing. Any testing performed on incomplete systems shall be redone on completion of the work.
    d. Provide the Owners' Representative with the opportunity to witness all testing. On reasonable request, the installer shall demonstrate that the test procedure competently identifies the fault conditions being tested for.
    e. Complete and record all of the tests identified in these specifications.
    f. Notify the Owners' Representative ten working days before the date of commencement of the cable tests. Provide details in writing, on that advance date, of proposed tests, the test schedule, equipment to be used, its certification and calibration and the names and qualifications of test personnel.
    g. The Owner and Owners Representative shall be invited, to the first instance of each type of test conducted. In the event of a number of tests being conducted by the Installer prior to this first inspection, the Owner's Representative reserves the right to reject these tests as non-compliant and to require them to be repeated at the Installer's cost.
    h. Personnel shall be competent in and qualified by experience or training for comprehensive TDR and OTDR operation and troubleshooting, for both copper and optical fiber testing.
    i. Include the cost of obtaining, calibrating and maintaining test equipment and the cost of carrying out and recording the tests detailed in this specification, including labor costs, in the bid sum. No extra costs will be entertained.

j. Ensure that all test equipment is in calibration before delivery to site and throughout the testing period. The Installer shall be responsible for ensuring that any necessary tests and rework to maintain equipment's calibration status is carried out. Any tests performed on uncalibrated test equipment shall be repeated at the Installer's cost.
k. The test documentation shall be available for inspection by the Owners' Representative during the installation period and copies shall be passed to the Owners' Representative within five working days of completion of tests on cables in each area. The Installer shall retain a copy to aid preparation of as-built information.
l. Failures detected during the testing shall be noted on the test results schedule, rectified and re-tested. On the fault being rectified, this shall also be noted. These notes shall not be deleted or obliterated.
m. Rectification of all damaged cables shall include replacing damaged cables with new cables in complete runs, replacing damaged connectors or remaking poor terminations. In-line cable joints, splices or distribution points will not be acceptable except where specified in this document. All damaged cables shall be removed from site.
n. If on submittal of the As-Built documentation there are any missing test results or incorrectly named files, the test shall be repeated at the Installer's expense.

D. TESTING

1. The Contractor shall perform signal strength testing throughout the building. Testing shall be performed using a portable spectrum analyzer or other approved test equipment and the field strength measurements recorded. Test results shall be compared to the requirements of the Performance Specification to determine compliance with this Specification.
2. Dual testing shall consist of the following:

    a. Benchmark test: A signal of known strength shall be injected at the head end. Measurements shall be taken throughout the entire installation area using a portable spectrum analyzer or other approved test equipment and recorded.
    b. Actual field strength measurements: Measurements shall be taken throughout the entire installation area at each of the frequencies reradiated over the DAS system and recorded.

3. Test results shall be compiled and submitted to provide evidence of compliance with this specification.

E. Optical Fiber Cabling

1. Test each Optical Fiber Cable and its associated connectors. All tests performed on optical fiber cabling that use a laser or LED in a test set shall be carried out with safety precautions in accordance with ANSI Z136.2. All outlets, cables, patch panels and associated components shall be fully assembled and labeled prior to field-testing. Any testing performed on incomplete systems shall be retested at the Contractors expense.

2. Carry out the following tests on every element of every optical fiber cable:

    a. Power Meter
    b. Length
    c. Polarity

3. The tester shall have the following parameters:

    a. Optical Loss Test Sets (OLTS) shall be used to test every optical fiber cable.
    b. OLTS shall be used to test optical in both directions and take the average. Provide a launch lead and far end drop off lead.
    c. Multimode optical fibers shall be tested at 850nm and 1300 nm in accordance with ANSI/TIA-526-14-B, one-cord reference method.
    d. Single mode optical fibers shall be tested at 1310nm and 1550nm in accordance with ANSI/TIA-526-7, method A.1, one reference jumper equivalent method.
    e. Link attenuation does not include any active devices or passive devices other than cable, connectors and splices (i.e. link attenuation does not include such devices as optical bypass switches, couplers, repeaters, or optical amplifiers.

4. Test each optical fiber cable element and its associated connectors. Carry out the following test on every element of every optical fiber cable:

    a. Visually check optical connectors using microscope (minimal magnification x200) to ensure that no physical damage has occurred during the installation process. There are to be no scratches on the core of the fiber or pits on the core or cladding. If any defect cannot be rectified with polishing, the connector is to be replaced.
    b. Record the length and loss of each mated connector pair on the test results schedule for all elements.
    c. Verify the labeling of the cable and connectors is correct.

5. Acceptance of test results:

    a. Unless otherwise specified by the Owner or the Owners representative, each cabling link shall be in compliance with the following test limits:

        1) Optical loss testing for Multimode and Single mode links:
        2) The link attenuation shall be calculated by the following formulas as specified in ANSI/TIA-568-C.0.
        3) Link Attenuation (dB) = Cable_Attn (dB) + Connector_Attn (dB) + Splice_Attn (dB)
        4) Cable_Attn (dB) = Attenuation_Coefficient (dB/km) * Length (Km)
        5) Connector_Attn (dB) = number_of_connector_pairs * connector_loss (dB)
        6) Maximum allowable connector_loss = 0.75 dB
        7) Splice_Attn (dB) = number_of_splices * splice_loss (dB)
        8) Maximum allowable splice_loss = 0.3 dB

9) The values for the Attenuation_Coefficient (dB/km) are listed in the table below:

Type of Optical Fiber	Wavelength (nm)	Attenuation coefficient (dB/km)	Wavelength (nm)	Attenuation coefficient (dB/km)
Multimode 62.5/125 µm	850	3.5	1300	1.5
Multimode 50/125 µm	850	3.5	1300	1.5
Single-mode (Inside plant)	1310	1.0	1550	1.0
Single-mode (Outside plant)	1310	0.5	1550	0.5

b. Test results to include OLTS attenuation link and channel measurements at the appropriate wavelength(s) and the margin (difference between the measured attenuation and the test limit value).
c. The overall Pass/Fail evaluation of the link-under-test for OLTS and OTDR measurements.

F. Proof of Performance and Testing Methodology

1. Test requirements specified in this document shall be successfully completed prior to issuance of a Certificate of Occupancy and yearly thereafter. Also testing with a successful result shall occur whenever a design change is made to the system, which changes the technical performance or coverage of the system.
2. The test data provided shall include measured data for each point for all PSN communications systems (channels).
3. Each floor of the structure that is a component of this project shall be divided into 20 grids of equal area. The center point of each grid shall then be pre-designated a test location. On each floor of each structure only one test location may fail the tests specified and still consider the test to have passed for the system. All public safety radio systems specified above shall be tested at each test location. The failure of any test location on any of the public safety radio systems shall be considered a failure of that location.
4. The test receiver or field strength meter used to provide measurements during testing shall bear evidence of calibration within the last 12 months.
5. The AHJ may request system testing whenever the AHJ believes system performance has degraded to unacceptable levels. At the discretion of the AHJ spot tests may be conducted if they believe the system performance has degraded to unacceptable levels. The Owner shall make the facility available for testing upon request during normal business hours.
6. The system must be tested annually beginning one (1) year from the date of final acceptance testing. The cost of future annual testing will be borne by the respective premises/system owner.

G. The Contractor shall make any corrections needed to meet the performance requirements as stated in this document at no additional cost.

H. Final Acceptance of the DAS will be based on the Contractor complying with the Statement of Work as evidenced by the Contractor completing the following:

1. Installation workmanship inspections witnessed by the Owner's Representative.
2. Testing, supported by complete and accurate test records.
3. Coverage tests witnessed by the Owner's Representative.
4. Initial acceptance test witnessed by the Owner's Representative.
5. Successful systems commissioning.
6. Final acceptance test witnessed by the Owner's Representative.
7. Technical training.

I. The Contractor shall provide written notice to the Owner's Representative at least thirty (30) calendar days in advance of the initiation of final system acceptance testing. Included in the advance notice shall be three (3) copies of the approved test plans and procedures to ensure acceptance test monitoring personnel are familiar with the tests, procedures and the expected results.

J. After successful completion of the initial acceptance test, the Contractor shall inform the Owner's Representative and demonstrate to the satisfaction of the Owner's Representative that the DAS is operating fault free.

K. All tests must be successfully completed as a condition for Final Acceptance testing (to be witnessed by the Owner's Representative).

L. Final Acceptance testing shall be completed a minimum of 14 days prior to Owner's submittal for Request for Occupancy.

M. Annual Testing:

1. The system shall be tested annually beginning one (1) year from the date of final acceptance testing. The cost of future annual testing will be borne by the Owner.
2. Annual testing shall be conducted by the City Fire Department/Other or their representatives in conjunction with inspection procedures.
3. Amplifiers shall be tested to ensure that the gain is the same as it was upon initial installation and acceptance.
4. The Owner shall notify the AHJ in writing two (2) weeks in advance of when annual test occurs and shall the AHJ by certified mail of the results of the test. Test records shall be retained on the inspected premises by the Owner.

3.8 MAINTENANCE

A. Prior to the final acceptance of the DAS elements, the Contractor shall provide preventive and "on call" corrective maintenance services for all installed equipment. Qualified maintenance personnel shall respond on-site, if required, in no more than two (2) hours from the maintenance call. This service shall include all labor, material, travel expenses, and incidentals at no additional cost to the Owner.

B. During the above maintenance period, the Contractor shall maintain complete logs of all maintenance activities including service calls, preventive maintenance, component failures, etc. The maintenance logs shall be kept on-site and made available to the Owner's Representative upon request. Upon Final Acceptance, the maintenance logs shall become the property of the Owner.

C. Prior to, and as a condition of: Final Acceptance, the Contractor shall submit to the Owner's Representative recommended modifications, as appropriate, to the maintenance procedures and the spare parts lists based upon actual experience with the system.

3.9 TRAINING

A. The Contractor shall provide training for elements of the DAS. Such training shall include management, operational and maintenance levels and shall be provided to individuals (maximum of 3) to be designated by the Owner's Representative.

B. Training shall be conducted by qualified personnel fully conversant on the equipment, materials, software, and over all operation of the installed elements.

1. Training shall be based upon as much hands-on training as is possible.
2. The Contractor shall provide all necessary training aids and materials, which shall include written handouts.
3. All training shall be completed prior to Final Acceptance.

C. Times, locations and quantities of training sessions shall be subject to the Owner's Representative approval.

3.10 WARRANTY

A. The Contractor shall, as a condition precedent to the final payment provide a warranty to the Owner certifying that all the contract requirements have been completed in accordance with the Contract Specifications and Drawings. The written warranty shall specifically address the following:

1. The Contractor shall warrant all installed hardware for a period of one (1) year from the date of Final Acceptance. Where such warranties are provided directly from the equipment manufacturers, the Contractor shall formally transfer all such warranties to the Owner. In the event that any manufacturer customarily provides a warranty period greater than one (1) year or such extended warranties are required by the Contract Documents, the warranty shall be for the greater period of time.
2. The Contractor shall warrant for a period of one (1) year from the date of Final Acceptance all defects or damages due to faulty materials or workmanship. Defects related to faulty workmanship, including all damages to surrounding work caused by such defects, shall be without delay, repaired to the Owner's Representative's satisfaction at the Contractor's own expense.

B. Warranty Work: When equipment and labor covered by the Contractor's warranty or by a manufacturer's warranty have been replaced or restored because of failure during the period of that warranty, the warranty period for the replaced or repaired equipment or restored Work shall be reinstated for a period of time equal to the original warranty period, and commencing with the date of completion of the replacement or restoration work.

C. Unless specifically allowed, in writing, by the Owner's Representative, the required warranty period for the DAS shall not start until the Owner grants written acceptance. No partial acceptance of the DAS will be granted.

END OF SECTION

SECTION 280500 - COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specifications, apply to this Section.

1.2 SUMMARY

A. Part 1 Includes:

1. Related Documents
2. Summary and related sections
3. References
4. Definitions
5. System Description and General Responsibilities
6. Coordination
7. Quality Assurance
8. Submittals
9. Delivery, Storage, and Handling
10. Site Conditions
11. Sequencing and Scheduling
12. Warranty
13. Extra Materials

B. Part 2 Includes:

1. Product Options and Substitutions
2. Materials and Equipment
3. Equipment Modification
4. Fabrication
5. Source Quality Control
6. Firestopping/Sealant Materials

C. Part 3 Includes:

1. Examination
2. Installation
3. Field Quality Control
4. Cleaning
5. Training

D. Related Sections:

1. 28 13 00 Physical Access Control System
2. 28 16 00 Intrusion Detection System
3. 28 23 00 Video Surveillance System
4. 28 26 00 Duress Alarm System
5. 28 31 00 Fire alarm Systems

1.3 REFERENCES

A. Codes compliance - Comply with the established project edition of the following codes as applicable:

1. National Fire Alarm Codes (NFPA 72) NFAC
2. All Local, State, County or Federal codes and ordinances

B. Standards Compliance - Comply with the following standards as applicable:

1. American National Standards Institute ANSI
2. American Society for Testing and Materials ASTM
3. Electronics Industry Association EIA
4. Electrical Testing Laboratories ETL
5. Federal Communications Commission FCC
6. Institute of Elect. and Electronics Engineers IEEE
7. National Electrical Contractors Association NECA
8. National Electrical Manufacturers Association NEMA
9. National Fire Protection Association NFPA
10. Occupational Safety Health Act OSHA
11. Underwriter's Laboratories UL

1.4 DEFINITIONS

A. By Others or By Other Trades: By persons or parties other than the Division 28 Contractor. In this context the words “by others or by other trades” shall not be interpreted to mean “not in contract (NIC)”.

B. Certified: Equipment has been tested and found by a nationally recognized testing laboratory to meet nationally recognized standards and found to be safe for use in a specified manner; production is periodically inspected by a nationally recognized testing laboratory; and it bears a label, tag, or other record of certification.

C. Concealed: Not visible or readily accessible such as, embedded in masonry or other construction installed behind wall furring with double partitions or above hung ceilings, in crawl spaces, in shafts.

D. Conveniently Accessible: Capable of being serviced without climbing or crawling under or over obstacles, and with adequate working clearance both front and back.

E. Damage: Visible or invisible abuse that negatively affects performance or appearance and creates defective materials or workmanship.

F. Defective Materials or Workmanship: Operational failures, performance below minimum requirements, evidence that the system will not be reasonably maintainable, errors in documentation, abnormal operations, unsafe conditions, or similar unsatisfactory performance.

G. Contractor: Company holding the contract or agreement with the Owner or its representative. The Contractor may, when permitted, sub-contract Work described in this Section to which the term contractor may apply.

H. Exposed: Not concealed.

I. Failure: Any deviation from intended system operation and performance, as determined by the Contract Documents and subsequent submittals and the Owner's Representative.

J. Furnish: Purchase and deliver to the Project site complete with every necessary appurtenance, support, and accessory required for operation.

K. Install: Unload at the delivery point at the site and perform every operation necessary to establish secure mounting and correct operation at the proper location in the Project.

L. Labeled: Equipment embodies a valid label, symbol, or other identifying maker of a nationally recognized testing laboratory such as Underwriters' Laboratories, Inc., the laboratory makes periodic inspections of the production of such equipment, and the labeling indicates compliance with nationally recognized standards or tests to determine safe use in a specified manner.

M. Listed: Equipment is mentioned in a list which is published by a nationally recognized laboratory which makes periodic inspection of the production of such equipment or states that such equipment meets nationally recognized standards or has been tested and found safe for use in a specified manner.

N. Nationally Recognized Testing Laboratory: A testing laboratory, which is approved, in accordance with OSHA regulations, by the Secretary of Labor.

O. Provide: Furnish and install, completely ready for use, including all accessories required for operation.

1.5 SYSTEM DESCRIPTION AND GENERAL RESPONSIBILITIES

A. The work to be performed under this contract includes the furnishing of all labor, materials, and equipment for a video surveillance system, a physical access control system, a duress / panic system, and an audio announcement system. Work shall include all provisions of new electronics controls systems, including, physical access control, duress alarm, video surveillance, and audio. Portion of the work are to be bid as an optional add alternate, and the Owner may or may not choose to execute this work under the contract.

B. Combined Prescriptive and Performance Design Requirements

1. Division 28 includes a combination of prescriptive and performance specifications. Compliance with the performance specifications, as well as coordination and

integration of the prescription requirements, will require substantial design work on the part of the Contractor.

2. The performance requirements are intended to establish overall system performance requirements, satisfy the operational requirements, and establish the inter-coordination requirements for the Division 28 systems.
3. The prescriptive requirements establish the minimum quality, characteristics, and types of components, equipment, and materials to be used to achieve the stated system performance requirements. The Contractor is advised, however, that prescriptive specifications have not been provided to satisfy all of the specified performance requirements.
4. The Contractor shall carefully consider all of the requirements for each of the Division 28 systems when preparing its bid. Any questions regarding the intent of these requirements, the scope of the systems or their coordination requirements must be submitted in writing prior to bidding in accordance with the Instructions to Bidders. The Contractor shall have no claim for either extra compensation or extra time on the grounds that it did not understand the scope or the requirements of the Division 28 work, and/or the coordination requirements of the Division 28 work with the work of the other Divisions.
5. Compliance with the project requirements will be progressively monitored and adjusted through the submittal process, installation period, and performance verification testing.

C. Drawing Interpretation

1. The Drawings are diagrammatic and indicate the general arrangement of systems and equipment unless indicated otherwise by dimensions or detail drawings. The Drawings installation and schematic diagrams and symbols to outline the Work to be provided. These drawings do not have any dimensional significance, nor do they delineate every item required for the intended Work. No interpretation shall be made from the limitations of symbols and diagrams that any elements necessary for complete Work are excluded.
2. The Work shall be provided in accordance with the intent expressed on the Drawings and Specifications, and in conformance with the actual building architectural and structural conditions. When in conflict, field conditions take precedence over the Contract Documents.
3. The meaning of abbreviations shall be the same whether in lower case letters or without periods.
4. The use of words in the singular shall not be considered as singular where other indications denote that more than one item is referred to.
5. Details that appear on the Contract Documents which are specific with regard to the dimensioning and positioning of the Work, are intended only for the purpose of establishing general feasibility. They do not replace engineering or field coordination by the contractor for the Work.

D. Provide all parts and equipment for a complete and operational system for the Work of Division 28 as described herein and shown on the drawings.

E. Furnish and install all trenching and backfill, duct banks, conduits, raceways, sleeves, boxes, gutters, shelves, enclosures, shelf and enclosure supports, backboards, pull ropes

(in unused or spare conduits) required to make all systems fully operational, including components not shown on the Drawings, but necessary for fully operational systems.

F. Furnish, install, terminate, test, dress, and identify all wire and cable required to make systems fully operational, including all wire and cabling not shown on the Drawings, but necessary for fully operational systems.

G. Recognize that the Work entails integration between individual systems, as well as the design and implementation of many system and component interfaces. Take full responsibility for the complete design, installation, and performance of the total integrated system, including integration between systems and various interfaces, to achieve the specified operational features and system performance requirements.

H. Fully test the systems, demonstrate their satisfactory operation, and train maintenance and operating personnel, as specified in this Section and the Sections governed by this Section.

1.6 COORDINATION

A. Coordinate with the Owner and all other trades as required to ensure that the entire Work of this Project will be carried out in an orderly, complete, and coordinated fashion.

B. Coordinate installation of lighting and ventilation in all equipment rooms and control stations to avoid any possible interference and to enhance system function.

C. Coordinate with the Work of all applicable Divisions and Drawings for the required electrical and mechanical control interfaces to the work of this section.

D. If applicable, provide coordination drawings of security device plate mounting templates and internal frame conduits to the hollow metal frame manufacturer/supplier to facilitate frame preparation for electronic devices. Rework all frames for which device mounting has not been coordinated at Contractor’s expenses.

E. If applicable, obtain product data and wiring schematic information from the Division 8 and 11 Contractors/manufacturers for all approved locking and door monitoring hardware. Coordinate with the Contractors to properly wire, terminate and test all electrically controlled and monitored door/gate hardware.

1.7 QUALITY ASSURANCE

A. Division 28 requires contractors with similar work experience and specific licenses and certifications to perform the work of this section. Contractors must be certified or licensed at the time of bid where Manufacture certification or licensure is required. Required licenses and certifications shall be submitted the contractor’s bid package.

B. The Division 28 contractor shall have had experience in the design and installation of similar systems of similar project sizes and similar integration as this project to be considered qualified.

C. The Contractor shall be responsible for all costs incurred including costs incurred by the Owner and its representatives for failure to provide the experience and key personnel as specified.

1. Deductive change orders may be issued as a result of the failure to properly engineer the work prior to construction or improperly installed work that results in costs incurred to the Owner. Examples of incurred costs are rejection of submittals for failure to follow specifications or failure to properly engineer the work; re-inspection of rejected work.

D. The Division 28 contractor shall maintain a local service center with qualified service technicians for the duration of the Warranty.

E. The Division 28 Contractor shall have an active C-7 or C-10 contractor's license, as required by the project scope, issued by the State of California.

F. Key Project Personnel must have work experience with projects of similar size and complexity. Systems experience shall be demonstrated for the Key Project Personnel. Résumés of prospective key personal shall be submitted within 30 days of contract award.

1. Project Manager Qualifications

a. Five years' experience with projects of similar size and complexity.

2. The approved Project Manager shall represent the Contractor at all times in all project matters and shall be responsible for the administrative work including but not limited to, the following:

a. Representation at all project meetings.
b. Progress schedule and progress reporting.
c. Payment schedule of values and pay requests.
d. Representation and management of all employees and sub-contractors.
e. Conduction of on-site performance and acceptance testing.

3. The approved Project Engineer shall be qualified and shall be responsible for technical work including but not limited to, the following:

a. Preparation and signature of all engineering, shop drawings, and product data submittals.
b. System fabrication, field installation work, and testing.

4. Consider all qualification and experience materials submitted as binding. Obtain the Owner's approval in writing prior to any deviations from the minimum requirements in organization, personnel, work plan, quality control plan, procurement plan or other declaration within the qualification submittal. Key project personnel substituted prior to or during the Work must meet the specification requirements and obtain the Owner's approval.

G. Regulatory Requirements and Standards:

1. Obtain and pay for all permits and inspections required by all legal authorities and agencies having jurisdiction for the Work. The certificates of all such permits and inspections shall be delivered to the Owner.

1.8 SUBMITTALS

A. Submit under provisions of Division 1, Submittals.

B. Contractor is advised that approval or acceptance of product data or shop drawing submittals does not release the contractor from providing all necessary documentation per submittal requirements, nor does it obviate contractor from additional design and coordination throughout the project.

C. Work Plan

1. Submit a work plan for all work to be performed in the existing facility within 15 days of the Notice to Proceed.

D. CPM Schedule

1. Submit a Critical Path Method Schedule within 30 days of the Notice to Proceed.
2. At a minimum show tasks by area such as by building, by floor or other appropriate designations.
3. Include tasks that are not part of the work of this section but that may affect this section such as work by other trades or contractors or Owner review time.
4. Include tasks that are not part of the work of this section but that may affect this section such as work by other trades or contractors or Owner review time.

E. Submittal Matrix

1. Prepare a matrix of submittals by type vs. section of all submittals to be made by the Division 28 contractor within 30 days of the Notice to Proceed.
2. Utilize the list of required submittals listed at the end of this section as a starting point. Add columns for expected delivery dates and each specification section. If a listed submittal is not required for a specific section, indicate such with an “N/A” or other means in the column and row cross point.

F. Schedule of Values

1. Submit a Schedule of Values (SOV) based on the CPM schedule and Submittal Matrix that reflect the value of the systems and installation of work for this Division.
2. That approved SOV will be used as a basis for progress payments.

G. Product Data:

1. Product data is required for all materials and equipment. Include complete bill of materials for each section with the product data submittal.
2. Cross-reference submitted items to the Specifications using their related sections and paragraph numbers.

3. Submit complete product data for all system components in a single, bound submittal of one or more volumes. Provide a table of contents and labeled divider tabs for each section. Partial submittals for individual sections will be returned without review.
4. Include descriptive literature, catalog cuts, illustrations, schematics, technical data sheets, and test data necessary for the Owner's Representative to ascertain that proposed equipment and materials comply with specification requirements. Include manufacturer's name, model, catalog or part numbers. Catalog cuts shall be legible and shall clearly identify equipment being submitted.
5. Include required calculations, I/O points lists, system zone schedules, and other tabular data as necessary to clarify system sizing and configuration. Do not, however, consider such submittals as a substitute for complete shop drawings.
6. Disclosure of Product Deviations: Specifically identify and tabulate any and all deviations from the contract documents including all system functions and features. Reference the corresponding specification sections and paragraph/article numbers. All variances and deviations will be reviewed for acceptance or rejection. It will be the Contractor's sole responsibilities to comply with all other contract requirements not revealed in the disclosure of product deviations.

H. Shop Drawings:

1. Shop drawings are required for all systems and component assemblies.
2. AutoCAD ".dwg" files of the Contract Drawings may be made available upon request. These files may be used as a first step in the preparation of shop drawings. Do not consider the drawing plots from such files as a substitute for the shop drawings that are to be prepared by the contractor.
3. Shop drawings will not be accepted or considered unless they are submitted as a complete package for each specification section. Partial submittals covering less than a whole system or with incomplete interfaces to other systems will be rejected.
4. Standard manufacturer's drawings may not be used as shop drawings unless specifically modified for use on this project.
5. Each drawing requires a unique drawing number and revision level. Revisions shall per be dated and referenced per submittal number. Delta numbers and clouds on the drawings shall be used in all instances where changes have been made to the pervious submittal.
6. At a minimum, include the following shop drawings:

    a. Floor Plans: Scaled drawings showing equipment and device locations in plan view. Include wire and cable types and quantities, raceway sizing and routing. Routing information shall indicate where rated assemblies are penetrated. Separate into as many plan series as needed to prevent overlapping information. These drawings shall be fully coordinated with other trades prior to submittal. Show relationships to adjacent surrounding structures.
    b. Equipment and Control Room Plans and Elevations: Scaled, dimensioned drawings showing security equipment layouts in security equipment rooms, electrical/security closets, and control rooms. Include electrical J-boxes and receptacles, power, conduit sizing and routing, metal gutters, wiring ducts, cable trays, and supports. Indicate all other non-security cabinets, enclosures, and equipment within the room. All constraints and clearance requirements shall be shown in dimensioned drawings.

c. Cabinet, Enclosure, and Rack Elevations: Scaled, dimensioned drawings for each system equipment cabinet, enclosure, and rack showing component and equipment mounting, wire and cable routing and separation, connector and terminal block locations and labeling, and all necessary fabrication details.
d. System Block Diagrams: Single line block diagrams showing the general relationship between system components and the interconnection between systems. Use these drawings as a reference for the Single line diagrams and point-to-point diagrams by cross-referencing the shop drawing number of those diagrams on these drawings.
e. Single Line Diagrams: Interconnection diagrams for the riser and trunk wiring between equipment cabinets, enclosures racks and major components. Use the same equipment designations as the floor plans and block diagrams.
f. Point-to-Point Diagrams: Drawings which show the wiring of each component or device of each individual system. Include details of power supply, grounding, shielding, shield grounding, surge protection, fusing, connector pin-outs, terminal assignments, and similar wiring and connection details. Use the same component and device designations as the floor plans and other shop drawings.
g. Device Installation Diagrams: Details which show the installation and wiring termination of each field device in each individual system. Include settings for dipswitches, jumpers, addresses, port assignments, etc. of all devices.
h. All other shop drawings necessary to install, fabricate, locate, identify, test, service, and repair the systems provided.

7. Shop drawings approved by the Owner's Representative OR by the Consultant Engineer is not a release from Contract requirements as defined by the Drawings, Specifications, and governing codes and regulations.

I. Samples:

1. Field Samples:

a. Wires and Cables: Submit a one (1) foot sample length of each wire and cable type to be used with the cable identification clearly shown.
b. Submit all required samples along with the product data submittal for review and approval prior to installation.
c. If all wire samples cannot be submitted at the same time, submit samples with a complete list of all cables to be used noting samples which have been submitted. Update the list with each subsequent sample submittal.

2. Devices/Equipment:

a. If required by Owner, submit sample assemblies of each of the following devices or equipment along with the product data submittal for review and approval by the Owner's Representative:

1) Substituted products if requested by Owner.
2) Custom component, board, equipment or assembly.

3. Disposition: Submitted samples become property of the Owner and will not be returned.

4. Approval of any custom or modified assemblies shall be required. Submit technical information with samples.

J. Test Procedures:

1. Initial Performance Testing: Submit test procedures, forms, and checklists for point-by-point testing. Include a listing for each individual system, each control station and control panel, each equipment room, and each major system component. At a minimum, forms shall include columns for operational/non-operational status, remarks, workmanship, and date corrected. Submit a sample format for approval by the Owner's Representative a minimum of 20 days prior to testing.
2. Performance Verification Testing: Submit test forms which are identical to or similar to the accepted Initial Performance Testing forms. Obtain approval from the Owner's Representative for any changes in test procedure or forms.

K. Test Results:

1. Performance Verification Testing: Submit completed test results prior to or with the request to have the project declared substantially complete by the Owner.

L. Record (As-Built) Documents:

1. Maintain a current record set of as-built drawings on the job and as construction and installation progress, show the actual installed location of all items, material, and equipment.
2. Accurately record actual routing of all conduits including sizes and types.
3. The as-built drawings shall be available to the Owner's Representative for review and will be required for evaluation of progress payments.
4. Submit as-built shop drawings created from the approved shop drawings and updated from the site as-built drawing set and any other drawings required to depict the as-built conditions of the installed work.

M. Operational Manuals:

1. Submit the required quantity of identical manuals, which shall contain the Theory of Operation, start up, shut down and emergency procedures, and the manufacturer's operating instructions.
2. Subdivide the manual by section with tab dividers. Provide a table of contents which identifies each section and the contents therein.
3. Submit an electronic copy.

N. Maintenance Manuals:

1. Submit a complete set of maintenance documents as described in this Section. For documents of sizes greater than 11 x 17 inches, prints and electronic copy shall be furnished.
2. Manuals shall include the following as a minimum requirement:

a. Technical system description.
b. System schematics.

c. Detailed wiring diagrams to identify cabling, termination, and routing.
d. Panel assembly drawings to identify location of components, terminal strips, and equipment as required to correlate with system drawings.
e. Descriptions and drawings as required to maintain equipment from the board to the component level.
f. Description of software and user programmable functions. Procedures for user programmable functions shall be included.
g. A complete electronic copy of each unique system program.

3. For systems where the program resides on electronic media or other similar storage medium, furnish a copy of the media, or similar medium, to the Owner's Representative.
4. Where multiple systems are combined into a single integrated system, documentation shall include a description of the integrated system and the details of the interfaces between systems.
5. Provide a list of current telephone numbers and addresses of all material vendors and equipment manufacturers who have supplied components in this Project. Include separate service telephone list and purchasing telephone list cross-referencing with each component.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect all materials and equipment from damage during storage at the site and throughout the construction period. Protect equipment and materials during shipment and storage against physical damage, dirt, dust, moisture, cold, rain, and any foreign substances that may damage the equipment.

B. Prevent damage from rain, dirt, sun and ground water by storing the equipment on elevated supports and covering them on all sides with securely fastened protective rigid or flexible waterproof coverings.

C. Protect conduit by storing it on elevated supports and capping the ends with suitable closure material to prevent dirt accumulation.

D. Protect all fabricated and/or installed materials and equipment against dust, dirt, moisture, physical damage, metal debris, and any foreign substances that may damage the equipment.

E. Protect painted surfaces with removable heavy Kraft paper, sheet vinyl or equal, installed at the factory and removed prior to final inspection.

1. Replace equipment determined by the Owner's Representative to be damaged. Repaint and finish damaged paint on equipment and materials with the same quality of paint and workmanship used by manufacturer so that repaired areas are not obvious.

1.10 SITE CONDITIONS

A. Site Investigation

1. Prior to commencement of work, the Contractor shall perform a site survey of all related existing systems and submit any potential problems of the design documents that may increase the installation cost of the project.
2. Survey all locations where work is to be performed and verify existing conditions prior to shop drawing submittals.

B. Coordination with Security Personnel

1. The owner will assign a contact person for the contractor to coordinate day to day activities and access into areas. Coordinate all system interruptions and scheduled down time with the contact person.

C. Security Requirements

1. Any special security requirements will be provided by the Owner. See Division 1.

1.11 SEQUENCING AND SCHEDULING

A. General Requirements:

1. Do not begin the project without the Owner’s acceptance of proposed key project personnel for the Division 28 Work.
2. Prepare, review, and coordinate with the Owner’s Representative an approved construction (CPM) work schedule. Schedule work in areas and at times that will not interfere with scheduled activities as defined by the Owner’s Representative.
3. Provide weekly short term (4-week schedule) updates to Owner’s Representative showing day to day progress and impact to occupied areas.
4. Do not procure any equipment without accepted product data submittals. Do not perform any field installation without accepted shop drawings. Do not begin any extensive software development or programming without accepted system, operational narratives, the required Owner’s coordination, and user's requirements.
5. Pre-assemble control electronics, control panels, racks, and cabinets off-site as most practical.
6. Install system control equipment, control panels, cabinets, racks, and consoles only after major construction in the area in which they are to be installed has been completed and areas have been cleaned, painted, and sealed.
7. After systems installation and prior to point-by-point performance testing, thoroughly pre-test all devices and device wiring for proper performance. Then, thoroughly pre-test each system function in each state or condition under every operating mode.

B. Coordinate all work in the existing facility with the facility contact person.

1.12 WARRANTY

A. The Contractor is to provide a warranty of the work provided under this contract (including, but not limited to, software, hardware, and peripheral equipment) as a system, including interfaces to work by others for one year from the date of Acceptance of the Work. Specific Division 28 sections may require longer warranty periods. Divisions of work among various

suppliers, vendors, installers, subcontractors, and other parties will not be recognized or accepted.

B. Extended Warranty: Provide itemized pricing for an Extended Service and Warranty for years 1, 2, and 3 after the initial warranty period. Describe whether all parts and labor are included in this offering.

C. Guarantee to repair and replace defective materials or workmanship during the warranty period including labor and materials.

D. An emergency maintenance (Warranty) request shall be defined as a system or portion of a system failure that affects building safety, security, and operation of critical components, including any access controlled door, which by failing, prevents entry into a building space through other means or direction. Failure of a single component (i.e., duress button, access controlled door which does not prevent access to a space through other means or direction, camera, or monitor) is not considered an emergency maintenance request.

E. Respond within four hours to an emergency maintenance request. Provide a twenty-four hour telephone contact number (24 hours per day, 365 days per year). Service response time is defined as the period between the placing of a service request and the arrival of a qualified technician capable servicing the problem on-site.

F. Maintain a sufficient parts inventory within 50 miles of the project during the warranty period to meet the guaranteed system repair times.

G. Repair and make operational any defective materials or workmanship resulting from an emergency maintenance request within an 8-hour period from the time of the initial arrival of service personnel at the site. Correct non-emergency defective materials or workmanship within four (4) calendar days of receiving notice of the defect.

H. Where the equipment manufacturer's warranty covers a longer time period than that required by these Specifications, the manufacturer's warranty shall govern.

1.13 EXTRA MATERIALS

A. Prior to Acceptance of the Work, deliver to the Owner all spare parts and extra materials required in each Section. All spare parts and extra materials shall be brand new in their original shipping boxes or packages and shall have one year material warranty remaining at the time of delivery. Extra materials shall be available to the Contractor to use as immediate replacements during the warranty period. All extra materials used for the warranty requirements shall be replaced by the Contractor.

B. Special Tools:

1. Provide three of each type of security screw bits used.
2. Provide minimum of one of any specialty tools used.

PART 2 - PRODUCTS

2.1 PRODUCT OPTIONS AND SUBSTITUTIONS

A. Comply with the General and Supplementary Conditions and Division 1 Specifications.

B. The products named in this section and the sections governed by this section establish minimum qualities that substitutions must meet to be considered acceptable. The specified products have also been used in preparing the drawings and specifications, and therefore establish the basis for equipment sizing, wire and cable design, power consumption, and other design parameters.

C. Substitution requests, if permitted, will be considered only if submitted in strict accordance with the followings:

1. Cross-reference submitted items to the Specifications using their related Section and paragraph number.
2. Submit complete product data, descriptive literature, catalog cuts, illustrations, schematics, technical data sheets, and test data necessary for the Owner's Representative to ascertain that proposed equipment and materials comply with specification requirements. Include manufacturer's name, model, catalog or part numbers. Catalog cuts shall be legible and shall clearly identify equipment being submitted.
3. Disclosure of Product Deviations: Specifically identify and tabulate any and all deviations from the contract documents including all system functions and features. Reference the corresponding specification sections and paragraph/article numbers. All variances and deviations will be reviewed for acceptance or rejection. It will be the Contractor's sole responsibilities to comply with all other contract requirements not revealed in the disclosure of product deviations.

D. The Contractor shall take full responsibility for all design, coordination, and cost associated with substitutions including, but not limited to:

1. Its integration into the total system including physical mounting space, electrical interconnection, signal wiring, power, quality, electromagnetic interference, communication protocols, and similar design considerations.
2. Any additional materials, equipment, components, accessories, items required for equivalent system operation and performance.
3. Any necessary changes to branch power circuits, circuit protective devices, and the Work of other trades.
4. Any modifications to wire, cable, and raceway design.

2.2 MATERIALS AND EQUIPMENT

A. All equipment and materials required for installation under these Specifications shall be new and without blemish or defect.

B. Materials and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacturing of such items, for which replacement parts are available.

Specifications are prepared long in advance of project construction; the contractor is to use the newest model of the specified products available at bid time.

C. All material and equipment shall be listed, labeled, or certified by Underwriters' Laboratories, Inc., where such standards have been established. Equipment and material which are not covered by UL Standard will be accepted provided equipment and material is listed, labeled, certified or otherwise determined to meet safety requirements of a nationally recognized testing laboratory. Equipment of a class which no nationally recognized testing laboratory accepts, certifies, lists, labels, or determines to be safe will be considered, if inspected or tested in accordance with national industrial standards such as NEMA or ANSI.

D. All parts of a system shall be the product of one manufacturer. When more than one unit of the same class of equipment or material is required, such units shall be the products of a single manufacturer. Constituent parts which are similar shall be the product of a single manufacturer.

E. All components of an assembled unit need not be products of the same manufacturer; however, all components must be acceptable to the Owner's Representative. Components shall be compatible with each other and with the total assembly for the intended service.

2.3 EQUIPMENT MODIFICATIONS:

A. When standard manufactured equipment is modified from its original condition or factory options have been exercised identify the changes as noted below.

1. Clearly identify the modifications on the shop drawings.
2. Clearly identify each piece of modified equipment with a label, which states, "This unit has been modified..." and identify the modification or reference. Locate the label so that a service technician or factory service personal will be able to determine the equipment in use is non-standard and that modifications are required for service, testing and replacement.
3. Identify and describe the modifications on the Record Documents.

B. Equipment modification labels are not required for jumper or switch settings.

2.4 FABRICATION

A. Fabricate enclosures to easily accommodate interconnecting cables entering from above or below through the use of auxiliary gutters, cable trays, and conduits. Protect all metal cabinet edges where conductors cross and conduit ends with protective covering or bushing.

B. Group wires and cables by types, boards and modules, and maintain National Electrical Code clearances throughout the installation, including Class 1, Class 2, communications, and branch circuit power separations. Maintain sufficient and proper separation between microphone-level audio, line-level audio, high-level audio, and video cables.

C. Uniformly organize equipment and cable routing throughout all enclosures, racks, and cabinets. Provide wiring ducts, raceways, wire posts, D rings, wire saddles to route and

secure factory and field wiring. Provide routing for all wiring from point of entry to point of termination to maintain required separation, access to all components, and general organization to the wiring. Neatly dress, route and secure wiring.

D. Mechanically fasten cabinet raceways and cable clamps to enclosure rear panels, rack members, console members, or to other system components. The use of adhesive fasteners (without mechanical fastener) is not permitted. Furnish and install cable support posts where necessary to properly support cables.

E. No splices are permitted in cabinet raceways. Exception: Splice to cable shield when within two inches of cable termination is permitted.

F. Furnish and install metal grounding type outlet strips in each equipment cabinet, enclosure, and rack. Leave a minimum of two unused receptacles at each location for future expansion. Neatly shorten and dress power cords from individual equipment to the outlet strips.

G. Provide protection from accidental contact of all terminals or exposed conductors over 25 volts within enclosures that contain Class 2 wiring. Use non-conductive barriers, heat shrink or other acceptable methods. Tape of any kind is not permitted.

H. Provide an isolated ground bus within each equipment cabinet, enclosure, and rack for single point termination of audio and data shields and grounds.

2.5 SOURCE QUALITY CONTROL

A. Shop Inspections:

1. The Owner's Representative shall have the right at all times to inspect or otherwise evaluate the Work performed or being performed and shall have access to the premises in which the Work is being performed.
2. The Owner's Representative may verify the inspections or re-inspect any item. The Owner reserves the right to reject materials and workmanship found unacceptable during inspections.

B. Shop Test and Demonstration

1. Shop Test and Demonstration shall be a major milestone that shall commence only after all shop assembly, system integration, and software development and programming is complete. Owner's approval of the integrated shop test shall be obtained before any system components are shipped to the site for installation.
2. Perform a point-by-point system demonstration of the Integrated Security System including surveillance system, duress alarm system, physical access control system, and audio announcement system to show all systems functioning and communicating as a single integrated system where required.
3. Notify the Owner a minimum of 15 working days prior to demonstration so that the Owner may witness the demonstration.
4. Conduct the demonstration in strict accordance with the test procedure accepted by the Owner. Demonstrate full compliance with the required operating modes and

sequences of operation under all operating modes. Record demonstration/ test results on a report which shall include a list of all personnel witnessing the demonstration, test methods used, and a record of each specific test made.

5. If demonstration results are not in compliance with requirements, make necessary hardware and software changes, corrections, repairs, or adjustments at no additional cost to the Owner. If corrections cannot be made during the scheduled Shop Test and another shop test is required, the Contractor shall pay for all transportation, lodging and expenses of the Owner's representatives' (maximum seven people) attending the additional tests. This process shall continue until the systems are acceptable to the Owner.

2.6 FIRESTOPPING/SEALANT MATERIALS

A. Firestop and seal all penetrations of fire walls with minimum three hour sealant or Fire Stop Putty (FSP). This includes but is not limited to all raceway, conductor, sleeve, and cable tray penetrations where penetrating device does not completely seal the hole.

B. Accepted Products: International Protective Coatings Corp. FlameSafe FSP 1100, Nelson FSP, Domtar Fire-Halt, or approved equal from other manufacturers.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Carefully inspect the installed Work by other trades and verify that all such Work is complete to the point where installation of the Work of this division may properly commence.

B. In the event of discrepancy, immediately notify the Owner's Representative. Do not proceed with installation in areas of discrepancy until such discrepancies have been fully resolved.

C. Install all equipment in accordance with all pertinent codes and regulations, the accepted design, and the referenced standards.

3.2 INSTALLATION

A. Equipment Identification:

1. Install a nameplate on each individual equipment rack, enclosure, boxes, cabinet, and significant equipment item.
2. Use identifiers and abbreviations defined in the Drawings whenever possible. Use plan designation for labeling, unless indicated otherwise.
3. Nameplates shall be laminated black phonemic resin with a white core and engraved lettering, a minimum of 1/4" high.
4. Engrave using upper case letters of uniform height; centered on device, cover plate, or enclosure; with all characters made clearly and distinctly.
5. All equipment shall have the manufacturer's name, address, model number and rating on a name plate securely affixed in a conspicuous place. All equipment shall bear

labels attesting to Underwriters Laboratories approval where subject to Underwriters Laboratories label service.

6. Identify all field terminals and relays with device identification. Lettering shall be 3/16" high minimum.

B. Equipment Installation:

1. Install all equipment in accordance with the manufacturer's recommendations, and accepted shop drawings.
2. Install all equipment in compliance with CEC requirements, NECA's "Standard of Installation", and recognized industry practices.
3. If requested, submit structural and seismic mounting load calculations demonstrating adequate support and bracing for seismic zone 4.
4. Do not attach electrical materials to roof decking, removable or knockout panels, or temporary walls and partitions unless indicated otherwise. Use hangers and other supports to support the equipment and materials, intended for this purpose.
5. Locate equipment as close as practical to the locations shown on the Drawings.
6. Maintain minimum 3-foot working clearances on each side of equipment or equipment racks where access is required to inspect, service or adjust.
7. Check equipment against available mounting space indicated on the drawings. Coordinate location of equipment with existing devices to minimize interference. Bring all conflicts or clearance problems to the attention of the Owner's Representative during the preparation of shop drawings.
8. Where the Owner's Representative determines that equipment installation is not conveniently accessible for operation and maintenance, remove and reinstall equipment in a conveniently accessible manner at no extra cost.

C. Grounding and Shielding:

1. Comply with Section 27 05 26.

D. Surge Suppression:

1. Comply with Section 27 05 26.

3.3 FIELD QUALITY CONTROL

A. Initial Performance Testing:

1. Initial Performance Testing is to be conducted by the Contractor.
2. Point-by-point testing shall include the sequential operation of each system and control function in each of its operating modes. All tests are to be conducted and recorded per the accepted procedure and test forms.
3. Notify the Owner's Representative ten days in advance that this activity will be occurring.

B. Performance Verification Testing:

1. Performance Verification Testing (PVT) is to be conducted by the Contractor and witnessed by the Owner's Representative.

2. Schedule point-by-point PVT only after Initial Testing has been satisfactorily completed and all necessary corrections have been made. Provide the Owner's Representative with a minimum of 10 working days' notice with a request to schedule PVT. Submit Initial Performance Test records prior to the scheduled PVT. Failure to submit test results as specified shall be cause to re-schedule testing.
3. Point-by-point testing shall include the sequential operation of each function in each of its operating modes, in addition to completion of all required performance testing and measurement.
4. Conduct point-by-point PVT testing in the presence of Owner's Representative. Record test results on the accepted test checklist which shall include a list of all personnel witnessing the tests. If test results are not in compliance with requirements, make necessary changes or adjustments at no additional cost, and arrange for another test. This process shall continue until the systems are acceptable to the Owner's Representative.
5. Failure of any part of the system which precludes completion of system testing, which cannot be repaired in four (4) hours, shall be cause for terminating the test. Retesting of the entire system shall be rescheduled at the convenience of the Owner, and Contractor shall bear the Owner's costs to complete retesting.
6. PVT will also include inspections for contract document compliance, codes and standards compliance, and workmanship.

3.4 CLEANING

A. Comply with Division 1 requirements.

B. Protect equipment during installation against entry of foreign matter on the inside. Vacuum clean all equipment both inside and outside before testing, operating and painting. Clean electrical connections with a suitable solvent prior to assembly.

C. Remove from the premises and dispose of all packing material and debris daily.

D. Upon completion of the Work, remove excess debris, materials, equipment, apparatus, tools and the like and leave the premises clean, neat, and orderly.

E. Thoroughly polish all bright metal or plated Work and remove any pasted labels, dirt, or stains from the equipment.

3.5 TRAINING

A. Provide on-site, project-specific training sessions for system operations, maintenance, and programming with designated total hours as follows:

		Administrative	Operator
1.	Video Surveillance System	8/4/4	4/2/2
2.	Access Control System	8/4/4	4/2/2
3.	Duress Alarm System	1/NA	1/NA

B. All classroom training is to occur on site at a location provided by the Owner.

C. All training is to review the existing systems as they apply to the equipment and systems provided under this contract. All personnel being trained are expected to have basic experience for the existing systems.

D. Operator Training:

1. Train security staff in the operation of the System. Operational training shall include how to monitor and control the systems provided under this contract and how to respond to system events.

E. Administrator Training:

1. Train Owner's personnel in the site-specific programming and software trouble shooting of the System. Training will also include all user programmable features. Conduct training sessions using instructors who have been actively involved throughout construction and who are certified in writing by the manufacturers of the specific systems.
2. Provide a combination of classroom sessions supported by audio/visual aids, and field sessions with personnel participating in hands-on for programming changes, software uploading/downloading, trouble shooting, etc.
3. Train Owner's personnel in the basic user level maintenance and troubleshooting of the System. Structure training to identify the equipment and systems that can be serviced or reset by the on duty building engineer, how to identify systems that have failed or not working, and emergency shut down procedures.
4. Provide a combination of classroom sessions supported by audio/visual aids, and field sessions with personnel participating in hands-on preventative, corrective maintenance, and reactive maintenance.

F. Submit an estimated training schedule 15 days prior to training for approval by the Owner's Representative. Estimate classroom and hands-on hours required for all three types of training (operational, maintenance, and programming). Include a syllabus for each class session. Provide video recording, minimum 720p, of the training sessions on solid-state media.

G. All training materials including Operational and Maintenance (O&M) Manuals shall be reviewed and approved prior to conducting the specific training.

SCHEDULE 280500A
SAMPLE LIST OF DIVISION 28 SUBMITTALS

1. CPM Schedule
2. Submittal Matrix
3. Schedule of Values (SOV)
4. Licenses and certifications
5. Key Project Personnel
6. Product Data
7. Shop Drawings
    a. Floor Plans
    b. Enlarged Control / Equipment Rooms and Elevations
    c. Rack and Cabinet Elevations
    d. Block Diagrams
    e. Single Line Diagrams
    f. Point- to-Point Diagrams
    g. Schematic Diagrams
    h. Installation Diagrams and Details
8. Calculations; UPS, Data
9. Sequence of Operations
10. Samples
11. Test Procedures
12. Test Results
13. Record Documents
    a. Drawings
    b. O&M Manuals
    c. Warranty
14. Extra Materials

SCHEDULE 280500 B
SUMMARY OF REQUIRED LICENSES AND CERTIFICATIONS

This list is provided for the convenience of the Contractor only.

A. Section 28 05 00 Integrated Systems Contractors

1. Key Personnel Degree or equal
2. Local Contractors License
3. Qualifications of licensed electrician performing work onsite.

END OF SECTION

SECTION 281300 - PHYSICAL ACCESS CONTROL SYSTEM

PART 1 - GENERAL

1.1 INTENT

A. It is the intent of the Owner to enter into a contract with a qualified contractor to have that contractor procure, provide, install, and make fully operational a Physical Access Control System (PACS) with operational characteristics and capabilities which meet or exceed the product specification and technical performance parameters contained within this document and shown on the project drawings.

B. This PACS shall be installed in Compton CCD Student Housing Buildings A & B.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Division 8 Door Locking Hardware

C. Section 280500 Common Work Results for Electronic Security Systems

D. Section 282300 Video Surveillance System

1.3 SUMMARY

A. Section includes a physical access control system consisting of credentials, proximity card readers, door position switches, request to exit sensors, IP compatible door controllers, headend software system, workstations, and door locking hardware (door locking hardware by Div 8 Contractor).

B. Physical access control system shall be integrated with systems specified in:

1. Division 8 Door Locking Hardware
2. Section 270500 Requirements for Communications Installation
3. Section 281600 Intrusion Detection System
4. Section 282300 Video Surveillance System

1.4 DEFINITIONS Retain definition(s) remaining after this Section has been edited.

A. Access Level: An authorization level or security criteria that must be met before access to a controlled space is granted

B. Access Point: A point of entry into a secure area, typically managed by a door controller and a card reader.

C. ACS: Access Control System

D. ALPR: License Plate Recognition

E. API: Application Programming Interface

F. Biometrics: A machine readable technology that identifies individuals based on reading features such as retinal scans, fingerprints, or other individualistic biological feature

G. Credential: A card, token, keyfob, or other item which is encoded with information specific to an individual

H. Door Controller: Device which integrates and access controlled point to the system headend

I. Door Strike: A door-frame mounted device which works with a mechanical lock or latch mechanism

J. DGM: Dynamic Graphical Maps

K. Encoder: A device utilized to record data onto an access credential

L. Fail Safe Access Point: A door that will unlock automatically in the event of a power failure to permit entering and exiting through the door.

M. Fail Secure Access Point: An access point that automatically locks during a power failure, preventing anyone from entering, but allowing them to exit during an emergency.

N. Input/Output (I/O) Device: An I/O device facilitates elevator control and multi-door monitoring (in/out only).

O. IP-based Access Control: IP access control technology utilizes the network to provide secure network-controlled access and management of physical doors at a facility or location.

P. Magnetic Lock (Mag Lock): A locking device that consists of an electromagnet and a strike plate that works in conjunction with a mechanical lock or latch mechanism, and uses electromagnetic attraction to lock and unlock a door.

Q. Mustering: An access control software feature that quickly verifies where individuals in a particular zone at a location for easy tracking and identification.

R. PACS: Physical Access Control System

S. PDF: Portable Document Format. The file format used by the Acrobat document-exchange-system software from Adobe.

T. Proximity Card (Prox Card): A access control credential that is encrypted with proximity technology and can be read by a proximity reader without having to physically insert the card into the reader, in order to grant a cardholder access to a location.

U. Power over Ethernet (PoE): PoE carries both power and data for the access control door controller and peripheral door hardware.

V. PoE Injector: A Power over Ethernet (PoE) injector brings PoE capabilities to non-PoE network links.

W. Request to Exit Sensor (REX): A button or device that must be activated to release the door in order to exit without triggering a forced door alert.

X. SDK: Software Development Kit

Y. SSM: Server Software Module

Z. SMA: Software Maintenance Agreement

AA. Smart Card – An access card that can be integrated with different technologies including biometric, magnetic stripe, proprietary proximity—and has a memory feature which can contain information about the cardholder.

BB. TCP/IP: Transport control protocol/Internet protocol incorporated into Microsoft Windows.

CC. UI: User Interface

DD. UPS: Uninterruptable Power Supply

EE. VMS: Video Management System

FF. WAN: Wide area network.

GG. WAV: The digital audio format used in Microsoft Windows.

HH. WMP: Windows media player.

II. Wiegand: Patented magnetic principle that uses specially treated wires embedded in the credential card.

JJ. Windows: Operating system by Microsoft Corporation.

KK. Workstation: A PC with software that is configured for specific, limited security-system functions.

1.5 ACTION SUBMITTALS

A. See Section 280500 – Common Work Results for Electronic Security Systems

1.6 INFORMATIONAL SUBMITTALS

A. See Section 280500 – Common Work Results for Electronic Security Systems

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For card readers, door position sensors, request-to-exit sensors, VMS hardware / software, storage, and work station components include all operation, troubleshooting, and maintenance manuals. In addition to items specified above, include the following:

B. See Section 280500 – Common Work Results for Electronic Security Systems

1.8 WARRANTY

A. See Section 280500 – Common Work Results for Electronic Security Systems

PART 2 - PRODUCTS

2.1 QUALITY ASSURANCE

A. Manufacturer of any major component or system installed as a part of this project and not named as a basis of design shall have been in the business of manufacturing such component or system for a minimum of 5 years immediately preceding the date on this document.

B. Any major component or system installed as a part of this contract and not named as a basis of design shall have been installed in a minimum of 3 successfully completed projects of a similar size and scope. Contractor shall supply reference information with their proposal including project name, project location, and contact information for the system end-user.

2.2 BASIS OF DESIGN

A. Where a specific manufacturer’s product is listed below, such product’s performance characteristics and capabilities constitute the minimum acceptable, and any suggested alternates shall have characteristics and capabilities which meet or exceed the product named as the basis of design. Contractor may propose alternate products as follows –

1. See Section 280500 – Common Work Results for Electronic Security Systems

Owner shall make every effort to review proposed alternate equipment, however there is no guarantee that the Owner will review the alternate equipment proposal before the bid opening date, and the Contractor assumes all risk in proposing any such alternates. In the event that the Contractor's alternate equipment is judged by the Owner to not be an acceptable substitute after the Contractor submits a bid, the Contractor shall be responsible for providing the basis of design specified equipment at no additional cost to the Owner.

2.3 PACS BASIS OF DESIGN TECHNICAL PERFORMANCE SPECIFICATIONS

A. Card Reader –

1. Integrated into the locking hardware – manufactured by HID
2. Wall Mount – RP40 as manufactured by HID
3. Mullion Mount – RP10 as manufactured by HID

B. Door Position Sensor –

1. Integrated into the locking hardware – Refer to section 087100
2. Standalone - manufactured by Aritech

C. Request-to-Exit Sensor –

1. Integrated into the locking hardware (Refer to section 087100.)
2. Standalone – DS160 series as manufactured by Bosch

D. Door Locking / Exit Hardware – By Division 8 Contractor

E. Power Supplies for Door Locking Hardware – By Division 8 Contractor

F. IP Compatible Door Controller – iSTAR G2 with Trusted Execution Environment (TEE) as manufactured by JCI Security Products

G. Headend / Software – Software House C-Cure 9000 as manufactured by JCI Security Products

2.4 POWER SUPPLIES

A. All door controllers and equipment connected to door controllers shall be PoE powered, apart from Division 8 Door Locking Hardware.

PART 3 - EXECUTION

3.1 QUALITY ASSURANCE

A. Contractor shall be a factory authorized reseller / installer of all major components installed as a part of this project. Contractor shall submit proof of such authorization as a part of their bid package.

B. Contractor shall have successfully completed a minimum of 3 projects similar in size and scope to this one and shall submit references for such projects with their bid package. Reference shall include project name, location, type of facility, system(s) installed, and end-user contact information. It is expected that substantially the same personnel will be assigned to this project as participated in the referenced projects. This would include the project engineer, project manager, and lead installation technician. If any of these personnel were not involved in the referenced project, Contractor shall supply resumes for these employees documenting their experience and qualifications related to this project.

C. At a minimum, the lead installation technician assigned to this project shall be manufacturer certified in the installation of all major components installed as a part of this project.

3.2 EXAMINATION

A. Examine pathway elements intended for system cabling. Check raceways and other elements for compliance with space allocations, installation tolerance, hazards to camera installation and / or operation, and other conditions affecting installation.

B. Examine roughing-in for LAN, WAN, and IP network before device installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 WIRING

A. See Section 280500 – Common Work Results for Electronic Security Systems

3.4 CONTROL SYSTEM INSTALLATION

A. PACS device locations shown on drawings are approximate, and Contractor shall verify final position with the Owner before any work is done.

B. Install all PACS components per manufacturer’s installation instructions.

C. Install headend / software at location(s) as directed by the Owner.

D. Install key locks on any field enclosures

E. Identify system components, wiring, cabling, and terminals according to Section 260553 "Identification for Electrical Systems”, and Section 280500 – “Common Work Results for Electronic Security Systems”. In instances where there is a

discrepancy between 26 05 53 and 28 05 00, the more stringent requirement shall apply.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Tests and Inspections:

1. See Section 280500 – Common Work Results for Electronic Security Systems

C. Performance Verification Test Schedule: See Section 280500 – Common Work Results for Electronic Security Systems

1. See Section 014000 "Quality Requirements" for retesting and reinspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.

D. Physical access control system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.6 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to TWO (2) visits to Project during normal business hours for this purpose. Tasks shall include, but are not limited to, the following:

1. Check cable connections.
2. Check proper operation of readers and doors.
3. Check proper operation of all integration driven functionalities.

3.7 CLEANING

A. Clean installed items using methods and materials recommended in writing by manufacturer.

B. Clean PACS components as needed.

3.8 TRAINING

A. Training on the surveillance system shall be as follows:

1. See Section 280500 – Common Work Results for Electronic Security Systems

END OF SECTION

SECTION 281500 - INTEGRATED ACCESS CONTROL HARDWARE DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes access control door hardware for the following:

1. Swinging doors.
2. Other doors to the extent indicated.

B. Section includes, but is not necessarily limited to, the following for the integrated access control security and site management system:

1. Electrified and Integrated Access Control Card Key Door Hardware

C. Related Sections include the following:

1. Division 01 Section “Cash Allowances”.
2. Division 01 Section “Product Allowances”.
3. Division 08 Section “Door Schedule”.
4. Division 08 Section “Door Hardware Schedule”.
5. Division 08 Section "Hollow Metal Doors and Frames."
6. Division 08 Section "Flush Wood Doors".
7. Division 08 Section "Clad Wood Doors".
8. Division 08 Section "Stile and Rail Wood Doors".
9. Division 08 Section “Fiberglass Doors”,
10. Division 08 Section "Integrated Door Opening Assemblies".
11. Division 08 Section "Aluminum-Framed Entrances and Storefronts".
12. Division 08 Section "All-Glass Entrances".
13. Division 08 Section "Automatic Entrances".
14. Division 08 Section "Door Hardware".
15. Division 08 Section "Automatic Door Operators".
16. Division 14 Section "Elevators" for security access to elevator floor selection controls.
17. Division 26 Section "Electrical" for connections to electrical power system and for low-voltage wiring work.
18. Division 27 Section "Communications" for connections to the LAN.

19. Division 28 Section "Access Control" for access control devices and equipment installed at door openings and provided as part of a security and site management system.
20. Division 28 Section "Intrusion Detection" for detection devices installed at door openings and provided as part of an intrusion detection system.
21. Division 28 Section "Video Surveillance" for motion detection and video camera devices and equipment installed at door openings and provided as part of a security and site management system.
22. Division 28 Section "Fire Detection and Alarm" for connections to building fire alarm system.

D. References:

1. ANSI A117.1 (1998) - Accessible and Usable Buildings and Facilities.
2. IBC - International Building Code
3. NFPA 70 (2002) - National Electrical Code.
4. NFPA 80 (1999) - Fire Doors and Windows.
5. NFPA 101 (2006) - Life Safety Code.
6. UL 294 - Access Control Systems.
7. UL 1076 - Proprietary Burglar Alarm Units and Systems.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. System Operational Descriptions: Complete system operational narratives for the integrated access controlled openings defining the owner's prescribed requirements for the opening functionality. Narratives include, but are not limited to, the following situations: normal secured/unsecured state of door; authorized access; authorized egress; unauthorized access; unauthorized egress; fire alarm and loss of power conditions, and interfaces with other building control systems.

C. Shop Drawings: Details of electrified integrated locking hardware and access control firmware, indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication and control of the access control system electrified hardware and firmware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

   a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
   b. Complete (risers, point-to-point) access control system block wiring diagrams.

2. Electrical Coordination: Coordinate with related Electrical Sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Proof of Certification: Upon request provide a copy of manufacturer(s) official certification or accreditation document indicating proof of status as a qualified and authorized provider of the primary access control components.

E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete access control and site management installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and telephone number of the supplier/integrator providing the installation and the nearest service representatives for each item of equipment included in the system. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.

1. As-Built Drawings: During system installation, the Contractor to maintain a separate hard copy set of drawings, elevation diagrams, and wiring diagrams of the access control system to be used for record drawings. This set to be kept up to date by the Contractor with all changes and additions to the access control system accurately recorded.

F. Warranties and Maintenance: Special warranties and maintenance agreements specified in this Section.

1.4 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum of five (5) years of documented experience in providing access control and security systems equipment and software similar to that indicated for this Project and that have a proven record of successful in-service performance.

1. Software and access control systems components to have been previously and thoroughly tested together with proven installations similar in size and functionality to the design requirements indicated for this Project.

B. Supplier Qualifications: Supplier/Dealers, verifiably authorized and in good standing with the primary product manufacturers, with a minimum of three (3) years of experience supplying integrated access control systems similar in material, design, and scope to that indicated for this Project and whose work has resulted in construction with a proven record of successful in-service performance.

1. ASSA ABLOY access control products are required to be supplied only through designated “Authorized Channel Partners.”

a. Contact Michael Del Vecchio (Michael.DelVecchio@assaabloy.com) or Dale Samsel (Dale.Samsel@assaabloy.com) for current list of approved ACPs.

C. System Integrator Qualifications: Systems Integrators, verifiably factory trained and certified by the primary product manufacturers, with a minimum of three (3) years documented experience installing complete integrated access control systems similar in material, design, and scope to that indicated for this Project and whose work has resulted in construction with a proven record of successful in-service performance. Qualifications include, but are not necessarily limited, to the following:

1. References: Provide a list of references for similar projects including contact name, phone number, name and type of project.
2. Professional Staffing: Firms to have a dedicated access control systems integration department with full time, experienced professionals on staff experienced in providing on site consulting services for both electrified door hardware and integrated access control systems installations.
3. Factory Training: Installation and service technicians are to be competent factory trained and certified personnel capable of maintaining the system.
4. Service Center: Firms to have a service center capable of providing training, in-stock parts, and emergency maintenance and repairs at the Project site with 24-hour/7-days a week maximum response time.

D. Installer Qualifications: Certified technicians, verifiably authorized with the primary product manufacturers for installation of IP-Enabled, Wireless, and Power-over-Ethernet Access Control products in accordance with documented instructions and NFPA 80.

1. ASSA ABLOY access control products are required to be installed only through designated "Preferred Installers."

E. Retain or edit subparagraphs below as needed to reflect the Source Limitation criteria specific to the Project's supplier, integrator and installer market conditions.

F. Source Limitations: Obtain the access control door hardware, system firmware and application software specified in this Section from a single source, qualified supplier/integrator unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
2. Provide integrated access control door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

G. Regulatory Requirements: Comply with NFPA 70, NFPA 80, NFPA 101 and ANSI A117.1 requirements and guidelines as directed in the model building code including, but not limited to, the following:

1. Comply with NFPA 70 "National Electrical Code", including electrical components, devices, and accessories listed and labeled as defined in Article 100 by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

2. Where indicated to comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," ANSI A117.1.
3. Comply with NFPA 101 "Life Safety Code" for doors in a means of egress.
4. Comply with NFPA 80 "Fire Doors and Windows" for fire labeled opening assemblies.
5. The installed access control system shall conform to all local jurisdiction requirements.

H. Keying Conference: Reference Division 8 Section "Door Hardware".

I. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier/Dealer, Systems Integrator, and Contractor to review proper methods and procedures for receiving, handling, and installing the access control system hardware. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedules.

1. Inspect and discuss Division 26 electrical roughing-in and similar preparatory work performed by other trades.
2. Review and verify sequence of operation descriptions for each unique access controlled opening.
3. Review and finalize construction schedule and verify availability of materials.
4. Review the required inspecting, testing, commissioning, and demonstration procedures.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not store electronic access control hardware, software or related accessories at Project site without prior authorization.

1. Access control firmware and software: Where approved and directed, inventory upon receipt and store electronic access control equipment in a secure, temperature and humidity controlled environment in original manufacturer's sealed containers.

B. Tag each item or package separately with identification related to the final Access Control Door Schedule, and include basic installation instructions with each item or package.

C. Deliver permanent keys, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner established at the “Pre-Submittal Conference".

1.6 COORDINATION

A. Coordinate quantity and arrangement of assemblies with ceiling space configuration and with components occupying ceiling space, including structural members, pipes, air-distribution components, raceways, cable trays, recessed lighting fixtures, and other items.

B. Access Control System Electrical Coordination: Coordinate the layout and installation of scheduled electrified door hardware, and related access control equipment, with required connections to source power junction boxes, power supplies, detection and monitoring hardware and fire alarm system.

1. Door Hardware Interface: The card key access control system to interface and be connected to electronic door control hardware (electromechanical locks, electric strikes, magnetic locks, door position switches, other monitoring contacts, and related auxiliary control devices) as described under Division 8 "Door Hardware". Coordinate the installation and configuration of specified door hardware being monitored or controlled with the controls, software and access control hardware specified in this Section.

C. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing electrified door hardware and access control system components. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing access control system hardware to comply with indicated requirements.

D. Door and Frame Preparation: Related Division 08 Sections (Steel, Aluminum and Wood) doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article will not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and are in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of the installed access control system hardware and software that fails in materials or workmanship, including all related parts and labor, within specified warranty period after final testing and acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.

3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

D. Special Warranty Periods (Electrified Access Control Door Hardware):

1. Two years for Electrified, Wiegand Output, and IP-Enabled Access Control Door Hardware.

E. Maintenance Support and Extended Service Agreement: Submit for Owner's consideration an optional extended Service Agreement for the installed access control system, including support for software related issues. The extended Service Agreement is considered elective and is without manufacturer's requirement stipulating mandatory coverage for owner and/or vendor system support.

1. A published copy of this agreement to be included with the submittal package
2. Support for the installed access control system components is provided through the vendor under a 24 hour technical assistance program.
3. Access control and management system components are to be available on a one-day turn around time frame from the manufacturer.
4. Primary systems manufacturer to offer and provide remote modem or internet access for direct factory support to the vendor. The factory level support to include diagnostics and troubleshooting support on systems related issues at no additional cost to the owner.

F. Access Control Software Upgrades: Version upgrades and "fix" releases to the access control system software are available at no extra charge as long as the version of software provided under this specification remains the current manufacturer's version or for up to (2) years after a new version release.

1. Major access control software revisions that provide new functionality to the product provided free of charge for up to one (1) year from the date of substantial completion.
2. Access control system software is to be upgradable as may be required or as necessary, to expand and manage the owner's site or sites. Upgrades are to be offered at a published flat fee for the primary system software, with single license modules included in the primary fee structure. System upgrades offered at a costing structure based upon the original number of licensed modules issued, or on those to be purchased at a future date, are not allowed.
3. As part of the submittal package, provide a list of available software upgrades and/or expansions modules. List to identify related costs for upgrades, or expansions to the original system, up to the next qualifying operational level.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of the installed access control system hardware and components.

B. Maintenance Service: Beginning at Substantial Completion, and running concurrent with the specified warranty period, provide continuous (6) months full maintenance by skilled employees of the Systems Integrator. Include repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door opening operation. Provide parts and supplies as used in the manufacture and installation of original products.

1.9 SCOPE OF WORK

A. On-Line Electronic Access Control System: Furnish and install at the indicated locations the specified electrified and integrated door hardware and access control firmware and software for a completely operational access control and security site management system. System includes, but is not necessarily limited, to the following:

1. Electrified integrated card reader locks and exit hardware, network control processors, reader controller panels, I/O monitor/control interfaces, door position switches, remote card readers, keypads, and display terminals, access cards and credentials, system application software, special tools, operating manuals, and required cabling and accessories as detailed below and listed in the Access Control Hardware Sets at the end of Part 3.

    a. Provide the appropriate number of reader controller panels and I/O monitoring/control expansion interfaces as needed to handle the number of card readers, locking devices, door status devices, and identified alarm inputs specified in this section, and as shown on the security drawings.
    b. Provide manufacturer approved integrated card reader locks, exit hardware, and remote mounted card readers, keypads, and display terminals that are functionally compatible with the specified access control equipment interfaces.

2. Access control system equipment to be installed in an enclosure box compatible with the specified components. This enclosure to include, but is not necessarily limited to, the network control processor, I/O monitor/control interface panels, power supplies, terminal strips, wire ducts, keyed lock cylinder, integrated outlet for A/C power, and standoffs.

    a. Enclosure box to be located in the designated IT/Telecom room(s) with connection to local area network for communication back to the central server host.

3. Owner to provide the following:

    a. Central server host computer, client workstations, and hardware peripherals to be from an approved, major line computer manufacturer. Specific information detailing compliance with system requirements to be included in the project submittal package as specified.
    b. Owner will be responsible for ensuring that each computer hardware component includes the required interfaces, expansion boards, and peripherals that will be necessary to allow the system to operate as described within this specification and as indicated on the drawings.
    c. Power Sourcing and Network Switches: Quantity as required to accommodate installed access control (and video surveillance) devices.
    d. Network Control Processor Connections:
        1) LAN/Ethernet communication ports (jacks) and network interface cards as needed, CAT5e cabling from network router/switch to network control processor, outlet and cover plates and/or patch cables required for network connection within each designated IT/Telecom room.
        2) Required static IP addresses.

4. Power Supplies, including battery back up and separately fused surge protection, required for the electrified door hardware and access control equipment.
5. Installation, final configuration and commissioning of electrified door and access control system hardware, communication firmware, power supplies and related accessories.
6. System application software including installation, programming, and end user training of the access control system demonstrating operating, repair, and maintenance procedures. Include no fewer than 8 hours of on-site central server training for designated personnel (facilities maintenance, security, IT, administration) by a factory certified representative.
7. Provide manufacturer required power controllers, interface boards, and programming that may be required for approved electric latch retraction exit devices supplied under Division 08 Section "Door Hardware."
8. Electrical contractor, Division 26, to provide the following:

    a. Source power wiring (120VAC) as required for the electrified locking and access control hardware, equipment, accessories and power supplies. This includes quad outlets as required on a dedicated circuit in the designated IT/Telecom room(s) and the related conduit, stub-in, junction boxes and connectors required for the source power delivery and connections.
    b. Provide required conduit, stub-in, junction and back boxes for both the electrified locking hardware and access control equipment at each of the access controlled or monitored openings per plan drawings and specs. Supply and install conduit between each of the aforementioned devices and between the electrical junction boxes, power supplies and access control equipment located on or above the door opening.

1) At wall mounted remote readers, provide conduit on the secured side of the door, 36" from the finish floor and 6" from the edge of the frame, to the related power supplies and access control equipment.
2) At electrical hardware power transfers provide conduit on the secured side of the opening from the power transfer, thru-wire hinge, or serviceable panel location on the frame jamb to the related power supplies and access control equipment.

c. Electrical Contractor to provide all 120VAC cabling connections and terminations from the electrical junction boxes to these electrical devices.

9. Access Control System Integrator to provide the following:

a. Low voltage wiring (12/24VDC) and communication cabling (RS-232/RS-485) from network control processors to reader controllers, I/O monitor/control interface panels, electrified and integrated locking hardware, remote card readers, keypads, or display terminals, monitoring and signaling switches, and power supplies. Work includes related connectors, final terminations, and hook-ups required for a complete and functional access controlled opening in accordance with applicable codes and specified system operational narratives.

10. Elevator Contractor to provide the following:

a. Interface or landing of interface cable onto the elevator call button will be performed by a certified elevator contractor.
b. Coordinate with access control systems integrator provisions for a card reader with output allowing the elevator call button to be activated. A validated card read will be required for activation.

11. Full and seamless integration of the site intrusion alarm service if applicable, with the installed site access control system software.
12. Final connections to fire alarm system, if required, by electrical and fire alarm system contractors.
13. Provide permits, submittals and approvals required by the authority having jurisdiction, prior to commencing with work.
14. Provide manufacturer required power controllers, interface boards, and programming that may be required for approved electric latch retraction exit devices supplied under Division 08 Section "Door Hardware."
15. Electrical contractor (Division 26) to provide the following:

a. Provide required conduit, stub-in, junction and back boxes for both the electrified locking hardware and access control equipment at each of the access controlled or monitored openings per plan drawings and specs. Supply and install conduit between each of the aforementioned devices and between the electrical junction boxes, power supplies and access control equipment located on or above the door opening.

1) At off-line remote readers, provide conduit on the secured side of the door, 36" from the finish floor and 6" from the edge of the frame, to the related power supplies and access control equipment.
2) At electrified hardware power transfers provide conduit on the secured side of the opening from the power transfer, thru-wire hinge, or serviceable panel location on the frame jamb to the related power supplies and access control equipment.

b. Electrical Contractor to provide all 120VAC cabling connections and terminations from the electrical junction boxes to these electrical devices.

16. Access Control System Supplier to provide the following:

a. Low voltage wiring (12/24VDC) for the electrified locking hardware, remote card readers, monitoring and signaling switches, and power supplies. Work includes related connectors, final terminations and hook-ups required for a complete and functional access controlled opening in accordance with applicable codes and specified system operational narratives.

17. Typical System Requirements (Owner Provided): Central server host computer, client workstations, and hardware peripherals to be from an approved, major line computer manufacturer. Specific information detailing compliance with system requirements to be included in the project submittal package as specified.

PART 2 - PRODUCTS

2.1 INTEGRATED WIRED OUTPUT ACCESS CONTROL, MULTI-CLASS READER

2.2 POWER OVER ETHERNET ACCESS CONTROL

A. IP Enabled Power-over-Ethernet (PoE) Integrated Card Reader Mortise Lock: IP enabled ANSI/BHMA A156.13 Grade 1 mortise lockset with integrated credential reader, request-to-exit, and door position signaling in one complete unit. Motor driven locking/unlocking control of the lever handle trim, 3/4" projection latchbolt, and optional 1" steel deadbolt. Lock is U.L listed and labeled for use on up to 3 hour fire rated openings. Available with or without keyed high security cylinder override.

1. Completely intelligent and integrated locking unit with Ethernet power and communication connection capability directly from the locking unit back to the central system host server without additional access control interfaces or components (excluding PoE Endspan and Midspan devices) via an existing or newly installed IEEE 802.3af PoE enabled network.
2. Open architecture design supports wired integration with third party access control systems applications via software development kit (SDK). Real-time software accessible alarms for forced door, unknown card and door held open,

with inside lever handle (request-to-exit), battery status, tampering, and door position (open/closed status) monitoring.

3. 2,400 users and 10,000 event transaction history (audit trail). Distributed intelligence allows stand alone operation in absence of network communication allowing for system operational redundancy.
4. Provide a network and lock configuration CD tool kit for initial lock setup and programming via a USB connection.
5. Energy Efficient Design: Provide lock bodies which have a holding current draw of 15mA maximum, and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.
6. Integrated reader supports the following credentials:

    a. 125kHz proximity credentials: HID, AWID, Indala, and EM4102.
    b. 13.56 MHz contactless credentials: HID iClass, HID iClass SE, HID iClass Seos, SIO on MIFARE Classic, SIO on MIFARE DESFire EV1, MIFARE Classic, DESfire EV1, NFC-enabled mobile phones, Bluetooth Smart-enabled mobile phones.

7. Optional push-button keypad for PIN only usage or dual authentication requirements.
8. Communication between access control system and device is protected by AES 128 bit encryption via the SDK. Programmable for time zones, holidays, and automatic unlocking.
9. Power and communication from one Ethernet (CAT5e or higher) cable. Compliant with 802.3af Class 1 device specifications requiring 3.84 watts for Power over Ethernet.
10. Supports real-time system lockdown capabilities. Inside lever retracts latch bolt and deadbolt simultaneously.
11. High security mechanical key provides emergency override retraction of latchbolt without need for electronic activation.
12. Ethernet system framework, network cabling, mounting boxes, PoE end-span/mid-span, electrical hard wiring, grounding, and connections are required for complete system functionality. All system components are by others and are specified elsewhere.

    a. Power Requirement: PoE Class 2, maximum 7 watts.
    b. Network Cabling Requirements: Cat5e or higher meeting or exceeding ANSI/TIA/EIA-568-C. 24 AWG Plenum rated.
    c. Bonding and Grounding: Meet or exceed TIA-607-B requirements. Connect device ground cable to building electrical earth ground.
    d. Network Surface Mount Box: Meet or exceed ANSI/TIA/EIA-568-C requirements. Cat5e or higher (RJ45).

13. Manufacturers:

    a. Sargent Manufacturing (SA) – IN220 Series.

B. IP Enabled Power-over-Ethernet (PoE) Integrated Card Reader Exit Hardware: IP enabled, PoE ANSI/BHMA A156.3 Grade 1 rim and mortise exit device hardware with integrated credential reader, touchbar monitoring, and request-to-exit signaling in one

complete unit. Motor driven locking/unlocking control of the lever handle exit trim with 3/4" throw latch bolt. U.L listed and labeled for either panic or fire exit hardware for use on up to 3 hour fire rated openings. Available with or without keyed high security cylinder override trim.

1. Completely intelligent and integrated locking unit with Ethernet power and communication connection capability directly from the locking unit back to the central system host server without additional access control interfaces or components (excluding PoE Endspan and Midspan devices) via an existing or newly installed IEEE 802.3af PoE enabled network.
2. Open architecture design supports wired integration with third party access control systems applications via software development kit (SDK). Real-time software accessible alarms for forced door, unknown card and door held open, with push rail (request-to-exit), battery status, tampering, and door position (open/closed status) monitoring.
3. 2,400 users and 10,000 event transaction history (audit trail). Distributed intelligence allows stand alone operation in absence of network communication allowing for system operational redundancy.
4. Provide a network and lock configuration CD tool kit for initial lock setup and programming via a USB connection.
5. Energy Efficient Design: Provide lock bodies which have a holding current draw of 15mA maximum, and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.
6. Integrated reader supports the following credentials:

    a. 125kHz proximity credentials: HID, AWID, Indala, and EM4102.
    b. 13.56 MHz contactless credentials: HID iClass, HID iClass SE, HID iClass Seos, SIO on MIFARE Classic, SIO on MIFARE DESFire EV1, MIFARE Classic, DESfire EV1, NFC-enabled mobile phones, Bluetooth Smart-enabled mobile phones.

7. Optional push-button keypad for PIN only usage or dual authentication requirements.
8. Communication between access control system and device is protected by AES 128 bit encryption via the SDK. Programmable for time zones, holidays, and automatic unlocking.
9. Power and communication from one Ethernet (CAT5e or higher) cable. Compliant with 802.3af Class 1 device specifications requiring 3.84 watts for Power over Ethernet.
10. Supports real-time system lockdown capabilities
11. High security mechanical key provides emergency override retraction of latchbolt without need for electronic activation.
12. Ethernet system framework, network cabling, mounting boxes, PoE end-span/mid-span, electrical hard wiring, grounding, and connections are required for complete system functionality. All system components are by others and are specified elsewhere.

    a. Power Requirement: PoE Class 2, maximum 7 watts.
    b. Network Cabling Requirements: Cat5e or higher meeting or exceeding ANSI/TIA/EIA-568-C. 24 AWG Plenum rated.

c. Bonding and Grounding: Meet or exceed TIA-607-B requirements. Connect device ground cable to building electrical earth ground.
d. Network Surface Mount Box: Meet or exceed ANSI/TIA/EIA-568-C requirements. Cat5e or higher (RJ45).

13. Manufacturers:

a. Sargent Manufacturing (SA) – IN220 - 80 Series.

2.3 CABLES AND WIRING

A. Comply with Division 27 Section "Conductors and Cables for Electronic Safety and Security."

B. Data Line Supervision: System to include alarm initiation capability in response to opening, closing, shorting, or grounding of data transmission lines.

C. Install appropriate number of conductor pairs, in the wire gage (AWG) recommended by manufacturer, corresponding to the electronic locking functions specified, amperage drawn and distances covered between the power supplies, power transfer devices, electrified hardware and access control equipment.

2.4 ACCESS CONTROL HARDWARE FINISHES

A. Standard: Comply with BHMA A156.18.

B. Protect mechanical finishes on exposed surfaces from damage by applying temporary protective coverings before shipping.

C. Where specified, finishes on integrated card key locksets or exit hardware to incorporate an FDA recognized antimicrobial coating (i.e., MicroShield™) listed for use on equipment as a suppressant to the growth and spread of a broad range of bacteria, algae, fungus, mold and mildew.

D. BHMA Designations: Comply with base material and finish as specified.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance of the installed access control system.

B. Examine roughing-in for electrical source power to verify actual locations of wiring connections before electrified and integrated access control door hardware installation.

C. Examine roughing-in for LAN and control cable conduit systems to PCs, controllers, card readers, and other cable-connected devices to verify actual locations of conduit and back boxes before device installation.

D. Notify architect of any discrepancies or conflicts between the specifications, drawings and scheduled access controlled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Doors and frames at scheduled access controlled openings to be properly prepared to receive specified electrified and access control hardware and connections without additional in-field modifications.

3.3 INSTALLATION

A. Install each item of electronic integrated door hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

B. Mounting Heights: Mount electronic integrated door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."

C. Boxed Power Supplies: Verify locations.

1. Configuration: Provide the least number of power supplies required to adequately serve doors with access control hardware and equipment.

D. Final connect the system control switches (integrated card key locking hardware, remote readers, keypads, display terminals, biometrics), and monitoring, and signaling equipment to the related Controller devices at each opening to properly operate the electrified door and access control hardware according to system operational narratives.

E. Retrofitting: Install each door hardware and access control item to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

F. System Application Software: Install, and test application(s) software and databases for the complete and proper operation of systems involved. Assign software license(s) to Owner.

3.4 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

B. Commissioning and Testing Schedule: Prior to final acceptance of the access control system installation, the following testing and documentation to be performed and provided to the Owner.

1. Inspection: Verify that units and controls are properly installed, connected, and labeled and that interconnecting wires and terminals are identified.
2. Pre-testing: Program and adjust the system and pretest all components, wiring, and functions to verify they conform to specified requirements. Provide testing reports indicating devices tested, pass/fail status, and actions taken to resolve problem(s) on failed tests.
3. Acceptance Test Schedule: Correct deficiencies identified by tests and observations and retest until specified requirements are met.
4. Provide “as designed” drawings showing each device and wiring connection and electronic enclosure legends indicating cabling in and out.
5. Provide a complete set of operating instructions for access control hardware devices and a complete software user manual. The documentation includes module reference guides for each electronic enclosure.

3.5 ADJUSTING

A. Adjust and check each operating item of integrated access control door hardware, and each door opening to ensure proper secured operation and function of every unit. Replace units that cannot be adjusted to operate as intended.

3.6 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by access control system installation.

B. Clean operating items as necessary to restore proper finish and provide final protection and maintain conditions that ensure access control door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Engage an authorized systems manufacturer representative to train Owner's maintenance personnel to adjust, operate, and maintain electronic integrated door hardware and the access control system.

3.8 ACCESS CONTROL HARDWARE SETS

A. The access control system hardware sets listed below represent the design intent and direction of the owner, architect, and security consultant (as applicable). They are intended as a guideline only and should not be considered a detailed opening schedule. Discrepancies, conflicting, and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

B. The supplier is responsible for handing and sizing all products and providing the correct option for the appropriate door type and material where more than one is presented in the hardware sets. Quantities listed are for each pair of doors, or for each single door.

C. Refer to Section 087100, Door Hardware, for hardware sets.

END OF SECTION 281500

SECTION 282300 - VIDEO SURVEILLANCE SYSTEM

PART 1 - GENERAL

1.1 INTENT

A. It is the intent of the Owner to enter into a contract with a qualified contractor to have that contractor procure, provide, install, and make fully operational an Electronic Video Surveillance System (EVSS) with operational characteristics and capabilities which meet or exceed the product specification and technical performance parameters contained within this document and shown on the project drawings.

B. This EVSS shall be installed in …….

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Section 28 05 00 Common Work Results for Electronic Security Systems

C. Section 28 13 00 Physical Access Control System

1.3 SUMMARY

A. Section includes a video surveillance system consisting of:

1. Fixed Interior Wall / Ceiling Mount Megapixel Camera
2. Fixed Exterior Wall / Pole Mount Megapixel Camera
3. Interior Pan, Tilt, Zoom (PTZ) Wall / Ceiling Mount Megapixel Camera
4. Exterior Pan, Tilt, Zoom (PTZ) Wall / Pole Mount Megapixel Camera
5. Supplemental Illumination Devices
6. Digital Video Recording and Management Software (DVRMS)
7. System Servers
8. System Workstations / Review Monitor
9. Power and Data Cabling, Conduit, and Infrastructure

B. Video surveillance system shall be integrated with systems specified in:

1. Section 28 16 00 Physical Access Control System

1.4 ABBREVIATIONS AND ACRONYMS

A. CPU = Central Processing Unit

B. DVD = Digital Video Disc

C. DVRMS = Digital Video Recording and Management System

D. FPS = Frames per Second

E. GB = Gigabyte

F. GBPS = Gigabyte per Second

G. HDD = Hard Disk Drive

H. HDMI = High Definition Media Interface

I. IDS = Intrusion Detection System

J. IPS = Images per Second

K. LAN = Local Area Network

L. MB = Megabyte

M. MBPS = Megabyte per Second

N. NAS = Network Attached Storage

O. LED = Light Emitting Diode

P. PACS = Physical Access Control System

Q. RAID = Redundant Array of Independent Disks

R. RAM = Random Access Memory

S. SAN = Storage Attached Network

T. TCP/IP = Transport Control Protocol / Internet Protocol

U. UPS = Uninterruptable Power Supply

V. USB = Universal Serial Bus

W. PVT = Performance Verification Testing

X. V-LAN = Virtual Local Area Network

Y. VMS = See DVRMS

Z. VSS = Video Surveillance System

AA. WAN = Wide Area Network

1.5 REFERENCE STANDARDS

A. National Television System Committee - NTSC (North America)

B. Joint Photographic Experts Group – JPEG

C. Motion Joint Photographic Experts Group - MJPEG

D. Moving Picture Experts Group - MPEG

E. Underwriters Laboratory – UL

F. Federal Communications Commission – FCC

G. Interference Causing Equipment Standard – ICES (Canada)

H. Institute of Electronic and Electrical Engineers - IEEE

I. International Standards Organization – ISO

J. International Electrotechnical Commission -IEC

K. Restriction of Hazardous Substances Directive (RoHS)

1.6 ACTION SUBMITTALS

A. See Section 28 05 00 Common Work Results for Electronic Security Systems

1.7 INFORMATIONAL SUBMITTALS

A. See Section 28 05 00 Common Work Results for Electronic Security Systems

1.8 CLOSEOUT SUBMITTALS

A. See Section 28 05 00 Common Work Results for Electronic Security Systems

1.9 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NECA 1.

C. Comply with NFPA 70.

1.10 WARRANTY

A. See Section 28 05 00 Common Work Results for Electronic Security Systems

PART 2 - PRODUCTS

2.1 QUALITY ASSURANCE

A. Manufacturer of any major component or system installed as a part of this project and not named as a basis of design shall have been in the business of manufacturing such component or system for a minimum of 5 years immediately preceding the date on this document.

B. Any major component or system installed as a part of this contract and not named as a basis of design shall have been installed in a minimum of 3 successfully completed projects of a similar size and scope. Contractor shall supply reference information with their proposal including project name, project location, and contact information for the system end-user.

2.2 BASIS OF DESIGN

A. Where a specific manufacturer's product is listed below, such product's performance characteristics and capabilities constitute the minimum acceptable, and any suggested alternates shall have characteristics and capabilities which meet or exceed the product named as the basis of design. Contractor may propose alternate products as follows:

1. See Section 28 05 00 Common Work Results for Electronic Security Systems

2.3 EVSS BASIS OF DESIGN TECHNICAL PERFORMANCE SPECIFICATIONS

A. Fixed Interior Wall / Ceiling Mount Megapixel Camera - TBD

B. Fixed Exterior Wall / Pole Mount Megapixel Camera - TBD

C. Interior Pan, Tilt, Zoom (PTZ) Wall / Ceiling Mount Megapixel Camera - TBD

D. Exterior Pan, Tilt, Zoom (PTZ) Wall / Pole Mount Megapixel Camera - TBD

E. Supplemental Illumination Devices - TBD

F. Digital Video Recording and Management Software (DVRMS) - TBD

G. System Servers - TBD

H. System Workstations / Review Monitor - TBD

2.4 POWER SUPPLIES

A. All system components to be connected to a UPS providing a minimum of 4 hours back-up power.

B. The control panel shall be equipped with backup batteries sufficient to provide 24 hours of standby operation and 10 minutes of alarm activation.

PART 3 - EXECUTION

3.1 QUALITY ASSURANCE

A. Contractor shall be a factory authorized reseller / installer of all major components installed as a part of this project. Proof of such authorization shall be submitted as a part of the bid package

B. Contractor shall hold licenses as required by local, state, or federal agencies.

C. Contractor shall have successfully completed a minimum of 3 projects similar in size and scope to this one, and shall submit references for such projects with their bid package. Reference shall include project name, location, type of facility, system(s) installed, and end-user contact information. It is expected that substantially the same personnel will be assigned to this project as participated in the referenced projects. This would include the project engineer, project manager, and lead installation technician. If any of these personnel were not involved in the referenced project, Contractor shall supply resumes for these employees documenting their experience and qualifications related to this project.

D. At a minimum, the lead installation technician assigned to this project shall be manufacturer certified in the installation of all major components installed as a part of this project.

3.2 SITE SPECIFIC SCOPES OF WORK

A. TBD

B. TBD

C. TBD

D. TBD

3.3 EXAMINATION

A. Examine pathway elements intended for EVSS cabling. Check raceways and other elements for compliance with space allocations, installation tolerance, hazards to camera installation and / or operation, and other conditions affecting installation.

B. Examine roughing-in for all components before device installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.4 WIRING

A. Comply with requirements in Section 26 05 33 "Raceways and Boxes for Electrical Systems."

B. Wiring Method: Install cables in raceways and or conduit unless otherwise indicated.

1. Except raceways are not required in accessible indoor ceiling spaces and attics, where Contractor shall utilize self-supported J-hooks.
2. Except raceways are not required in hollow gypsum board partitions.
3. Conceal raceways and wiring except in unfinished spaces.

C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

D. Splices, Taps, and Terminations: For power and control wiring, use numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

E. For LAN connection and fiber-optic and copper communication wiring, comply with:

1. Section 27 13 13 "Communications Copper Backbone Cabling"
2. Section 27 13 23 "Communications Optical Fiber Backbone Cabling"
3. Section 27 13 33 "Communications Coaxial Backbone Cabling
4. Section 27 15 00 "Communications Horizontal Cabling."

F. Grounding: Provide independent-signal circuit grounding recommended in writing by manufacturer.

3.5 ELECTRONIC VIDEO SURVEILLANCE SYSTEM INSTALLATION

A. EVSS device locations shown on drawings are approximate, and Contractor shall verify final position with the Owner before any work is done.

B. Install all EVSS components per manufacturer’s installation instructions.

C. Install control panel at location as directed by the Owner.

D. Install key locks on all enclosures

E. Identify system components, wiring, cabling, and terminals according to Section 26 05 53 "Identification for Electrical Systems."

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Tests and Inspections:

1. Inspection: Verify that units and controls are properly installed, connected, and labeled, and that interconnecting wires and terminals are identified.
2. Pretesting: Align and adjust system and pretest components, wiring, and functions to verify that they comply with specified requirements. Prepare IDS equipment for acceptance and operational testing as follows:

    a. Prepare equipment list described in "Informational Submittals" Article.
    b. Verify operation of all cameras.
    c. Verify proper recording and playback functionality.
    d. Verify proper operation of workstation with EVSS headend / software for logging alerts and events.
    e. Verify all integration functionality with Access Control and Intrusion Detection Systems.

3. Performance Verification Test Schedule: Schedule tests after pretesting has been successfully completed and system has been in normal functional operation for at least 14 days. Provide a minimum of 14 working days' notice of test schedule.

    a. Contractor shall prepare and submit to the Owner a PVT plan showing a structured and complete testing procedure. This PVT plan shall be submitted to the Owner a minimum of 14 working days prior to planned start of testing.
    b. PVT plan shall show equipment being tested, means of testing, and pass/fail criteria.
    c. PVT form shall include space for Contractor / Owner initials on each testing phase, along with a signature page with PVT results and follow-up notes.

4. Should any component of the system fail TWO (2) consecutive PVT tests, the Contractor shall be liable for costs incurred by the Owner to provide personnel for further PVT testing.

C. Electronic video surveillance system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.7 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to TWO (2) visits to Project during normal business hours for this purpose. Tasks shall include, but are not limited to, the following:

1. Check cable connections.
2. Check proper operation of cameras and VMS
3. Check proper operation of all integration driven functionalities.

3.8 CLEANING

A. Clean installed items using methods and materials recommended in writing by manufacturer.

B. Clean EVSS components as needed.

3.9 TRAINING

A. See Section 28 05 00 Common Work Results for Electronic Security Systems

END OF SECTION

SECTION 283111 - DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM

PART 1 - GENERAL

1.1 SCOPE:

A. This specification describes a Campus Wide Fire Detection and alarm system with a site reporting system. The control panel, to be intelligent device addressable, analog detecting, low voltage and modular, with digital communication techniques, in full compliance with all applicable codes and standards. This system shall operate as a stand-alone panel, and if needed with transponders operation to meet the systems requirements. The features and capacities described in this specification are required as a minimum for this project and shall be furnished by the successful contractor.

B. The system described shall operate with a Network Command Center monitoring and controlling systems in a peer-to-peer configuration, which shall allow interaction between each system, connected to the network.

C. The system shall be in full compliance with National and Local Codes (2022 CBC, CEC, CFC).

D. The system shall include all required hardware, piping, raceways, interconnecting wiring and software to accomplish the requirements of this specification and the contract drawings, whether or not specifically itemized herein.

E. All equipment furnished shall be new and the latest state of the art products of a single manufacturer, engaged in the manufacturing and sale of analog fi1re detection devices for over ten years.

F. The system as specified shall be supplied, installed, tested and approved by the local Authority Having Jurisdiction, and turned over to the owner in an operational condition.

1.2 SUMMARY

A. Section Includes:

1. Fire-alarm control unit.
2. Manual fire-alarm boxes.
3. System smoke detectors.
4. Nonsystem smoke detectors.
5. Heat detectors.
6. Notification appliances.
7. Device guards.
8. Magnetic door holders.
9. Remote annunciator.

B. Related Requirements:

1. Section 271513 "Communications Copper Horizontal Cabling" for cables and conductors for fire-alarm systems.

1.3 DEFINITIONS

A. EMT: Electrical Metallic Tubing.

B. FACP: Fire Alarm Control Panel.

C. HLI: High Level Interface.

D. NICET: National Institute for Certification in Engineering Technologies.

E. PC: Personal computer.

F. VESDA: Very Early Smoke-Detection Apparatus.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product, including furnished options and accessories.

1. Include construction details, material descriptions, dimensions, profiles, and finishes.
2. Include rated capacities, operating characteristics, and electrical characteristics.

B. Shop Drawings: For fire-alarm system.

1. Comply with recommendations and requirements in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
2. Include plans, elevations, sections, details, and attachments to other work.
3. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and locations. Indicate conductor sizes, indicate termination locations and requirements, and distinguish between factory and field wiring.
4. Detail assembly and support requirements.
5. Include voltage drop calculations for notification-appliance circuits.
6. Include battery-size calculations.
7. Include input/output matrix.
8. Include statement from manufacturer that all equipment and components have been tested as a system and meet all requirements in this Specification and in NFPA 72.
9. Include performance parameters and installation details for each detector.
10. Verify that each duct detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
11. Provide program report showing that air-sampling detector pipe layout balances pneumatically within the airflow range of the air-sampling detector.

12. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale; coordinate location of duct smoke detectors and access to them.

    a. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators.

    b. Show field wiring required for HVAC unit shutdown on alarm.
    c. Show field wiring and equipment required for HVAC unit shutdown on alarm and override by firefighters' control system.
    d. Show field wiring and equipment required for HVAC unit shutdown on alarm and override by firefighters' smoke-evacuation system.
    e. Locate detectors according to manufacturer's written recommendations.
    f. Show air-sampling detector pipe routing.

13. Include voice/alarm signaling-service equipment rack or console layout, grounding schematic, amplifier power calculation, and single-line connection diagram.

14. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits and point-to-point wiring diagrams.

C. General Submittal Requirements:

1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect.

2. Shop Drawings shall be prepared by persons with the following qualifications:

    a. Trained and certified by manufacturer in fire-alarm system design.
    b. NICET-certified, fire-alarm technician; Level IV minimum.

    c. Licensed or certified by authorities having jurisdiction.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Seismic Qualification Data: Certificates, for fire-alarm control unit, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Field quality-control reports.

1.6 Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following and deliver copies to authorities having jurisdiction:

a. Comply with the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
b. Provide "Fire Alarm and Emergency Communications System Record of Completion Documents" according to the "Completion Documents" Article in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
c. Complete wiring diagrams showing connections between all devices and equipment. Each conductor shall be numbered at every junction point with indication of origination and termination points.
d. Riser diagram.
e. Device addresses.
f. Air-sampling system sample port locations and modeling program report showing layout meets performance criteria.
g. Record copy of site-specific software.
h. Provide "Inspection and Testing Form" according to the "Inspection, Testing and Maintenance" chapter in NFPA 72, and include the following:

1) Equipment tested.
2) Frequency of testing of installed components.
3) Frequency of inspection of installed components.
4) Requirements and recommendations related to results of maintenance.
5) Manufacturer's user training manuals.

i. Manufacturer's required maintenance related to system warranty requirements.
j. Abbreviated operating instructions for mounting at fire-alarm control unit and each annunciator unit.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On magnetic media or compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps for Remote Indicating Lamp Units: Quantity equal to 10 percent of amount installed, but no fewer than one unit.
2. Lamps for Strobe Units: Quantity equal to 10 percent of amount installed, but no fewer than one unit.

3. Smoke Detectors, Fire Detectors[, and Flame Detectors]: Quantity equal to [10] <Insert number> percent of amount of each type installed, but no fewer than one unit of each type.
4. Detector Bases: Quantity equal to 2 percent of amount of each type installed, but no fewer than one unit of each type.
5. Keys and Tools: One extra set for access to locked or tamper-proofed components.
6. Audible and Visual Notification Appliances: 1 of each type installed.
7. Filters for Air-Sampling Detectors: Quantity equal to 2 percent of amount of each type installed, but no fewer than one unit of each type.
8. Air-Sampling Fan: Quantity equal to 1 for every five detectors, but no fewer than one unit of each type.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level IV technician.

B. NFPA Certification: Obtain certification according to NFPA 72 by a UL-listed alarm company.

1.10 PROJECT CONDITIONS

A. Perform a full test of the existing system prior to starting work. Document any equipment or components not functioning as designed.

B. Use of Devices during Construction: Protect devices during construction unless devices are placed in service to protect the facility during construction.

1.11 SEQUENCING AND SCHEDULING

A. Existing Fire-Alarm Equipment: Maintain existing equipment fully operational until new equipment has been tested and accepted. As new equipment is installed, label it "NOT IN SERVICE" until it is accepted. Remove labels from new equipment when put into service, and label existing fire-alarm equipment "NOT IN SERVICE" until removed from the building.

B. Equipment Removal: After acceptance of new fire-alarm system, remove existing disconnected fire-alarm equipment and wiring.

1.12 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace fire-alarm system equipment and components that fail in materials or workmanship within specified warranty period.

1. Warranty Extent: All equipment and components not covered in the Maintenance Service Agreement.
2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Source Limitations for Fire-Alarm System and Components: Components shall be compatible with, and operate as an extension of, existing system. Provide system manufacturer's certification that all components provided have been tested as, and will operate as, a system.

B. Noncoded, UL-certified addressable system, with multiplexed signal transmission and horn/strobe evacuation.

C. Automatic sensitivity control of certain smoke detectors.

D. All components provided shall be listed for use with the selected system.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 SYSTEMS OPERATIONAL DESCRIPTION

A. Fire-alarm signal initiation shall be by one or more of the following devices and systems:

1. Manual stations.
2. Smoke detectors.
3. Duct smoke detectors.
4. Automatic sprinkler system water flow.
5. Fire-extinguishing system operation.

B. Fire-alarm signal shall initiate the following actions:

1. Continuously operate alarm notification appliances.

2. Identify alarm and specific initiating device at fire-alarm control unit, connected network control panels, off-premises network control panels, and remote annunciators.
3. Transmit an alarm signal to the remote alarm receiving station.
4. Unlock electric door locks in designated egress paths.
5. Release fire and smoke doors held open by magnetic door holders.
6. Activate alarm communication system.
7. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
8. Activate smoke-control system (smoke management) at firefighters' smoke-control system panel.
9. Activate stairwell and elevator-shaft pressurization systems.
10. Close smoke dampers in air ducts of designated air-conditioning duct systems.

11. Recall elevators to primary or alternate recall floors.
12. Activate elevator power shunt trip.
13. Activate emergency lighting control.

14. Activate emergency shutoffs for gas and fuel supplies.
15. Record events in the system memory.
16. Record events by the system printer.
17. Indicate device in alarm on the graphic annunciator.

C. Supervisory signal initiation shall be by one or more of the following devices and actions:

1. Valve supervisory switch.
2. High- or low-air-pressure switch of a dry-pipe or preaction sprinkler system.
3. Alert and Action signals of air-sampling detector system.
4. Elevator shunt-trip supervision.
5. Fire pump running.
6. Fire-pump loss of power.
7. Fire-pump power phase reversal.
8. Independent fire-detection and -suppression systems.
9. User disabling of zones or individual devices.
10. Loss of communication with any panel on the network.

D. System trouble signal initiation shall be by one or more of the following devices and actions:

1. Open circuits, shorts, and grounds in designated circuits.
2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
3. Loss of communication with any addressable sensor, input module, relay, control module, remote annunciator, printer interface, or Ethernet module.
4. Loss of primary power at fire-alarm control unit.
5. Ground or a single break in internal circuits of fire-alarm control unit.
6. Abnormal ac voltage at fire-alarm control unit.
7. Break in standby battery circuitry.
8. Failure of battery charging.
9. Abnormal position of any switch at fire-alarm control unit or annunciator.

10. Voice signal amplifier failure.
11. Hose cabinet door open.

E. System Supervisory Signal Actions:

1. Initiate notification appliances.
2. Identify specific device initiating the event at fire-alarm control unit, connected network control panels, off-premises network control panels, and remote annunciators.
3. Record the event on system printer.
4. After a time delay of 200 seconds transmit a trouble or supervisory signal to the remote alarm receiving station.
5. Transmit system status to building management system.
6. Display system status on graphic annunciator.

2.3 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Fire-alarm control unit and raceways shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified.

2.4 FIRE-ALARM CONTROL UNIT

A. General Requirements for Fire-Alarm Control Unit:

1. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864.

    a. System software and programs shall be held in nonvolatile flash, electrically erasable, programmable, read-only memory, retaining the information through failure of primary and secondary power supplies.
    b. Include a real-time clock for time annotation of events on the event recorder and printer.
    c. Provide communication between the FACP and remote circuit interface panels, annunciators, and displays.
    d. The FACP shall be listed for connection to a central station signaling system service.
    e. Provide nonvolatile memory for system database, logic, and operating system and event history. The system shall require no manual input to initialize in the event of a complete power down condition. The FACP shall provide a minimum 500-event history log.

2. Addressable Initiation Device Circuits: The FACP shall indicate which communication zones have been silenced and shall provide selective silencing of alarm notification appliance by building communication zone.
3. Addressable Control Circuits for Operation of Notification Appliances and Mechanical Equipment: The FACP shall be listed for releasing service.

B. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

1. Annunciator and Display: Liquid-crystal type, 80 characters, minimum.
2. Keypad: Arranged to permit entry and execution of programming, display, and control commands.

C. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

1. Annunciator and Display: Liquid-crystal type, 3 line(s) of 80 characters, minimum.
2. Keypad: Arranged to permit entry and execution of programming, display, and control commands.

D. Initiating-Device, Notification-Appliance, and Signaling-Line Circuits:

1. Pathway Class Designations: NFPA 72, Class B.

2. Pathway Survivability: Level 1.

3. Install no more than 50 addressable devices on each signaling-line circuit.

4. Serial Interfaces:

a. One dedicated RS 485 port for central-station operation using point ID DACT.
b. One RS 485 port for remote annunciators, Ethernet module, or multi-interface module (printer port).
c. One USB port for PC configuration.
d. One RS 232 port for VESDA HLI connection.
e. One RS 232 port for voice evacuation interface.

E. Smoke-Alarm Verification:

1. Initiate audible and visible indication of an "alarm-verification" signal at fire-alarm control unit.
2. Activate an approved "alarm-verification" sequence at fire-alarm control unit and detector.
3. Record events by the system printer.
4. Sound general alarm if the alarm is verified.
5. Cancel fire-alarm control unit indication and system reset if the alarm is not verified.

F. Notification-Appliance Circuit:

1. Audible appliances shall sound in a three-pulse temporal pattern, as defined in NFPA 72.

2. Where notification appliances provide signals to sleeping areas, the alarm signal shall be a 520-Hz square wave with an intensity 15 dB above the average ambient sound level or 5 dB above the maximum sound level, or at least 75 dBA, whichever is greater, measured at the pillow.
3. Visual alarm appliances shall flash in synchronization where multiple appliances are in the same field of view, as defined in NFPA 72.

G. Elevator Recall:

1. Elevator recall shall be initiated only by one of the following alarm-initiating devices:

    a. Elevator lobby detectors except the lobby detector on the designated floor.
    b. Smoke detector in elevator machine room.
    c. Smoke detectors in elevator hoist way.

2. Elevator controller shall be programmed to move the cars to the alternate recall floor if lobby detectors located on the designated recall floors are activated.
3. Water-flow alarm connected to sprinkler in an elevator shaft and elevator machine room shall shut down elevators associated with the location without time delay.

    a. Water-flow switch associated with the sprinkler in the elevator pit may have a delay to allow elevators to move to the designated floor.

H. Door Controls: Door hold-open devices that are controlled by smoke detectors at doors in smoke-barrier walls shall [be] [not be] connected to fire-alarm system.

I. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and change those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory and print out the final adjusted values on system printer.

J. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.

K. Printout of Events: On receipt of signal, print alarm, supervisory, and trouble events. Identify zone, device, and function. Include type of signal (alarm, supervisory, or trouble) and date and time of occurrence. Differentiate alarm signals from all other printed indications. Also, print system reset event, including same information for device, location, date, and time. Commands initiate the printing of a list of existing alarm, supervisory, and trouble conditions in the system and a historical log of events.

L. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory signals supervisory and digital alarm communicator transmitters and digital alarm radio transmitters shall be powered by 24-V dc source.

1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.

M. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.

1. Batteries: Sealed, valve-regulated, recombinant lead acid.

N. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

2.5 MANUAL FIRE-ALARM BOXES

A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.

1. Double-action mechanism requiring two actions to initiate an alarm, breaking-glass or plastic-rod type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
2. Station Reset: Key- or wrench-operated switch.

3. Indoor Protective Shield: Factory-fabricated, clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm. Lifting the cover actuates an integral battery-powered audible horn intended to discourage false-alarm operation.

4. Weatherproof Protective Shield: Factory-fabricated, clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm.

2.6 SYSTEM SMOKE DETECTORS

A. General Requirements for System Smoke Detectors:

1. Comply with UL 268; operating at 24-V dc, nominal.

2. Detectors shall be four wire type.

3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
4. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
6. Integral Visual-Indicating Light: LED type, indicating detector has operated and power-on status.
7. Provide low frequency sounder base for sleeping rooms and dwelling units as shown on the drawings.

8. Remote Control: Unless otherwise indicated, detectors shall be digital-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition and individually adjustable for sensitivity by fire-alarm control unit.

    a. Rate-of-rise temperature characteristic of combination smoke- and heat-detection units shall be selectable at fire-alarm control unit for 15 or 20 deg F (8 or 11 deg C) per minute.
    b. Fixed-temperature sensing characteristic of combination smoke- and heat-detection units shall be independent of rate-of-rise sensing and shall be settable at fire-alarm control unit to operate at 135 or 155 deg F (57 or 68 deg C).

    c. Multiple levels of detection sensitivity for each sensor.
    d. Sensitivity levels based on time of day.

B. Duct Smoke Detectors: Photoelectric type complying with UL 268A.

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

    a. Primary status.
    b. Device type.
    c. Present average value.
    d. Present sensitivity selected.
    e. Sensor range (normal, dirty, etc.).

3. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector for smoke detection in HVAC system ducts.

4. Each sensor shall have multiple levels of detection sensitivity.
5. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.

6. Relay Fan Shutdown: Fully programmable relay rated to interrupt fan motor-control circuit.

2.7 NOTIFICATION APPLIANCES

A. General Requirements for Notification Appliances: Individually addressed, connected to a signaling-line circuit, equipped for mounting as indicated, and with screw terminals for system connections.

B. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet (3 m) from the horn, using the coded signal prescribed in UL 464 test protocol.

C. Visible Notification Appliances: Xenon strobe lights complying with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- (25-mm-) high letters on the lens.

1. Rated Light Output: 15/30/75/110 cd, selectable in the field.
2. Mounting: Wall mounted unless otherwise indicated.
3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
4. Flashing shall be in a temporal pattern, synchronized with other units.
5. Strobe Leads: Factory connected to screw terminals.
6. Mounting Faceplate: Factory finished, red.

D. Exit Marking Audible Notification Appliance:

1. Exit marking audible notification appliances shall meet the audibility requirements in NFPA 72.
2. Provide exit marking audible notification appliances at the entrance to all building exits.
3. Provide exit marking audible notification appliances at the entrance to areas of refuge with audible signals distinct from those used for building exit marking.

2.8 REMOTE ANNUNCIATOR

A. Description: Annunciator functions shall match those of fire-alarm control unit for alarm, supervisory, and trouble indications. Manual switching functions shall match those of fire-alarm control unit, including acknowledging, silencing, resetting, and testing.

1. Mounting: Surface cabinet, NEMA 250, Type 1.

B. Display Type and Functional Performance: Alphanumeric display and LED indicating lights shall match those of fire-alarm control unit. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions for compliance with requirements for ventilation, temperature, humidity, and other conditions affecting performance of the Work.

1. Verify that manufacturer's written instructions for environmental conditions have been permanently established in spaces where equipment and wiring are installed, before installation begins.

B. Examine roughing-in for electrical connections to verify actual locations of connections before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EQUIPMENT INSTALLATION

A. Comply with NFPA 72, NFPA 101, and requirements of authorities having jurisdiction for installation and testing of fire-alarm equipment. Install all electrical wiring to comply with requirements in NFPA 70 including, but not limited to, Article 760, "Fire Alarm Systems."

1. Devices placed in service before all other trades have completed cleanup shall be replaced.
2. Devices installed but not yet placed in service shall be protected from construction dust, debris, dirt, moisture, and damage according to manufacturer's written storage instructions.

B. Equipment Mounting: Install fire-alarm control unit on concrete base. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete."

1. Install seismic bracing.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (460-mm) centers around the full perimeter of concrete base.
3. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.

C. Equipment Mounting: Install fire-alarm control unit on finished floor.

D. Install wall-mounted equipment, with tops of cabinets not more than 78 inches (1980 mm) above the finished floor.

E. Manual Fire-Alarm Boxes:

1. Install manual fire-alarm box in the normal path of egress within 60 inches (1520 mm) of the exit doorway.
2. Mount manual fire-alarm box on a background of a contrasting color.
3. The operable part of manual fire-alarm box shall be between 42 inches (1060 mm) and 48 inches (1220 mm) above floor level. All devices shall be mounted at the same height unless otherwise indicated.

F. Smoke- or Heat-Detector Spacing:

1. Comply with the "Smoke-Sensing Fire Detectors" section in the "Initiating Devices" chapter in NFPA 72, for smoke-detector spacing.
2. Comply with the "Heat-Sensing Fire Detectors" section in the "Initiating Devices" chapter in NFPA 72, for heat-detector spacing.

3. Smooth ceiling spacing shall not exceed 30 feet (9 m).
4. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Annex A [or Annex B]in NFPA 72.

5. HVAC: Locate detectors not closer than 60 inches (1520 mm) from air-supply diffuser or return-air opening.
6. Lighting Fixtures: Locate detectors not closer than 12 inches (300 mm) from any part of a lighting fixture and not directly above pendant mounted or indirect lighting.

G. Install a cover on each smoke detector that is not placed in service during construction. Cover shall remain in place except during system testing. Remove cover prior to system turnover.

H. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct. Tubes more than 36 inches (9100 mm) long shall be supported at both ends.

1. Do not install smoke detector in duct smoke-detector housing during construction. Install detector only during system testing and prior to system turnover.

I. Air-Sampling Smoke Detectors: If using multiple pipe runs, the runs shall be pneumatically balanced.

J. Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location. Do not install smoke detectors in sprinklered elevator shafts.

K. Single-Station Smoke Detectors: Where more than one smoke alarm is installed within a dwelling or suite, they shall be connected so that the operation of any smoke alarm causes the alarm in all smoke alarms to sound.

L. Remote Status and Alarm Indicators: Install in a visible location near each smoke detector, sprinkler water-flow switch, and valve-tamper switch that is not readily visible from normal viewing position.

M. Audible Alarm-Indicating Devices: Install not less than 6 inches (150 mm) below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille. Install all devices at the same height unless otherwise indicated.

N. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches (150 mm) below the ceiling. Install all devices at the same height unless otherwise indicated.

O. Device Location-Indicating Lights: Locate in public space near the device they monitor.

P. Antenna for Radio Alarm Transmitter: Mount to building structure where indicated. Use mounting arrangement and substrate connection that resists [100-mph (160-km/h)] <Insert value> wind load with a gust factor of 1.3 without damage.

3.3 PATHWAYS

A. Pathways above recessed ceilings and in nonaccessible locations may be routed exposed.

1. Exposed pathways located less than 96 inches (2440 mm) above the floor shall be installed in EMT.

B. Pathways shall be installed in EMT.

C. Exposed EMT shall be painted red enamel.

3.4 CONNECTIONS

A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Section 087100 "Door Hardware." Connect hardware and devices to fire-alarm system.

1. Verify that hardware and devices are listed for use with installed fire-alarm system before making connections.

B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 36 inches (910 mm) from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.

1. Alarm-initiating connection to smoke-control system (smoke management) at firefighters' smoke-control system panel.
2. Alarm-initiating connection to stairwell and elevator-shaft pressurization systems.
3. Smoke dampers in air ducts of designated HVAC duct systems.
4. Magnetically held-open doors.
5. Electronically locked doors and access gates.
6. Alarm-initiating connection to elevator recall system and components.
7. Alarm-initiating connection to activate emergency lighting control.
8. Alarm-initiating connection to activate emergency shutoffs for gas and fuel supplies.
9. Supervisory connections at valve supervisory switches.
10. Supervisory connections at low-air-pressure switch of each dry-pipe sprinkler system.
11. Supervisory connections at elevator shunt-trip breaker.
12. Data communication circuits for connection to building management system.
13. Data communication circuits for connection to mass notification system.
14. Supervisory connections at fire-extinguisher locations.
15. Supervisory connections at fire-pump power failure including a dead-phase or phase-reversal condition.
16. Supervisory connections at fire-pump engine control panel.

3.5 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 270553 "Identification for Communications Systems."

B. Install framed instructions in a location visible from fire-alarm control unit.

3.6 GROUNDING

A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

B. Ground shielded cables at the control panel location only. Insulate shield at device location.

3.7 FIELD QUALITY CONTROL

A. Field tests shall be witnessed by authorities having jurisdiction.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

D. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Visual Inspection: Conduct visual inspection prior to testing.

    a. Inspection shall be based on completed record Drawings and system documentation that is required by the "Completion Documents, Preparation" table in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
    b. Comply with the "Visual Inspection Frequencies" table in the "Inspection" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.

2. System Testing: Comply with the "Test Methods" table in the "Testing" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
4. Test audible appliances for the private operating mode according to manufacturer's written instructions.
5. Test visible appliances for the public operating mode according to manufacturer's written instructions.
6. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" section of the "Fundamentals" chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

E. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.

F. Fire-alarm system will be considered defective if it does not pass tests and inspections.

G. Prepare test and inspection reports.

H. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

I. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

3.8 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of manufacturer's designated service organization. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

1. Include visual inspections according to the "Visual Inspection Frequencies" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
2. Perform tests in the "Test Methods" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
3. Perform tests per the "Testing Frequencies" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

3.9 SOFTWARE SERVICE AGREEMENT

A. Comply with UL 864.

B. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for two years.

C. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.

1. Upgrade Notice: At least 30 days to allow Owner to schedule access to system and to upgrade computer equipment if necessary.

3.10 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

END OF SECTION

SECTION 312200 - GRADING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. General exterior grading, cutting and filling, including grading for building area, paving, planting areas, banks and hillsides.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 31 1000 - Site Clearing.
3. Section 31 2313 - Excavation and Fill.
4. Section 31 2316 - Excavation and Fill for Pavement.
5. Section 31 2319 - Excavation and Fill for Structures.
6. Section 31 2323 - Excavation and Fill for Utilities.
7. Section 31 2326 - Base Course.
8. Section 32 9000 - Planting.

1.02 PROJECT REQUIREMENTS

A. General:

1. Fees: Pay as required by authorities having jurisdiction over the area.
2. Bonds: Post as required by authorities having jurisdiction over the area.
3. Haul Routes and Restrictions: Comply with requirements of authorities having jurisdiction over the area.
4. Before grading, contact Underground Service Alert of Southern California (USASC) for information on public buried utilities and pipelines. Retain the services of an underground utility locator for on-site utilities.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Materials shall conform to requirements specified in this and related sections.

PART 3 - EXECUTION

3.01 PREPARATION

A. Protect and maintain installed stakes until their removal is required for the Work. Provide replacement grade or location stakes lost or disturbed.

B. Install grade stakes and compare to indicated grades. If discrepancies are found between existing grades and grades indicated on Drawings, do not proceed until discrepancies are resolved.

3.02 ROUGH AND FINE GRADING

A. Rough grade area sufficiently high to require cutting by fine grading:

1. Grade area for bituminous surfacing and other paving to the indicated grades, equal to the section of the indicated base and pavement.
2. Slope banks to required finish grades as cut progresses or leave cuts full and finish grade by mechanical equipment to provide grades and soil densities indicated on the Drawings.
3. Rough grade, fill and compact banks beyond indicated finish grades. Finish grade banks and slopes to indicated grades and specified soil densities.
4. Grade Only Areas: In areas not indicated to receive pavement, rough grade to approximate finish grades and then scarify, moisten and roll to obtain required density and indicated finish grades.
5. Tolerances: Finish grades shall be within a tolerance of 0.05 inch per foot above or below grades indicated. Provide an average grade as indicated.

B. Base or Subgrade:

1. After subgrade has been constructed to approximate required grades, scarify to a depth of at least 6 inches:
   a. After scarifying, process loosened material to a finely divided condition and adjust moisture content to optimum condition by addition of water, addition and blending of dry suitable material, or by drying of existing material.
   b. Subgrade material shall be compacted by tamping, sheepsfoot rollers or pneumatic tire rollers. Required relative compaction shall be [**90**] percent minimum for the top 6 inches below subgrade.
   c. Install base course in accordance with Section 31 2326 - Base Course.
2. Tolerance of completed grades of base or subgrade shall not vary more than 0.03 inch per foot from grades indicated. Provide an average grade as indicated.

3.03 SHORING

A. Provide shoring as necessary to properly and safely support earth sides of excavations, and existing curbs, sidewalks, gutter, drives and stairs, against movement and collapse.

B. Design and Calculations: Provide in accordance with requirement of CalOHSA.

C. Remove shoring upon completion of the Work of this section or when no longer needed unless required otherwise by authorities having jurisdiction.

3.04 EXCESS MATERIAL DISPOSAL

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.05 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 312326 - BASE COURSE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Installation of base material.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 01 4524 – Environmental Import / Export Material Testing.
2. Section 31 1000 - Site Clearing.
3. Section 31 2200 - Grading.
4. Section 31 2313 - Excavation and Fill.
5. Section 31 2316 - Excavation and Fill for Paving.
6. Section 32 1216 - Asphalt Paving.
7. Section 32 1313 - Site Concrete Work.

1.02 SUBMITTALS

A. Crushed aggregate base (CAB) shall consist of native rock without naturally occurring asbestos or recycled materials. The CONTRACTOR shall submit written documentation, which identifies the source, volume, and proposed transport date of the material for review and approval by OWNER'S Office of Environmental Health and Safety (OEHS) prior to importing the material. A statement on company letterhead from the CAB source, stamped by either a California Professional Geologist or Engineer, which states that the subject materials are native rock, do not contain any recycled materials and that the source quarry does not mine ultramafic materials, a source of natural occurring asbestos shall be included in the submittal to OEHS. The CONTRACTOR may request variance from analytical testing required by Section 01 4524 for CAB. To be considered for a variance, the CONTRACTOR shall submit a documentation package for OEHS approval, which includes all of the aforementioned information at least 48 hours in advance of planned import.

1. Frequently used suppliers for LAUSD projects include:
   a. Hansen Aggregates.
   b. Vulcan Materials, Reliance Company.
   c. Vulcan Materials Durbin.

C. Product Data: Submit material source, technical information and test data for base materials. Gradation and quality certifications shall be dated within 30 days of the submittal.

D. Sample: Submit sample of proposed base course material.

1.03 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement: Standard Specifications for Public Works Construction, current edition.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Crushed Aggregate Base (CAB) materials shall conform to the requirements of the Standard Specifications for Public Works Construction: Section 200 - Rock Materials.

2.02 MATERIAL APPROVAL

A. Base material shall be inspected by the Project Inspector for gradation and material content prior to installation. The OWNER may choose to have additional tests performed by a geotechnical engineer, retained by the OWNER, before installation.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install base course material in layers not exceeding 4 inches in thickness, unless required otherwise. Grade and compact to indicated levels or grades, cut and fill, water and roll until the surface is hard and true to line, grade and required section. Provide a relative compaction of at least 95 percent, unless otherwise required.

B. Grade base course to elevations indicated on Drawings, ready to receive surfacing, in accordance with Section 312200 - Grading.

3.02 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.03 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 313116 - TERMITE CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Soil treatment.
2. Wood treatment.
3. Bait-station system.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood preservative treatment by pressure process.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components, and profiles for termite control products.
2. Include the EPA-Registered Label for termiticide products.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Certificates: For each type of termite control product.

C. Soil Treatment Application Report: After application of termiticide is completed, submit report for Owner's records and include the following:

1. Date and time of application.

2. Moisture content of soil before application.

3. Termiticide brand name and manufacturer.

4. Quantity of undiluted termiticide used.

5. Dilutions, methods, volumes used, and rates of application.

6. Areas of application.

7. Water source for application.

D. Wood Treatment Application Report: After application of termiticide is completed, submit report for Owner's records and include the following:

1. Date and time of application.

2. Termiticide brand name and manufacturer.

3. Quantity of undiluted termiticide used.

4. Dilutions, methods, volumes used, and rates of application.

5. Areas of application.

E. Bait-Station System Installation Report: After installation of bait-station system is completed, submit report for Owner's records and include the following:

1. Location of areas and sites conducive to termite feeding and activity.

2. Plan drawing showing number and locations of bait stations.

3. Dated report for each monitoring and inspection occurrence, indicating level of termite activity, procedure, and treatment applied before time of Substantial Completion.

4. Termiticide brand name and manufacturer.

5. Quantities of termiticide and nontoxic termite bait used.

6. Schedule of inspections for one year from date of Substantial Completion.

F. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A specialist who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment and products in jurisdiction where Project is located and who is accredited by manufacturer.

1.7 FIELD CONDITIONS

A. Soil Treatment:

1. Environmental Limitations: To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with requirements of the EPA-Registered Label and requirements of authorities having jurisdiction.

2. Related Work: Coordinate soil treatment application with excavating, filling, grading, and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs before construction.

1.8 WARRANTY

A. Soil Treatment Special Warranty: Manufacturer's standard form, signed by Applicator and Contractor, certifying that termite control work consisting of applied soil termiticide treatment will prevent infestation of subterranean termites. If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.

1. Warranty Period: Three years from date of Substantial Completion.

B. Wood Treatment Special Warranty: Manufacturer's standard form, signed by Applicator and Contractor, certifying that termite control work consisting of applied wood termiticide treatment will prevent infestation of subterranean termites. If subterranean termite damage is discovered during warranty period, repair or replace damage caused by termite infestation and treat replacement wood.

1. Warranty Period: 12 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain termite control products from single source from single manufacturer.

2.2 SOIL TREATMENT

A. Termiticide: EPA-Registered termiticide acceptable to authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Bayer Environmental Science.
b. Ensystex, Inc.
c. Master Builders Solutions; brand of MBCC Group.
d. Syngenta Crop Protection, LLC.

2. Service Life of Treatment: Soil treatment termiticide that is effective for not less than three years against infestation of subterranean termites.

2.3 WOOD TREATMENT

A. Borate: EPA-Registered borate termiticide acceptable to authorities having jurisdiction, in an aqueous solution for spray application and a gel solution for pressure injection, formulated to prevent termite infestation in wood.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Ensystex, Inc.
b. Nisus Corporation.
c. NovaGuard Technologies, Inc.

2.4 BAIT-STATION SYSTEM

A. Description: EPA-Registered system acceptable to authorities having jurisdiction. Provide bait stations based on the dimensions of building perimeter indicated on Drawings, according to product's EPA-Registered Label and manufacturer's written instructions.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Ensystex, Inc.
b. Master Builders Solutions; brand of MBCC Group.
c. The Dow Chemical Company.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of soil per termiticide label, interfaces with earthwork, slab and foundation work, landscaping, utility installation, and other conditions affecting performance of termite control.

B. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Prepare work areas according to the requirements of authorities having jurisdiction and according to manufacturer's written instructions before beginning application and installation of termite control treatment(s). Remove extraneous sources of wood cellulose and other edible materials, such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil within and around foundations.

B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended in writing by termiticide manufacturer.

1. Fit filling hose connected to water source at the site with a backflow preventer, according to requirements of authorities having jurisdiction.

3.3 APPLYING SOIL TREATMENT

A. Application: Mix soil treatment termiticide solution to a uniform consistency. Distribute treatment uniformly. Apply treatment at the product's EPA-Registered Label volume and rate for maximum specified concentration of termiticide to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction.

1. Slabs-on-Grade and Basement Slabs: Under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.

2. Foundations: Soil adjacent to and along the entire inside perimeter of foundation walls; along both sides of interior partition walls; around plumbing pipes and electric conduit penetrating the slab; around interior column footers, piers, and

chimney bases; and along the entire outside perimeter, from grade to bottom of footing.

3. Crawlspaces: Soil under and adjacent to foundations. Treat adjacent areas, including around entrance platform, porches, and equipment bases. Apply overall treatment only where attached concrete platform and porches are on fill or ground.

4. Masonry: Treat voids.

5. Penetrations: At expansion joints, control joints, and areas where slabs and below-grade walls will be penetrated.

B. Post warning signs in areas of application.

C. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

3.4 APPLYING WOOD TREATMENT

A. Wood Treatment: Apply wood treatment after framing, sheathing, and exterior weather protection is completed but before electrical and mechanical systems are installed.

B. Application: Mix borate wood treatment solution to a uniform consistency. Apply treatment at the product's EPA-Registered Label volume and rate for the maximum borate concentration allowed for each specific use so that wood framing, sheathing, siding, and structural members subject to infestation receive treatment. Apply treatment to the height of 8 feet above grade.

1. Framing and Sheathing: Apply termiticide solution by spray to bare wood and with complete coverage.

2. Heavy Wood Members: For wood greater than 4 inches thick, inject termiticide gel solution under pressure into holes of size and spacing required by manufacturer for treatment.

3. Exterior Uncoated Wood Trim and Siding: Apply termiticide solution to bare wood only when forecasted weather conditions indicate no precipitation or fog before application of seal coat. After 48 hours, verify that surface is sufficiently dry for seal coat and apply seal coat of paint as specified in Section 099113 "Exterior Painting.".

3.5 INSTALLING BAIT-STATION SYSTEM

A. Bait-Station System: Install during construction to determine areas of termite activity and after construction, including landscaping, is completed.

B. Place bait stations according to product's EPA-Registered Label and manufacturer's written instructions, in the following locations:

1. Conducive sites and locations indicated on Drawings.

2. In and around infested trees and stumps.

3. In mulch beds.

4. Where wood directly contacts soil.

5. Areas of high soil moisture.

6. Near irrigation sprinkler heads.

7. Each area where roof drainage system, including downspouts and scuppers, drains to soil.

8. Along driplines of roof overhangs without gutters.

9. Where condensate lines from mechanical equipment drip or drain to soil.

10. At plumbing penetrations through ground-supported slabs.

11. Other sites and locations as determined by licensed Installer.

C. Spacing: Place bait stations according to manufacturer's written instructions and at a frequency no less than the following:

1. One bait station per 8 linear feet.

2. One cluster of bait stations per 20 linear feet, with no fewer than three bait stations per cluster.

3.6 PROTECTION

A. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.

B. Protect termiticide solution dispersed in treated soils and fills from being diluted by exposure to water spillage or weather until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.

3.7 MAINTENANCE SERVICE

A. Maintenance Service: Beginning at Substantial Completion, maintenance service shall include three months' full maintenance by manufacturer's authorized service representative. Include monthly maintenance as required for proper performance

according to the product's EPA-Registered Label and manufacturer's written instructions. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

B. Continuing Maintenance Proposal: Provide from termite-control-treatment Installer to Owner, in the form of a standard yearly (or other period) maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

1. Include annual inspection for termite activity and effectiveness of termite treatment according to manufacturer's written instructions.

END OF SECTION 313116

SECTION 321216 - ASPHALT PAVING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Paving for playground, parking areas, areas between buildings, synthetic track surfacing adjacent to planting and turf areas as indicated.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 31 2200 - Grading.
3. Section 32 0117 - Pavement Repair.
4. Section 31 2326 - Base Course.
5. Section 32 1236 - Seal for Bituminous Surfacing.
6. Section 32 1313 - Site Concrete Work.

1.02 SUBMITTALS

A. Shop Drawings: Submit site plan indicating extent of paving and accessories.

B. Product Data: Manufacturer’s technical data for materials and products.

1.03 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement: Standard Specifications for Public Works Construction.

1.04 PROJECT CONDITIONS

A. Information on Drawings or in soils report does not constitute a guarantee of accuracy or uniformity of soil conditions over the Project site.

B A copy of the soils report is available for examination in the office of the Architect during regular office hours of the Architect.

PART 2 - PRODUCTS

2.01 BITUMINOUS MATERIALS

A. Provide materials of the class, grade, or type indicated on the Drawings, conforming to relevant provisions of Section 203 - Bituminous Materials of the Standard Specifications for Public Works Construction.

2.02 HEADERS

A. Concrete: Per specification Section 32 1313 - Site Concrete Work.

B. Wood:

1. Redwood, Construction Heart Grade, size 2 by 6, unless otherwise indicated.
2. Stakes: 2 by 4 redwood or 2 by 3 Douglas fir, Construction Grade.
3. Nails: Common, galvanized, 12d minimum.

PART 3 - EXECUTION

3.01 HEADERS

A. Install headers along edge of bituminous surfacing abutting turf, earth, or planting area, unless indicated otherwise.

B. Install headers so the bottom surface has continuous bearing on solid grade. Where excavation for headers is undercut, thoroughly tamp soil under the header. Compact backfill on both sides of header to the density of adjacent undisturbed earth.

C. Where wood headers are indicated on drawing, fasten headers in place with redwood or Douglas fir stakes of length necessary to extend into solid grade a minimum of 12 inches. Stakes shall be of sound material, neatly pointed, driven vertically, and securely nailed to headers. Space stakes, not to exceed 4 feet on center with top of stakes set one inch below top of header. Provide a minimum of two 12d galvanized common nails through each stake.

D. Remove existing headers where new surfacing is installed adjacent to existing surfacing.

E. Install temporary headers at transverse joints of paving where continuous paving operations are not maintained.

F. Provide additional stakes and anchorage as required to fasten headers in place.

3.02 CONSTRUCTION OF ASPHALT CONCRETE PAVEMENT

A. Thickness of Surfacing: Unless otherwise indicated on Drawings or specified, install bituminous surfacing to a compacted thickness of 2 inches.

B. Provide surfacing material over base course as specified in Section 31 2326 - Base Course.

C. Surfaces of walls, concrete, masonry, or existing bituminous surfacing indicated to be in direct contact with installed bituminous surfacing shall be cleaned, dried and uniformly coated with an asphaltic emulsion film.

D. Thicken edges of bituminous surfacing that do not abut walls, concrete, or masonry, and edges joining existing bituminous surfaces. Remove headers at existing bituminous surfacing where new bituminous surfacing is to be installed. Thicken edges an additional 2 inches and taper to the indicated or specified thickness 6 inches back from such edges.

E. At stairways, adjust thickness of paving such that the first tread is equal in height to all other treads.

F. Provide adequate protection for concrete, planting areas, and other finish Work adjacent to areas indicated to receive bituminous surfacing.

G. Placing:

1. Do not install bituminous surfacing when atmospheric temperature is below 40 degrees F; or when fog or other unsuitable weather conditions are present. Temperature of mixture at time of installation shall not be lower than 260 degrees F in warm weather or higher than 320 degrees F in cold weather.
2. Where 2-inch or 3-inch thick surfacing is indicated or specified, install surfacing in one course. Where surfacing is indicated or specified 4 inches or more in thickness, except for thickened edges, install bituminous surfacing in courses of approximately equal thickness, each course not exceeding 2 ½ inches in thickness.

H. Stakes or Screeds: Provide grade or screed stakes spaced not more than 15 feet apart in flow lines with grades of less than one percent. Continuous screeds may be provided instead of stakes.

I. Spreading: Install bituminous surfacing in a manner to cause least possible handling of mixture. In open areas and wherever practicable, install by mechanical means with a self-propelled mechanical spreader. In confined or restricted areas, install mixture with hot shovels and rakes, and smooth with lutes.

J. Joints: Provide vertical joints between successive runs. Install joints true to line, grade, and cross section. Lapped joints are not permitted.

K. Rolling:

1. Finish roll with a self-propelled tandem roller weighing at least 8 tons. Break down roll with a self-propelled roller weighing between 1 ½ tons and 8 tons.

2. Roll in a manner that preserves flow lines and the established finished grades. Break down roll in areas adjacent to flow lines parallel to flow lines. Break down roll after bituminous surfacing is installed without shoving or cracking of mixture under roller. Continue finish rolling until surfacing is unyielding, true to grade, and meets requirements for specified smoothness. Areas inaccessible to finish roller may be finish rolled with breakdown roller or tamped with hot tamping irons and smoothed with hot smoothing irons or hand roller.
3. Where bituminous surfacing abuts concrete, masonry, walks or paving, tamp joint smooth, if necessary, as described above to obtain a uniformly even joint, true to line and grade. Tamp and smooth to properly compact.
4. Compacted bituminous surfacing shall be provided with a bulk specific gravity of at least 2.31 when tested in accordance with ASTM D1188.

3.03 TOLERANCE

A. Smoothness: Surface of bituminous surfacing after rolling, shall be even, smooth and uniform in texture with no voids or rock pockets, free of roller marks or other irregularities, and not varying by more than 0.03 foot, except at local depressions or raised areas as indicated, when a 10-foot straightedge is placed on surface.

B. Grade: Finished grade shall not vary more than 0.02 foot above or below required grade. Variations within prescribed tolerance shall be compensating so that average grade and cross-section are provided.

C. Premium paving tolerances and requirements for synthetic track:

1. General: Test in-place asphalt concrete courses for compliance with requirements or thickness and surface smoothness. Repair or remove and replace unacceptable paving as directed by Owner's representative.
2. Thickness: Tolerances for thickness shall be ¼ inch, plus or minus.
3. Planarity: The asphalt substrate shall not vary from the planned cross slope by more than plus or minus 0.1 percent. The finished asphalt shall not vary, plus or minus, under a 10 feet straight edge greater than 1/8 inch. Flood test the surface with the use of a water truck. If, after 30 minutes on a 70 degree F day, "bird baths" are evident at a depth more than 1/8 inch repair using the best method of correction.
4. Corrective Measures: Determine if the planarity, cross slopes, and general specifications have been met. If all of the conditions have been met notify the Owner in writing of the acceptance of the asphalt paving.

3.04 TESTING

A. After first coat of surface seal has been installed and after a 24 hour period, the flood test shall be completed of the bituminous surfacing in presence of the Project Inspector. Repair areas of standing water or puddles and flood test locally; install surface seal and retest as necessary.

3.05 SURFACE SEALING

A. After bituminous surfacing has passed flood test, clear and allow to dry and provide one more coat of surface seal as specified in Section 32 1236 - Seal for Bituminous Surfacing.

B. Where indicated, provide multiple coats of surface seal to existing bituminous surfacing.

C. Where new bituminous surfacing joins existing bituminous surfacing, overlap surface seal a minimum of 12 inches onto existing bituminous surfacing.

3.06 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.07 CLEANUP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 321236 - SEAL FOR BITUMINOUS SURFACING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Surface sealer over bituminous surfacing.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 321216 - Asphalt Paving.
3. Section 321723 - Pavement Marking.

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's product information and application procedures for bituminous surfacing.

1.03 QUALITY ASSURANCE

A. Comply with the Standard Specifications For Public Works Construction, current edition.

B. Agitate bulk materials during transport.

1.04 MAINTENANCE

A. Extra Materials: Provide 10 gallons in unopened containers.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Provide one of the following surface seals:

	Product Name	Manufacturer
1.	Guard-Top	CALMAT / Industrial Asphalt
2.	Over Kote	Diversified Asphalt Product

3.	Park Top	Western Colloid Products
4.	Sure Seal	Asphalt Coating Engineering
5.	Super Drive Top.	SAF– T Seal. Inc.
6.	Equal.	

PART 3 - EXECUTION

3.01 SURFACE PREPARATION

A. Thoroughly wash surfaces with water to remove dirt, debris, excessive oil and grease, or other foreign matter.

3.02 APPLICATION

A. Install seal coat in strict accordance with manufacturer's written directions and recommendations.

B. Install two coats of surface seal to new bituminous surfacing. First coat shall be installed before flood testing. Clean surface and allow to dry before installing second coat. Second coat shall be installed after bituminous surfacing has passed flood test.

C. Where new bituminous surfacing is installed adjacent to existing bituminous surfacing, overlap surface seal a minimum of 12 inches onto existing bituminous surfacing.

D. Where existing bituminous surfacing is indicated to be patched and sealed, install two coats of surface seal after patching. Refer to Section 321216 - Asphalt Paving.

3.03 PROTECTION OF SURFACES

A. Protect sealed and unsealed surfaces from damage and traffic during performance of the Work of this section and until surface seal has thoroughly set and cured. Do not permit traffic of any kind for at least 24 hours after completion of installation.

B. Protect the Work of this section until Substantial Completion.

3.04 TESTING

A. Owner reserves the right to obtain samples, perform tests to ensure compliance with the Specifications, and to review weight slips and invoices of materials delivered to the Project site.

3.05 CLEAN UP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 321313 - SITE CONCRETE WORK

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: On-site concrete work:

1. Portland cement concrete pavement, driveways, curbs, gutters and mowing strips.
2. Ramps and stairs on grade.
3. Footings for fence post, bollards, flagpoles, light standards and athletic equipment.
4. Pipe encasements, thrust blocks, and equipment pads.
5. Retaining walls, planter walls and concrete benches.
6. Skateboard deterrents.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 03 1000 – Concrete Forming and Accessories.
3. Section 03 2000 - Concrete Reinforcement.
4. Section 03 3000 – Cast-in-Place Concrete.
5. Section - 05 5100 Metal Stairs.
6. Section 07 9200 – Joint Sealants.
7. Section 10 7516 – Flagpoles.
8. Section 11 6813 – Playfield Equipment Structures – Primary Centers and Elementary Schools.
9. Section 11 6816 – Playfield Equipment Structures – Middle and High Schools.
10. Division 23 - HVAC.
11. Division 26 - Electrical.
12. Section 31 2200 – Grading.

13. Section 31 2316 - Excavation and Fill for Pavement.

14. Section 31 2319 – Excavation and Fill for Structures.

15. Section 31 2326 - Base Course.

16. Section 32 1216 - Asphalt Paving.

17. Section 32 1723 – Pavement Markings.

18. Section 32 1816 – Playground Protective Surfacing.

19. Section 32 3113 - Chain Link Fences and Gates.

20. Section 33 1100 - Site Water Distribution Utilities.

21. Section 33 3000 - Site Sanitary Sewer Utilities.

22. Section 33 4000 - Storm Drainage Utilities.

1.02 REFERENCES

A. Structural work, such as retaining walls, planter walls, cast-in-place benches, equipment, fence and flagpole footings, and equipment pads, conform to the following Sections:

1. Section 03 1000 Concrete Forming.

2. Section 03 2000 Concrete Reinforcing.

3. Section 03 3000 Cast-in-Place Concrete.

B. Flatwork, such as walkways, driveways, ramps and steps on grade, swales, curbs, mow strips and utility related concrete, conform to:

1. Standard Specifications for Public Works Construction, The “Greenbook”, except reclaimed aggregates and processed miscellaneous base are not allowed.

C. Imported or exported earthwork shall conform to Section 01 4524 Environmental Import / Export Materials Testing.

D. National Ready Mixed Concrete Association (NRMCA):

1. Checklist for the Concrete Pre-Construction Conference.

1.03 QUALITY ASSURANCE

A. Source Limitations for Exposed Concrete: Obtain each color, size, type, and variety of concrete material and concrete mixture from single manufacturer with

resources to provide concrete of consistent quality in appearance and physical properties. Secure material required for the duration of the project as needed to ensure consistent quality in appearance.

B. Pre-Installation Conference:

1. CONTRACTOR shall coordinate and conduct pre-installation conference in conformance to Section 01 3119 Project Meetings.

2. CONTRACTOR shall use the NRMCA “Checklist for the Concrete Pre-Construction Conference” as the meeting agenda.

C. Mockup:

1. Build 8 feet by 8 feet mockups of full-thickness sections of concrete paving using processes and techniques intended for use on permanent work, including curing procedures.

2. Build mockups to demonstrate typical joints; surface finishes and standard of workmanship.

3. Obtain ARCHITECT’s approval of mockup before proceeding with work of this Section.

4. Mockup shall remain through completion of the work for use as a quality standard for finished work.

5. Remove mockup when directed by the OAR.

D. Field applied primers, paintings, sealers, sealants, caulking, leveling and patching compounds, crack/joint repair compounds adhesives and similar products shall be approved by the OWNER’s Office of Environmental Health and Safety (OEHS).

1.04 SUBMITTALS

A. Structural Work: Conform to the applicable requirements of Sections 03 1000 Concrete Forming, 03 2000 Concrete Reinforcing and 03 3000 Cast-in-Place Concrete.

B. Flatwork: Submit mix design in conformance to the Greenbook.

C. Shop Drawings: Submit drawings indicating the locations of concrete joints, including construction joints, expansion joints, isolation joints, and contraction joints.

D. Submit concrete Sample of each specified color.

E. Submit full range of manufacturer’s standard and custom range colors and products for ARCHITECT’s review and selection.

1.05 DELIVERY, STORAGE AND HANDLING

A. Store cement and aggregate materials so to prevent their deterioration or intrusion by foreign matter. Deteriorated or contaminated materials shall not be furnished.

B. Packaged materials shall bear the manufacturers and brand name label and shall be stored in their original unbroken package in a weather tight place until ready for use in the work.

C. Avoid exposure of reinforcing steel bars, wire, and wire fabric to dirt, moisture or conditions harmful to reinforcing.

D. Reinforcing steel bars, wire, and wire fabric shall be stored on the Project site to permit easy access for examination and identification of each shipment. Material of each shipment shall be separated by size and shape.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Structural Work: Conform to the applicable requirements of the following Sections, except as otherwise specified:

1. Section 03 1000 Concrete Forming.

2. Section 03 2000 Concrete Reinforcing.

3. Section 03 3000 Cast-in-Place Concrete.

4. Section 07 9200 Joint Sealants.

B. Flatwork: Conform to the applicable requirements of the Greenbook, Section 201.

2.02 SKATEBOARD DETERRENTS

A. Manufacturer: Barrett Robinson Inc. or equal.

B. Fabricated from 6061-T6 aluminum, clear anodized.

1. Fixed Angle Series:

a. FR0.12: For walls with 1/8" radius edge. Dimensions: 4.875" top x 1.0" face x 2.0" wide.

b. FA90A: For walls with 1/8" radius edge. Dimensions: 4.0" top x 2.375" face x 2.0" wide.

c. FA135: For chamfered edges, where the chamfer is 3/4” or more. Dimensions: 2" wide X 3-1/2" long X 1-1/8" tall.

d. FA902.5: For 90 degree walls with 1/2" radius edge. Dimensions: 3.75" top x 2.375" face x 2.0" wide.

2. Fixed Radius:

a. FR.12: For 1/8" radiused edges. Dimensions: 4.875" top x 1.0" face x 2.0" wide.

b. FR.05: For 1/2" radiused edges. Dimensions: 3.75" top x 1.0" face x 2.0" wide.

c. FR1.0: For 1" radiused edges. Dimensions: 4.375" top x 1.625" face x 2.0" wide.

3. Gorilla Series:

a. Gorilla 012: Rounded edge. For square corners from 0” - 3/8” radius. Size: 1-1/8” wide x 8” deep x 1-1/8”.

b. Gorilla 0135: Chamfered edge. For square corners from 0” - 3/8” radius. Size: 1-1/8” wide x 8” deep x 1-1/8”.

4. Two-part epoxy adhesive shall be approved by the OWNER’s Office of Environmental Health and Safety (OEHS).

5. Fastening pins as recommended by skateboard deterrent manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that gradients and elevations of base are correct. Maintain subgrade clean and in a smooth, compacted condition until the concrete is placed.

B. Maintain subgrade in a smooth, compacted condition in conformity with the required section and established grade until the concrete is placed. Earth surface shall be kept moist by frequent sprinkling up to the time of placing concrete.

3.02 CONSTRUCTION OF FORMS

A. Flatwork Forming: Set forms to the indicated alignment, grade and dimensions. Hold forms rigidly in place by a minimum of 4 stakes per form placed at intervals not to exceed two feet. Use additional stakes and braces at corners, deep sections, and radius bends, as required. Use clamps, spreaders, and braces where required to ensure rigidity in the forms.

B. Wall Formwork: Forms shall be constructed to conform to final concrete shape, lines and dimensions of members required by Drawings and Specifications. Forms shall be sufficiently tight to prevent leakage of concrete and properly braced or tied together to maintain position and shape.

3.03 STEEL REINFORCEMENT INSTALLATION

A. Fabricate bars of the indicated sizes and bend and form to required shapes and lengths by methods not injurious to materials. Do not heat reinforcement for bending. Bend bars No. 6 size and larger in the shop only. Bars with unscheduled kinks or bends are not permitted.

B. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

C. Install welded-wire reinforcement in lengths as long as practicable. Lap adjoining pieces, and lace splices with wire.

D. Clean reinforcement of loose rust and mill scale, earth, or bond-reducing materials.

3.04 PREPARATION FOR CONCRETE PLACEMENT

A. Surfaces to receive concrete shall be free of debris, standing water, and any other deleterious substances before start of concrete placing.

B. Do not place concrete until forms, reinforcement, pipe, conduits, outlet boxes, anchors, sleeves, bolts, and other embedded materials are securely fastened in place. Maintain a minimum of two inches clearance between said items and any part of the concrete reinforcement.

C. Adjust pull boxes, meter boxes, valve covers and manholes to proposed finish grade prior to placement of concrete. Anchor bolts shall be accurately set and maintained in position by templates while being embedded in concrete.

D. Clean thoroughly the surfaces of metalwork to be in contact with concrete, remove dirt, grease, loose scale and rust, grout, mortar, and other foreign substances before the concrete is placed.

E. Moisten subbase to provide a uniform dampened condition at time concrete is placed.

3.05 CONCRETE PLACEMENT

A. Place, compact, screed, float and trowel concrete as indicated in Section 03 3000 Cast-in-Place Concrete.

B. Finish: After straightedging, when most of the water sheen has disappeared and just before the concrete hardens, finish the surface with a wood or magnesium float or darby to a smooth and uniformly fine granular or sandy texture free of

waves, irregularities, or tool marks. Produce a scored surface by brooming with a fiber-bristle brush in a direction transverse to that of the traffic, followed by edging.

1. Provide medium broom finish on surfaces up to six percent slope by striating surface 1/32 to 3/64 inch deep with a soft bristle broom across concrete surface to provide a uniform fine line texture.

2. Provide heavy broom finish on surfaces over six percent by striating surface 1/16 inch to 1/8 inch deep with a stiff-bristled broom.

3.06 JOINTS

A. Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated. Align curb, gutter, and sidewalk joints.

B. Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour.

1. Continue steel reinforcement across construction joints unless otherwise indicated on the Drawings.

2. Provide tie bars at sides of paving strips where indicated on the Drawings

3. Butt Joints: Use bonding agent or epoxy-bonding adhesive at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.

5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated on the Drawings.

D. Expansion Joints:

1. Provide premolded joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together. Extend expansion joint fillers full-width and depth of joint, and 1/4" below finished surface where joint filler is indicated. If no joint sealer is indicated place top of premolded joint filler flush with top of concrete or curb.

2. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

E. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints to a depth equal to at least one-fourth of the concrete thickness, as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch radius. Repeat grooving of contraction joints after applying surface finishes. Remove grooving-tool marks on concrete surfaces.

2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.

3. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

F. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Remove edging-tool marks on concrete surfaces.

G. Where concrete is to be cast against old concrete, (greater than 60 days of age), the surface of the old concrete shall be thoroughly cleaned and roughened by sand-blasting, exposing the aggregate. The hardened surface shall be cleaned of latent foreign material and washed clean, prior to the application of an epoxy bonding agent.

3.07 STAIRS AND RAMPS

A. Install support post sleeves into the perimeter concrete curbing during the installation process of the curbing. Sleeves shall be three-inch diameter, schedule 40 PVC with a cap solvent welded to the bottom of the sleeve. Drill a half-inch weep hole on the bottom of the cap. Sleeve and cap shall be Nibco products or approved equal. Sleeves shall be embedded into concrete a minimum of nine inches and spaced at a maximum of four feet, or as indicated on the Drawings. Fill sleeve with non-shrink grout Quickcrete #1585-01 when setting posts. Provide control joints into the concrete on both sides for each post.

B. Finish step nosings with a safety step edger/groover with a 1/2 inch radius and four grooves spaced equally 3/4 inch on center and a bit depth between 1/4 to 3/8 inch. Paint with contrasting color.

3.08 CURB AND GUTTER CONCRETE PLACEMENT AND FINISHING

A. Formed Curb and Gutter: Place concrete to the required section in a single lift. Consolidate concrete using approved mechanical vibrators. Finish curve shaped gutters with a standard curb mule or concrete slipformed curb paving equipment.

B. Concrete Finishing: Float and finish exposed surfaces with a smooth wood float until true to grade and section and uniform in texture. Brush floated surfaces with a fine-hair brush using longitudinal strokes. Round the edges of the gutter and top of the curb with an edging tool to a radius of 1/2 inch. Immediately after removing the front curb form, rub the face of the curb with a wood or concrete rubbing block and water until blemishes, form marks, and tool marks have been removed. Brush the front curb surface, while still wet, in the same manner as the gutter and curb top. Finish the top surface of gutter to grade with a wood float.

C. Surface and Thickness Tolerances: Finished surfaces shall not vary more than 1/4 inch from the testing edge of a 10-foot straightedge. Permissible deficiency in section thickness will be up to 1/4 inch.

3.09 CLEAN UP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project Site.

3.10 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 321314 CONCRETE PAVING - LANDSCAPE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete paving, bands, curbs, mow strips, steps and walls.
2. Reinforcement.
3. Surface finish.
4. Special curing.

B. Related sections:

1. Section 312000 - Earth Moving, for backfilling and compacted fill for paving.
2. Section 321373 - Joint Sealants, for paving contraction joint sealing.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content. Include statement indicating cost for each product having recycled content.

C. Samples: Provide a 4 x 4 foot job site sample of each paving finish specified, for review and approval by Owner's Representative prior to installation. Sample shall represent final appearance of paving, including any stain, sealer or other surface applications. Provide additional samples until finish is considered acceptable by the Owner's Representative, at no additional cost to the Owner. The approved sample shall serve as a standard of appearance for the final work to be produced and shall remain on site until all site concrete has been reviewed and approved by the Owner's Representative.

D. Other Action Submittals:

1. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1.3 QUALITY ASSURANCE

A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

B. ACI Publications: Comply with ACI 301 unless otherwise indicated.

1.4 TESTS

A. Testing and analysis will be performed under provisions of Section 014000 - Quality Requirements.

B. Make available proposed mix design of each class of concrete to appointed firm for review prior to commencement of work.

C. Testing firm will take cylinders and perform slump and air entrainment tests in accordance with ACI 301.

D. Tests of cement and aggregates will be performed to ensure conformance with specified requirements.

E. Three concrete test cylinders will be taken for every 75 or less cubic yards of each class of concrete placed each day.

F. One additional test cylinder will be taken and be cured on site under same conditions as concrete it represents.

G. One slump test will be taken for each set of test cylinders taken.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of same type, brand, and source throughout Project:

1. Cement: ASTM C 150 Normal-Type I, gray Portland cement.
2. Blended Hydraulic Cement: ASTM C 595, cement.

B. Normal-Weight Aggregates: ASTM C 33, Class 4S, uniformly graded. Provide aggregates from a single source.

C. Water: Clean, potable and complying with ASTM C 94/C 94M.

D. Air-Entraining Admixture: ASTM C 260.

E. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain no more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

F. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, nonfading, and resistant to lime and other alkalis.

1. Color: As indicated.

2.2 FORM MATERIALS

A. Conform to ACI 301.

B. Wood or Steel form material, profiled to suit conditions.

2.3 STEEL REINFORCEMENT

A. Recycled Content: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 25 percent.

B. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, uncoated finish, fabricated from as-drawn steel wire into flat sheets.

C. Reinforcing Bars: ASTM A 615/A 615M; deformed, uncoated finish.

D. Plain-Steel Wire: ASTM A 82/A 82M, as drawn.

E. Tie Wire: Annealed steel, minimum 16 gage size.

F. Dowel Bars: ASTM A 615/A 615M, plain-steel bars. Cut bars true to length with ends square and free of burrs, uncoated finish.

G. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's Manual of Standard Practice from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified.

2.4 FIBER REINFORCEMENT

A. Synthetic Fiber: Fibrillated polypropylene fibers engineered and designed for use in concrete paving, complying with ASTM C 1116/C 1116M, Type III, 1/2 inch long.

2.5 ACCESSORIES

A. Pre-emergent Herbicide: Surflan.

B. Curing Compound: FS TT-C-800, Type 1, 30 percent solids; ASTM C309, Ashford Formula.

C. Integral Color (Non-immersion Conditions): Davis Colors, or approved equal.

D. Chemical Surface Retarder: 'Top-cast' by Grace Construction Products.

E. Liquid Surface Sealer: 'HLQ-125' by SINAK Corporation.

F. Patch Bond: Weld-Crete.

2.6 RELATED MATERIALS

A. Joint Fillers: ASTM D 4819, light weight polyethylene closed cell expansion joint filler.

2.7 PAVEMENT MARKINGS

A. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, Type II, with drying time of less than 45 minutes.

1. Color: As indicated.

B. Pavement-Marking Paint: MPI #97 Latex Traffic Marking Paint.

1. Color: As indicated.

2.8 WHEEL STOPS

A. Wheel Stops: Precast, air-entrained concrete.

1. Color: Gray.
2. Dowels: Galvanized steel, 3/4 inch in diameter, 10-inch minimum length.
3. Adhesive: As recommended by wheel stop manufacturer for application to concrete pavement.

2.9 CONCRETE MIXTURES

A. Mix concrete in accordance with ASTM C94.

B. Prepare design mixtures, proportioned according to ACI 301, with the following properties:

1. Compressive Strength (28 Days): 3000 psi.
2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.50.
3. Slump Limit: 4 inches, plus or minus 1 inch.
4. Air Content: 6 percent plus or minus 1.5 percent.

C. Chemical Admixtures:

1. Use accelerating admixtures in cold weather only when approved by Owner's Representative. Use of admixtures will not relax cold weather placement requirements.
2. Use set-retarding admixtures during hot weather only when approved by Owner's Representative.

D. Synthetic Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than 1.0 pound/cu. yd.

E. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions.

F. Add air entraining agent to concrete mix for concrete work as necessary.

2.10 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Furnish batch certificates for each batch discharged and used in the Work.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Verify compacted subgrade and/or base is ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

C. Beginning of installation means acceptance of existing conditions.

D. Moisten base to minimize absorption of water from fresh concrete.

E. Notify Owner's Representative minimum 24 hours prior to commencement of concreting operations.

F. Proof-roll prepared sub-base surface below concrete paving to identify soft pockets and areas of excess yielding.

G. Remove loose material from compacted sub-base surface immediately before placing concrete.

3.2 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of

work and so forms can remain in place at least 24 hours after concrete placement. Obtain layout approval prior to pour.

B. Assemble formwork to permit easy stripping and dismantling without damaging concrete. Use of permanent concrete screed is permissible. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

C. Place joint fillers vertical in position, in straight lines. Secure to formwork during concrete placement.

3.3 REINFORCEMENT

A. Place reinforcement. Comply with CRSI's Manual of Standard Practice for fabricating, placing, and supporting reinforcement.

B. Interrupt reinforcement at expansion joints.

C. Place reinforcement to achieve slab and curb alignment as detailed.

D. Provide dowelled joints at interruptions of concrete with one end of dowel set in capped sleeve to allow longitudinal movement.

3.4 JOINTS

A. General: Form contraction, isolation, and doweled construction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct contraction joints at maximum 5 foot intervals of paving and at right angles to centerline unless otherwise indicated. Align curb, gutter and sidewalk joints when possible.

B. Doweled Construction Joints: Set construction joints at side, end terminations of paving, between paving areas with differing color/finishes, and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints. In linear paving conditions, provide doweled construction joints at 20-foot intervals unless otherwise shown.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed vertical objects, and where indicated.

D. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/8-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

3.5 CONCRETE PLACEMENT

A. Comply with ACI 301 requirements for measuring, mixing, transporting, placing, and consolidating concrete.

B. Ensure reinforcement, inserts, embedded parts and formed joints are not disturbed during concrete placement.

C. Deposit and spread concrete in a continuous operation between predetermined construction joints. Do not push or drag concrete into place or use vibrators to move concrete into place. Do not break or interrupt successive pours such that cold joints occur.

D. Place concrete to pattern indicated.

E. Coordinate pours of integral color concrete to ensure consistency of color throughout. Color inconsistency will not be accepted.

F. For steps, walls or other cast-in-place elements, settle concrete by vibration to eliminate honeycombs. Concrete with visible honeycombs will be rejected.

G. Screed paving surface with a straightedge and strike off.

H. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

I. Tolerances in horizontal alignment of hardscape elements such as paving edges, joints, walls and steps shall not exceed 1/4 inch in 10 feet, or 1/2 inch in 50 feet.

3.6 FINISHING

A. See plan for finishes and finish locations.

B. Curbs, mow strips and gutters: Light broom, unless otherwise specified.

C. Finishes:

1. General: Do not add water to concrete surfaces during finishing operations. Compact and tamp concrete (unless Retardant Finish is specified), to bring 3/8 inch of mortar to surface, float with wood screeds and floats only, and apply following finishes after surface floating. Do not use steel or any plastic screeds, floats or “Fresno” for initial floating and screeding operations. For Retardant Finish, the concrete shall be placed and consolidated so as to completely fill all spaces in the forms; however, tamping will not be permitted because the aggregate must remain near the surface for later exposure.
2. All concrete finishes shall be as listed on the Drawings. Finishes are as follows:

    a. Fine-to-Medium-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.

b. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.
c. Rough Trowel Swirl Finish: Provide rough trowel finish to slab surfaces. After placing slabs, consolidate surface by floating to a uniform, smooth, granular texture.
d. Scratch Finish: Provide scratch finish to slab surfaces that are to receive mortar setting beds for precast tile pavers as noted on Drawings.
e. Steel Trowel Finish: After surface water disappears and floated surface is sufficiently hardened, steel trowel and re-trowel to smooth, dense, hard finish. After concrete has set sufficiently, re-trowel to a smooth, uniform finish free of trowel marks or other blemishes. Avoid excessive troweling that produces burned areas.
f. Sandblast Finish (Dry Sand Method):

    1) Contractor shall schedule this work to be executed with as little conflict with other trades as possible. Contractor shall be responsible for the protection or masking of adjacent surfaces, if necessary.
    2) Test areas for sample of blasting will be established where surfaces will not be left exposed. Owner's Representative shall be present at time of sample blasting and approve the desired finish.
    3) Care shall be taken to protect all adjacent surfaces from damage which are not receiving sandblasting.
    4) Sandblasting shall be accomplished using qualified workmen familiar with the proper technique.
    5) Sandblasting work shall be by the dry sane method, utilizing appropriate equipment and adequate air pressure. Abrasives shall be washed silica sand free from salt, clay or other foreign materials. Nozzle position during the operation shall be as determined in the making of the approved samples.
    6) All concrete areas requiring patching shall be patched, with all rough spots and unevenness in the concrete surface ground smooth before the sandblasting operation is begun.

g. Etched or Retardant Finish (with Surface Retarder):

    1) All work shall conform to applicable OSHA and EPA standards.
    2) Contractor shall schedule this work to be executed with as little conflict with other trades as possible. If necessary, Contractor shall be responsible for the protection of adjacent masonry and concrete surfaces with a film-forming protective coating, 'Face-off' by Grace Construction Products, or approved equal, allowing time for coating to dry prior to pouring concrete.
    3) Preparatory Work: The concrete should be placed and consolidated so as to completely fill all spaces in the forms. Tamping will not be permitted for Top-cast finish #25 or higher because the aggregate must remain near the surface for later exposure.
    4) Application of Retarder: Surface retarder shall be applied by qualified workmen familiar with the proper technique. After concrete has been floated or trowel finished and initial bleed water has risen to the surface, apply film-forming top surface retarder, 'Top-cast' by

Grace Construction Products or approved equal, at specified gradient, using a low-pressure sprayer with a 0.5 gpm tip at a rate of 200-350 square feet per gallon until surface has a complete hiding coat. Once surface retarder has cured adequately, dependent on weather and site conditions, remove by pressure washing. Remove rinse water and cement matrix from site in accordance with local codes.

3.7 CONCRETE PROTECTION, CURING AND SEALING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 pound/square feet x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by moisture-retaining-cover curing, curing compound or a combination of these.

F. Concrete Surface Sealer: All concrete paving shall be sealed with a clear, penetrating concrete sealer. If efflorescence or alkali-staining is evident after the concrete has cured, lightly wash the surface with a mild muriatic acid solution (usually a 10:1 dilution) that has been thoroughly rinsed with water and cleaned with diluted Lithochrome Floor Cleaner by L.M. Scofield, or approved equal. Rinse again and dry thoroughly. After concrete mix has cured for at least one month, the concrete surface shall be thoroughly washed with fresh, clean water. After surface is thoroughly dried, apply ‘HLQ-125’ as manufactured by SINAK Corporation, per manufacturer’s specifications.

3.8 PAVING TOLERANCES

A. Comply with tolerances in ACI 117 and as follows:

1. Elevation: 3/4 inch.
2. Thickness: Plus 3/8 inch, minus 1/4 inch.
3. Surface: Gap below 10-foot- long, unleveled straightedge not to exceed 1/2 inch.
4. Joint Spacing: 3 inches.
5. Contraction Joint Depth: Plus 1/4 inch, no minus.
6. Joint Width: Plus 1/8 inch, no minus.

3.9 PAVEMENT MARKING

A. Allow concrete paving to cure for a minimum of 28 days and be dry before starting pavement marking.

B. Sweep and clean surface to eliminate loose material and dust.

C. Apply paint with mechanical equipment to produce markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 millimeters.

3.10 WHEEL STOPS

A. Install wheel stops in bed of adhesive applied as recommended by manufacturer.

B. Securely attach wheel stops to paving with not less than two steel dowels located at one-quarter to one-third points. Install dowels in drilled holes in the paving and bond dowels to wheel stop. Recess head of dowel beneath top of wheel stop.

3.11 REPAIRS AND PROTECTION

A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Owner’s Representative.

B. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

C. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION

SECTION 321373 - CONCRETE PAVING JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cold-applied joint sealants.
2. Hot-applied joint sealants.

1.2 PRECONSTRUCTION TESTING

A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, eight samples of materials that will contact or affect joint sealants. Use manufacturer's standard test method to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

1.3 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples: For each kind and color of joint sealant required.

C. Pavement-Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

A. Product certificates.

B. Product test reports.

C. Preconstruction compatibility and adhesion test reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021.

B. Preinstallation Conference: Conduct conference at project site.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer based on testing and field experience.

B. Colors of Exposed Joint Sealants: As indicated by manufacturer's designations.

2.2 COLD-APPLIED JOINT SEALANTS

A. Single-Component, Nonsag, Silicone Joint Sealant for Concrete: ASTM D 5893, Type NS.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Crafco Inc., an ERGON company; RoadSaver Silicone.
b. Dow Corning Corporation; 888.
c. Pecora Corporation; 301 NS.

B. Single-Component, Self-Leveling, Silicone Joint Sealant for Concrete: ASTM D 5893, Type SL.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Crafco Inc., an ERGON company; RoadSaver Silicone SL.
b. Dow Corning Corporation; 890-SL.
c. Pecora Corporation; 300 SL.

C. Multicomponent, Pourable, Traffic-Grade, Urethane Joint Sealant for Concrete: ASTM C 920, Type M, Grade P, Class 25, for Use T.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Pecora Corporation; Urexpan NR-200.

2.3 HOT-APPLIED JOINT SEALANTS

A. Hot-Applied, Single-Component Joint Sealant for Concrete: ASTM D 3406.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Crafco Inc., an ERGON company; Superseal 444/777.

B. Hot-Applied, Single-Component Joint Sealant for Concrete and Asphalt: ASTM D 6690, Types I, II, and III.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Meadows, W. R., Inc.; Sealtight Hi-Spec.
   b. Right Pointe; D-3405 Hot Applied Sealant.

2.4 JOINT-SEALANT BACKER MATERIALS

A. Round Backer Rods for Cold- and Hot-Applied Joint Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

B. Round Backer Rods for Cold-Applied Joint Sealants: ASTM D 5249, Type 3, of diameter and density required to control joint-sealant depth and prevent bottom-side adhesion of sealant.

C. Backer Strips for Cold- and Hot-Applied Joint Sealants: ASTM D 5249; Type 2; of thickness and width required to control joint-sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

2.5 PRIMERS

A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.

B. Cleaning of Joints: Clean out joints immediately before installing joint sealants.

C. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

D. Install joint-sealant backings of kind indicated to support joint sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
   1. Do not leave gaps between ends of joint-sealant backings.
   2. Do not stretch, twist, puncture, or tear joint-sealant backings.
   3. Remove absorbent joint-sealant backings that have become wet before sealant application and replace them with dry materials.

E. Install joint sealants using proven techniques that comply with the following and at the same time backings are installed:

   1. Place joint sealants so they directly contact and fully wet joint substrates.
   2. Completely fill recesses in each joint configuration.
   3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Joint Sealants: Immediately after joint-sealant application and before skinning or curing begins, tool sealants according to the following requirements to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint:

   1. Remove excess joint sealant from surfaces adjacent to joints.
   2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.

G. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.

H. Clean off excess joint sealant or sealant smears adjacent to joints as the Work progresses, by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

END OF SECTION

SECTION 321816.13 – PLAYGROUND SURFACE SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Poured-in-Place Playground Surfacing System.

1.2 RELATED SECTIONS

A. Section 312000 – Earthwork

B. Section 116800 – Play Field Equipment and Structures

C. Section 033000 - Cast-in-Place Concrete

D. Section 321216 – Asphalt Paving

E. Section 321313 – Concrete Paving

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM D412 – Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension.
   2. ASTM D624 – Standard Test Methods for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
   3. ASTM D2047 – Standard Test Method for Static Coefficient of Friction of Polish-Coated Floor Surfaces as measured by the James Machine.
   4. ASTM D2859 – Standard Test Method for Flammability of Finished Textile Floor Covering Materials.
   5. ASTM E303 – Standard Test Method for Measuring Surface Frictional Properties Using the British Pendulum Tester.
   6. ASTM F1292 – Standard Specification for Impact Attenuation of Surface Systems under and around playground equipment.
   7. ASTM F1951 – Standard Specification for Determination of Accessibility of Surface Systems under and around playground equipment.

B. U.S. Consumer Products Safety Commission (CPSC): CPSC Handbook for Public Playground Safety.

1.4 SYSTEM DESCRIPTION

A. Safety Performance: Playground surface system within playground equipment use zones shall meet or exceed minimum performance requirements of CPSC, ASTM F 1292 and DSA Policy No. 97-04, for head-first fall. Peak deceleration of less than 200 G and Head Injury Criteria (HIC) value of less than 1000, for drop height not less than accessible portion of play equipment being installed as indicated on the Drawings.

B. Performance Requirements: Provide a 2-layer rubber-urethane playground surfacing system which has been designed, manufactured and installed to meet the following criteria:
   1. Shock Attenuation (ASTM F1292):
      a. Gmax: Less than 200.
      b. Head Injury Criteria: Less than 1000.
   2. Flammability (ASTM D2859): Pass.
   3. Tensile Strength (ASTM D412): 60 psi (413 kPa).
   4. Tear Resistance (ASTM D624): 140%.
   5. Water Permeability: 0.4 gal/yd2/second.
   6. Accessibility: Comply with requirements of ASTM F1951.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer’s descriptive data for each type of resilient playground surface system required.

B. Certificate of Compliance: Submit certificate for surfaces manufactured for the purpose of playground safety surface, impact attenuation performance shall be documented by a Certificate of Compliance executed by the manufacturer.

C. Test Data: Indicating compliance with ASTM F1951 – Standard Specification for Determination of Accessibility of Surface Systems under and around playground equipment.

D. Samples for Initial Selection Purposes: Submit manufacturer’s standard color charts in form of actual sections of resilient playground surface system showing full range of solid and variegated colors available.

E. Samples for Verification Purposes: Submit 9” x 9” (229 x 229 mm) square samples (minimum) of each solid and variegated color of resilient playground surface system required, applied to rigid backing, showing full-range of color variations.

F. Installation Instructions: For each component of safety surfacing.

G. Maintenance Instructions: Submit manufacturer’s written instructions for recommended maintenance practices.

H. Certificate of Insurance: Provided by manufacturer of safety surfacing, covering both general and product liability, of not less than $5,000,000 for seamless resilient playground surface system and $75,000,000 for loose fill playground surface system. Issuing underwriter shall be AA rated.

I. Closeout Submittals – Submit the following:
   1. Warranty documents specified herein.

J. LEED Submittals:

   1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
   2. Certificates for [**Credit MR 6**] [**Credit MR 7**]: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements: Provide playground surface systems determined to be accessible when tested according to ASTM F1951 and designed to comply with requirements for an accessible route as required by California Building Code (CBC), Chapter 11B.

B. Source Quality Control: Obtain materials from one source throughout.

C. Installer's Qualifications: Engage a company experienced in applying resilient playground surface system and approved or otherwise acceptable to resilient playground surface system manufacturer.

D. Grade Control: Establish and maintain required lines and elevations using accepted surveying procedures.

E. Certifications: Certification by manufacturer that installer is an approved applicator of the playground surfacing system.

F. International Play Equipment Manufacturers Association (IPEMA) certified.

1.7 DELIVERY, STORAGE & HANDLING

A. General: Comply with Division 1 Product Requirement Section.

B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at a minimum temperature of 40 degrees F (4 degrees C) and a maximum temperature of 90 degrees F (32 degrees C).

1.8 PROJECT CONDITIONS

A. Environmental Requirements: Install surfacing system when minimum ambient temperature is 40 degrees F (1 degree C) and maximum ambient temperature is 90 degrees F (32 degrees C). Do no install in steady or heavy rain.

1.9 WARRANTY

A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.

B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under contract documents.

C. Proper drainage is critical to the longevity of the PlayBound Poured-in-Place surfacing system. Inadequate drainage will cause premature breakdown of the poured system in affected areas; and void the warranty.

PART 2 - PRODUCTS

2.1 SEAMLESS PLAYGROUND SURFACE SYSTEM

A. Specified Manufacturer: Surface America, Inc., Williamsville, NY (local representative, Newport Beach, CA, 714/553-8065).

B. Acceptable Manufacturers: None identified. Equivalent products of other manufacturers will be considered in accordance with the substitution provisions specified in Section 01600 – Product Requirements.

C. Seamless Playground Surface System: PlayBound manufactured by Surface America, Inc., two-layer poured-in-place resilient playground surface system, consisting of shock-absorbing cushion layer and a resilient, weathering, multi-colored surface layer.
   1. Layers shall be composed of high grade rubber buffing and elastomeric resins, engineered to reduce injury from falls by children but firm enough to support wheelchair access.
   2. Colors and installation shall be as indicated on the Drawings.

D. Substrate Material: Compacted aggregate base as specified in Section 321216 – Asphalt Paving.

E. Base Mat Layer: Recycled black SBR rubber buffing, bound by 100 percent solids aromatic urethane, yielding approximately 16 percent ratio of resin to rubber, for troweled application. Granulated rubber shall not be used in cushion layer.

F. Top Surface Layer: Granulated, peroxide-cured EPDM Colored rubber, bound by 100 percent solids aromatic urethane, yielding approximately 20 percent ratio of resin to rubber, for troweled application. Granules shall be 1 to 3 mm and in colors as indicated on the Drawings.

G. Adhesive/Primer: Single component, moisture cured polyurethane primer.

H. Binders: Formulated specifically for use with rubber granule material for outdoor installation with low, odor and excellent weathering and binding characteristics, formulated specifically for use with rubber granule material for outdoor installations.

1. Base mat binder: Elastic aromatic polyurethane (yellowing).
2. Top surface binder: Elastic aliphatic polyurethane (non-yellowing).
3. Binders shall be 100 percent MDI based with 0 percent toluene diphenal isocyanate (TDI) monomers.

I. Surfacing Colors: Multiple colors, as indicated on the Drawings. Allow for customer colors, if necessary.

2.2 PRODUCT SUBSTITUTIONS

A. Substitutions: No substitutions permitted.

2.3 MIXES

A. Required mix proportions by weight:
1. Basemat: 16+% urethane (as ratio: 14% urethane divided by 86% rubber). 14% urethane, 86% rubber (based on entire rubber & urethane mix).
2. Top Surface: 22% urethane (ratio: 18% urethane divided by 82% rubber). 18% urethane, 82% rubber (based on entire rubber and urethane mix).

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

A. Comply with the instructions and recommendations of the playground surfacing manufacturer.

3.2 EXAMINATION

A. Substrate preparation must be in accordance with surfacing manufacturer's specification. New asphalt must be fully cured – up to 30 days. New concrete must be cured – up to 7 days.

B. Proper drainage is critical to the longevity of the PlayBound Poured-in-Place surfacing system. Inadequate drainage will cause premature breakdown of the poured system I affected areas; and void the warranty.

3.3 PREPARATION

A. Surface Preparation: Using a brush or short nap roller, apply primer to the substrate perimeter and any adjacent vertical barriers such as playground equipment support legs, curbs or slabs that will contact the surfacing system at the rate of 300 ft2/gal (7.5) m2/L).

3.4 INSTALLATION

A. Do not proceed with playground surfacing installation until all applicable site work, including substrate preparation, fencing, playground equipment installation and other relevant work has been completed.

B. Basemat Installation:
   1. Using screeds and hand trowels, install the basemat at a consistent density of 29 pounds, 1 ounce per cubic foot (466 kg/m3) to the specified thickness.
   2. Allow basemat to cure for sufficient time so that indentations are not left in the basemat from applicator foot traffic or equipment.
   3. Do not allow foot traffic or use of the basemat surface until it is sufficiently cured.

C. Primer Application: Using a brush or short nap roller, apply primer to the basemat perimeter and any adjacent vertical barriers such as playground equipment support legs, curbs or slabs that will contact the surfacing system at the rate of 300 ft2/gal (7.5 m2/L).

D. Top Surface Installation:
   1. Using a hand trowel, install top surface at a consistent density of 58 pounds, 9 ounces per cubic foot (938 kg/m3) to a nominal thickness of ½" (12.7 mm).
   2. Allow top surface to cure for a minimum of 48 hours.
   3. At the end of the minimum curing period, verify that the top surface is sufficiently dry and firm to allow foot traffic and use without damage to the surface.
   4. Do not allow foot traffic or use of the surface until it is sufficiently cured.

E. Colored Areas: Patterns and graphics as indicated on the Drawings.

F. Tolerances: In accordance with manufacturer's instructions and recommendations but not exceeding the following:
   1. Flatness: Maximum variation of 1/4-inch measured with 10 foot straight edge.
   2. Thickness: Within +1/8-inch/-1/16-inch of design thickness.
   3. Variation from True Elevation: Within 1/8-inch.

3.5 CLEANING AND PROTECTION

A. Protection, Resilient Playground Surface System:
   1. Prohibit all traffic on resilient playground surface system. Erect barricades to protect resilient playground surface system.
   2. Protect resilient playground surface system from damage and soiling from construction activities.

B. Cleaning, Seamless Playground Surface System: For substantial completion review, broom clean and wash resilient playground surface system, using cleaning and procedures as recommended by surfacing manufacturer.

END OF SECTION 321816.13

SECTION 323119 - DECORATIVE METAL FENCES AND GATES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Decorative steel fences.
2. Swing gates.
3. Gate operators, including controls.

B. Related Sections:

1. Division 1 Section “Sustainable Design Requirements” for additional LEED requirements.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For gates. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

C. Samples: For each fence material and for each color specified.

D. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance Data: For gate operators to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
B. UL Standard: Provide gate operators that comply with UL 325.

C. Emergency Access Requirements: Comply with requirements of authorities having jurisdiction for automatic gate operators on gates that must provide emergency access.

PART 2 - PRODUCTS

2.1 STEEL AND IRON

A. Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Bars (Pickets): Hot-rolled, carbon steel complying with ASTM A 29/A 29M, Grade 1010.

C. Tubing: ASTM A 500, cold formed steel tubing.

D. Bar Grating: NAAMM MBG 531.

1. Bars: Hot-rolled steel strip, ASTM A 1011/A 1011M, Commercial Steel, Type B.
2. Wire Rods: ASTM A 510.

E. Uncoated Steel Sheet: Hot-rolled steel sheet, ASTM A 1011/A 1011M, Structural Steel, Grade 45.

F. Galvanized-Steel Sheet: ASTM A 653/A 653M, structural quality, Grade 50, with G90 coating.

G. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, structural quality, Grade 50, with AZ60 coating.

H. Recycled Content:

1. Steel produced by electric arc furnace (EAF): Recycled content not less than 90 percent.
2. Steel produced by basic oxygen furnace (BOF): Recycled content not less than 25 percent.

2.2 COATING MATERIALS

A. Epoxy Zinc-Rich Primer for Steel: Complying with MPI #20 and compatible with coating specified to be applied over it.

B. Epoxy Primer for Galvanized Steel: Complying with MPI #101 and compatible with coating specified to be applied over it.

C. Epoxy Intermediate Coat: Complying with MPI #77 and compatible with primer and topcoat.

D. Polyurethane Topcoat: Complying with MPI #72 and compatible with undercoat.

2.3 MISCELLANEOUS MATERIALS

A. Concrete: Normal-weight concrete complying with requirements in Section 033000 "Cast-in-Place Concrete" with a minimum 28-day compressive strength of 3000 psi, 3-inch slump, and 1-inch maximum aggregate size.

B. Nonshrink Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107 and specifically recommended by manufacturer for exterior applications.

2.4 GROUNDING MATERIALS

A. Grounding Conductors: Bare, solid wire for No. 6 AWG and smaller; stranded wire for No. 4 AWG and larger.

1. Material above Finished Grade: Copper.
2. Material on or below Finished Grade: Copper.

B. Grounding Connectors and Grounding Rods: Comply with UL 467.

2.5 DECORATIVE STEEL FENCES

A. Decorative Steel Fences: Fences made from steel tubing and shapes.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. A & T Iron Works, Inc.
b. Ametco Manufacturing Corporation.
c. BarnettBates Corporation.
d. Golden State.

B. Posts: Square steel tubing, with 1/8-inch wall thickness.

C. Post Caps: Formed from steel sheet.

D. Rails:

1. Steel Tube Rails: Square steel tubing with 1/8-inch wall thickness.

E. Pickets: Decorative steel bars of pattern and size indicated.

1. Picket Spacing: 4 inches clear, maximum.

F. Fasteners: Stainless-steel carriage bolts and tamperproof nuts.

G. Fabrication:
   1. Fit and shop assemble in largest practical sections, for delivery to site.
   2. Fabricate items with joints tightly fitted and secured.
   3. Continuously seal joined members by continuous welds.
   4. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
   5. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
   6. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

H. Galvanizing: Hot-dip galvanize to comply with ASTM A 123/A 123M.

   1. Hot-dip galvanize posts and rails.
   2. Hot-dip galvanize rail and picket assemblies after fabrication.

I. Finish for Steel Items: Primed with two coats and shop-painted.

2.6 SWING GATES

A. Galvanized-Steel Frames and Bracing: Fabricate members from square tubes formed from 0.108-inch nominal-thickness, metallic-coated steel sheet or formed from 0.105-inch nominal-thickness steel sheet and hot-dip galvanized after fabrication.

B. Steel Frames and Bracing: Fabricate members from square steel tubing with 1/8-inch wall thickness.

C. Hardware: Latches permitting operation from both sides of gate, hinges, and keepers for each gate leaf more than 5 feet wide. Provide center gate stops and cane bolts for pairs of gates.

D. Galvanizing: For items that are indicated to be galvanized, hot-dip galvanize to comply with ASTM A 123/A 123M unless otherwise indicated.

E. Steel Finish: Primed with two coats and shop-painted.

2.7 GATE OPERATORS

A. General: Provide factory-assembled automatic operating system designed for gate size, type, weight, and operation frequency. Provide operation control system with characteristics suitable for Project conditions, with remote-control stations, safety devices, and weatherproof enclosures; coordinate electrical requirements with building electrical system.

1. Provide operator with UL-approved components.
2. Provide controllers, electrical devices, and wiring.

B. Motors: Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 110513 "Common Motor Requirements for Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

C. Gate Operators: Concrete base mounted and as follows:

1. Hydraulic Swing Gate Operators:

a. Duty: Heavy duty, commercial/industrial.

2. Mechanical Swing Gate Operators:

a. Duty: Heavy duty, commercial/industrial.

D. Remote Controls: Electric controls separated from gate and motor and drive mechanism, with NEMA ICS 6, Type enclosure for concrete base mounting, and with space for additional optional equipment. Provide the following remote-control device(s):

1. Card Reader: Programmable, multiple-code system.
2. Digital Keypad Entry Unit: Multiple-programmable, code capability.
3. Vehicle Detector: Loop system including automatic closing timer with adjustable time delay before closing, and timer cutoff switch,] designed to hold gate open until traffic clears.

E. Obstruction Detection Devices: Provide each motorized gate with automatic safety sensor(s). Activation of sensor(s) causes operator to immediately reverse gate in both opening and closing cycles and hold until clear of obstruction.

2.8 Accessories:

A. Battery Backup System: Battery-powered drive and access-control system.

B. Instructional, Safety, and Warning Labels and Signs: According to UL 325.

2.9 STEEL FINISHES

A. Surface Preparation: Clean surfaces according to SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

1. After cleaning, apply a conversion coating suited to the organic coating to be applied over it.

B. Powder Coating: 2-coat finish consisting of epoxy primer and TGIC polyester topcoat, with a minimum total dry film thickness of not less than 8 mils.
C. Primer Application: Apply zinc-rich epoxy primer immediately after cleaning, to provide a minimum dry film thickness of 2 mils.

D. High-Performance Coating: Apply epoxy intermediate and polyurethane topcoats to prime-coated surfaces. Apply at spreading rates recommended by coating manufacturer.

1. Match approved Samples for color, texture, and coverage.

PART 3 - EXECUTION

3.1 DECORATIVE FENCE INSTALLATION

A. Install fences according to manufacturer's written instructions.

B. Post Excavation: Excavate holes to a diameter of not less than 4 times post size and a depth of not less than 24 inches plus 3 inches for each foot or fraction of a foot that fence height exceeds 4 feet.

C. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.

1. Hold posts in position during setting with concrete or mechanical devices.
2. Concrete Fill: Place concrete around posts and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
3. Posts Set in Concrete: Extend post to within 6 inches of specified excavation depth, but not closer than 3 inches to bottom of concrete. Crown top of concrete for positive drainage.
4. Space posts uniformly at 6 feet o.c., maximum.

3.2 GATE INSTALLATION

A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

3.3 GATE OPERATOR INSTALLATION

A. General: Install gate operators according to manufacturer's written instructions, aligned and true to fence line and grade.

B. Concrete Bases: Cast-in-place or precast concrete, dimensioned and reinforced according to gate operator component manufacturer's written instructions and as indicated on Drawings.

C. Vehicle Loop Detector System: Cut grooves in pavement and bury and seal wire loop according to manufacturer's written instructions. Connect to equipment operated by detector.

D. Comply with NFPA 70 and manufacturer's written instructions for grounding of electric-powered motors, controls, and other devices.

3.4 GROUNDING AND BONDING

A. Fence Grounding: Install at maximum intervals of 1500 feet except as follows:

1. Fences within 100 Feet of Buildings, Structures, Walkways, and Roadways: Ground at maximum intervals of 750 feet.

a. Gates and Other Fence Openings: Ground fence on each side of opening. Bond metal gates to gate posts.

B. Grounding Method: At each grounding location, drive a grounding rod vertically until the top is 6 inches below finished grade. Connect rod to fence with No. 6 AWG conductor. Connect conductor to each fence component at the grounding location.

C. Bonding Method for Gates: Connect bonding jumper between gate post and gate frame.

D. Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

E. Bonding to Lightning-Protection System: If fence terminates at lightning-protected building or structure, ground the fence and bond the fence grounding conductor to lightning-protection down conductor or lightning-protection grounding conductor, complying with NFPA 780.

3.5 FIELD QUALITY CONTROL

A. Grounding-Resistance Testing: Engage a qualified testing agency to perform tests and inspections.

END OF SECTION

SECTION 328400 - PLANTING IRRIGATION – DOMESTIC WATER

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. It is the intent of the specifications and drawings that the finished system is complete in every respect and shall be ready for operation satisfactory to the Owner.

B. The work shall include all materials, labor, services, transportation, and equipment necessary to perform the work as in these specifications, and as necessary to complete the contract.

1.2 CONSTRUCTION DRAWINGS

A. Due to the scale of the drawings, it is not possible to indicate all offsets, fittings, sleeves, etc., which may be required. The Contractor shall carefully investigate the structural and finished conditions affecting all of his work and plan his work accordingly, furnishing such fittings, etc. as may be required to meet such conditions. Drawings are generally diagrammatic and indicative of the work to be installed. The work shall be installed in such a manner as to avoid conflicts between irrigation systems, planting, site utilities and architectural features.

B. All work called for on the drawings by notes or details shall be furnished and installed whether or not specifically mentioned in the specifications. When an item is shown on the plans but not shown on the specifications or vice versa, it shall be deemed to be as shown on both. The Landscape Architect shall have final authority for clarification. When a conflict occurs between an item shown on the plan and as shown on the specifications, the Landscape Architect shall have final authority for clarification.

C. The Contractor shall not willfully install the irrigation system as shown on the drawings when it is obvious in the field that obstructions, grade differences or discrepancies in area dimensions exist that might not have been considered in the design. Such obstructions or differences should be brought to the attention of the Landscape Architect as soon as detected. In the event this notification is not performed, the Irrigation Contractor shall assume full responsibility for any revisions necessary.

1.3 QUALITY ASSURANCE

A. Provide at least one English speaking person who shall be present at all times during execution of this portion of the work and who shall be thoroughly familiar with the type of materials being installed and the manufacturer’s recommended methods of installation and who shall direct all work performed under this section.

B. Manufacturer's directions and detailed drawings shall be followed in all cases where the manufacturer of articles used in this contract furnishes directions covering points now shown in the drawings and specifications.

C. All local, municipal and state laws, rules and regulations governing or relating to any portion of this work are hereby incorporated into and made a part of these specifications, and their provisions shall be carried out by the Contractor. Anything contained in these specifications shall not be construed to conflict with any of the above rules and regulations of the same. However, when these specifications and drawings call for or describe materials, workmanship, or construction of a better quality, higher standard, or larger size than is required by the above rules and regulations, the provisions of these specifications and drawings shall take precedence.

D. All materials supplied for this project shall be new and free from any defects. All defective materials shall be replaced immediately.

1.4 SUBMITTALS

A. Materials List:

1. After award of contract and before any irrigation system materials are delivered to the job site, submit to the Landscape Architect a complete list of all irrigation systems, materials, or processes proposed to be furnished and installed as part of this contract.
2. Show manufacturer's name and catalog number for each item, furnish complete catalog cuts and technical data, and furnish the manufacturer's recommendations as to the method of installation.
3. No substitutions will be allowed without prior written acceptance by the Landscape Architect or Owner's authorized representative.
4. Manufacturer's warranties shall not relieve the Contractor of his liability under the guarantee. Such warranties shall only supplement the guarantee.

B. Substitutions:

If the Contractor wishes to substitute any equipment or materials for those listed on the irrigation drawings and specifications, he may do so by providing the following information to the Landscape Architect for approval:

1. A written statement indicating the reason for making the substitution and the difference in installed price if the item is accepted.
2. Catalog cut sheets, technical data and performance information for each substitute item.

1.5 EXISTING CONDITIONS

A. The Contractor shall verify and be familiar with the locations, size and detail of points of connection provided as the source of water, electrical supply, and telephone line connection to the irrigation system.

B. Irrigation design is based on the available static pressure shown on the drawings. Contractor shall verify static water on the project prior to the start of construction. Should a discrepancy exist, notify the Landscape Architect and Owner's authorized representative prior to beginning construction.

C. Prior to cutting into the soil, the Contractor shall locate all cables, conduits, sewer lines, and other utilities as are commonly encountered underground and he shall take proper precautions not to damage or disturb such improvements. If a conflict exists between such obstacles and the proposed work, the Contractor shall promptly notify the Landscape Architect who will arrange for relocations. The Irrigation Contractor will proceed in the same manner if a rock layer or any other such conditions are encountered.

D. The Contractor shall protect all existing utilities and features to remain on and adjacent to the project site during construction. Contractor shall repair, at his own cost, all damage resulting from his operations or negligence.

E. The Irrigation Contractor shall coordinate with the General Contractor for installation of required sleeving as shown on the plans.

1.6 INSPECTIONS

A. The Landscape Architect shall be permitted to visit and inspect at all times any part of the work and shall be provided safe access for such visits.

B. Where the specifications require work to be tested by the Contractor, it shall not be covered over until accepted by the Landscape Architect, Owner's authorized representative, and/or governing agencies. The Irrigation Contractor shall be solely responsible for notifying the Landscape Architect, Owner, and governing agencies, a minimum of 48 hours in advance, where and when the work is ready for testing. Should any work be covered without testing or acceptance, it shall be, if so ordered, uncovered at the Irrigation Contractor's expense.

C. Inspections will be required for the following at a minimum. Landscape Architect may opt to review photographs of pressure test (with image of pressure gauge and time stamps) and sample dripline layout.

1. Pressure test of irrigation main line (Three hours at 150 PSI)
2. Sample layout of dripline irrigation.
3. Coverage test of irrigation sprinkler system.
4. Final inspection prior to start of maintenance period
5. Final acceptance

D. Site observations and testing will not commence without the record drawings a prepared by the Irrigation Contractor. Record drawings must be complete and up to date for each site visit.

E. Work which fails testing and is not accepted will be retested.

1.7 STORAGE AND HANDLING

A. Use all means necessary to protect irrigation system materials before, during, and after installation and to protect the installation work and materials of all other trades. In the event of damage, immediately make all repairs and replacements necessary to the acceptance of the Landscape Architect and Owner.

B. Exercise care in handling, loading, unloading, and storing plastic pipe and fittings under cover until ready to install. Transport plastic pipe only on a vehicle with a bed long enough to allow the pipe to lay flat to avoid undue bending and concentrated external load.

1.8 CLEANUP AND DISPOSAL

A. Dispose of waste, trash, and debris in accordance with applicable laws and ordinances and as prescribed by authorities having jurisdiction. Bury no such waste material and debris on the site. Burning of trash and debris will not be permitted. The Contractor shall remove and dispose of rubbish and debris generated by his work and workmen at frequent intervals or when ordered to do so by the Owner's authorized representative.

B. At the time of completion the entire site will be cleared of tools, equipment, rubbish and debris which shall be disposed of off-site in a legal disposal area.

1.9 TURNOVER ITEMS

A. Record Drawings:

1. Record accurately on one set of contract drawings all changes in the work constituting departures from the original contract drawings.
2. The changes and dimensions shall be recorded in a legible and workmanlike manner to the satisfaction of the Landscape Architect. Prior to final inspection of work, submit record drawings to the Landscape Architect for review and approval.
3. Dimensions from two permanent points of reference such as buildings, sidewalks, curbs, etc. shall be shown. Data on record drawings shall be recorded on a day to day basis as the project is being installed. All lettering on drawings shall be minimum 1/8 inch in size.
4. Show locations of the following items:

    a. Point of connection (including water meters, backflow preventors, master control valves, etc.)
    b. Routing of sprinkler pressure lines (dimensions shown at a maximum of 100 feet along routing and at all changes in direction)
    c. Sleeves (size and location)
    d. Gate valves
    e. Automatic remote control valves
    f. Quick coupling valves
    g. Routing of control wires

h. Irrigation controllers
i. Related equipment (as may be directed)

5. Maintain record drawings on site at all times. Upon completion of work, transfer all as-built information and dimensions to a clean set of bond prints, using red, waterproof ink.

B. Controller Charts:

1. Record drawings must be approved by Landscape Architect before controller charts are prepared.
2. Provide one controller chart for each automatic controller and provide one additional copy of each controller chart to the Owner. Each chart shall show the area covered by the particular controller.
3. The chart is to be a reduced copy of the actual “record” drawing. In the event the controller sequence is not legible, when the drawing is reduced, it shall be enlarged to a readable size. Print shall be black and white, with a different color used to indicate the area of coverage for each station.
4. When completed and approved, the chart shall be hermetically sealed between two pieces of plastic, each piece being a minimum 10 millimeters in thickness, with a matte finish.

C. Operation and Maintenance Manuals:

1. Two individually bound copies of operation and maintenance manuals shall be delivered to the Landscape Architect or Owner’s authorized representative at least 10 calendar days prior to final inspection. The manuals shall describe the material installed and the proper operation of the system.
2. Each complete, bound manual shall include the following information:

a. Index sheet stating Contractor’s address and telephone number, duration of guarantee period, list of equipment including names and addresses of local manufacturer representatives.
b. Operating and maintenance instructions for all equipment.
c. Spare parts list and related manufacturer information for all equipment.
d. Guarantee Statement.

D. Equipment:

1. Supply as a part of this contract the following items:

a. One (1) tool for disassembly and adjustment of each type of sprinkler head used in the irrigation system.
b. Padlock and two (2) keys for backflow enclosure (if used).
c. Two keys for each automatic controller.
d. Two quick coupler keys with a 3/4 inch bronze hose bib, bent nose type with hand wheel and two coupler lid keys.
e. One valve box cover key or wrench.
f. One 5-foot tee wrench for operating butterfly valves (if used).
g. Two (2) extra sprinkler heads of each size and type.

2. The above equipment shall be turned over to Owner’s authorized representative at the final inspection.

1.10 COMPLETION

A. At the time of the pre-maintenance period inspection, the Landscape Architect, Owner's authorized representative, and governing agencies will inspect the work, and if not accepted, will prepare a list of items to be completed by the Contractor. At the time of the post-maintenance period or final inspection, the work will be reinspected and final acceptance will be in writing by the Landscape Architect, Owner's authorized representative, and governing agencies.

B. The Owner's authorized representative shall have final authority on all portions of the work.

C. After the system has been completed, the Contractor shall instruct Owner's authorized representative in the operation and maintenance of the irrigation system and shall furnish a complete set of operating and maintenance instructions.

D. Any settling of trenches which may occur during the one-year period following acceptance shall be repaired. Repairs shall include the complete restoration of all damage to planting, paving or other improvements of any kind as a result of the work.

1.11 GUARANTEE

A. The entire sprinkler system, including all work done under this contract, shall be unconditionally guaranteed against all defects and fault of material and workmanship, including settling of backfilled areas below grade, for a period of one (1) year following the filing of the Notice of Completion.

Should any problem with the irrigation system be discovered within the guarantee period, it shall be corrected by the Contractor at no additional expense to Owner within ten (10) calendar days of receipt of written notice from Owner. When the nature of the repairs, as determined by the Owner, constitutes an emergency (i.e. broken pressure line) the Owner may proceed to make repairs at the Contractor's expense. Any and all damages to existing improvements, resulting either from faulty materials or workmanship, shall be repaired at the Contractor's expense.

B. Guarantee shall be submitted on Contractor's own letterhead as follows:

GUARANTEE FOR SPRINKLER IRRIGATION SYSTEM

We hereby guarantee that the sprinkler irrigation system we have furnished and installed is free from defects in materials and workmanship, and the work has been completed in accordance with the drawings and specifications, ordinary wear and tear and unusual abuse, or neglect excepted. We agree to repair or replace any defective material during the period of one year from date of filing of the Notice of Completion and also to repair or replace any damage resulting from the repairing or replacing of such defects at no additional cost to the Owner. We shall make such repairs or replacements within 10 calendar days following written notification by the Owner. In the event of failure to make such repairs or replacements within the time specified after

receipt of written notice from Owner, we authorize the Owner to proceed to have said repairs or replacements made at our expense and we will pay the costs and charges therefore upon demand.

PROJECT NAME:

PROJECT LOCATION:
CONTRACTOR NAME:

ADDRESS:

TELEPHONE:

SIGNED:

DATE:

PART 2 - PRODUCTS

2.1 SUMMARY

Use only new materials of the manufacturer, size and type shown on the drawings and specifications. Materials or equipment installed or furnished that do not meet Landscape Architect's, Owner's, or governing agencies standards will be rejected and shall be removed from the site at no expense to the Owner.

2.2 PIPING

A. Pressure supply line from point of connection through basket strainer unit shall be Type "K" copper or brass pipe.

B. Pressure supply lines 3 inches in diameter and larger shall be Class 200 PVC with bell-and-gasket joints. Piping shall conform to ASTM D2241.

C. Pressure supply lines 2 inches to 2-1/2 inches in diameter shall be Class 315 solvent weld PVC. Piping shall conform to ASTM D1784.

D. Pressure supply lines 1-1/2 inches and smaller in diameter shall be Schedule 40 solvent weld PVC. Piping shall conform to ASTM D1784.

E. Non-pressure lines 3/4 inches in diameter and larger downstream of the remote control valve shall be Schedule 40 PVC or as stated on Irrigation Materials Legend on plans. Non-pressure lines 1 inch and larger to conform to ASTM D1784.

2.3 METAL PIPE AND FITTINGS

A. Brass pipe shall be 85 percent red brass, ANSI, IPS Standard 125 pounds, Schedule 40 screwed pipe.

B. Fittings shall be medium brass, screwed 125-pound class.

C. Copper pipe and fittings shall be Type “K” sweat soldered.

2.4 PLASTIC PIPE AND FITTINGS

A. Pipe shall be marked continuously with manufacturer’s name, nominal pipe size, schedule or class, PVC type and grade, National Sanitation Foundation approval, Commercial Standards designation, and date of extrusion.

B. All plastic pipe shall be extruded of an improved PVC virgin pipe compound in accordance with ASATM D2241 or ASTM D1784.

C. All PVC fittings shall be standard weight Schedule 80 for constant-pressure mainline fittings and screwed fittings, and Schedule 40 for non-pressure lateral fittings and shall be injection molded of an improved virgin PVC fitting compound. Slip PVC fittings shall be the “deep socket” bracketed type. Threaded plastic fittings shall be injection molded. All tees and ells shall be side gated. All fittings shall conform to ASTM D2466 and D2467.

D. All threaded nipples shall be standard weight Schedule 80 with molded threads and shall conform to ASTM D1785.

E. All solvent cementing of plastic pipe and fittings shall be a two-step process, using primer and solvent cement applied per the manufacturer’s recommendations. Cement shall be of a fluid consistency, not gel-like or ropy. Solvent cementing shall be in conformance with ASTM D2564 and ASTM D2855.

F. When connection is plastic to metal, female adapters shall be hand tightened, plus one turn with a strap wrench. Joint compound shall be non-lead base Teflon paste, tape, or equal.

G. Expanding foam sealant for sleeving and conduit shall be a 2-part, 98% closed sell urethane foam, capable of sealing ¾” to 6” diameter conduits with multiple pipe and cable configurations. Sealant shall have good adhesion to PVC pipe and cable jacket surfaces with 120 lb. compressive strength (ASTM D1621) and shall be capable of holding 9.5 PSI water pressure continuous and 5 PSI gas or vapor continuous.

2.5 VALVES

A. Gate Valves:

1. Gate valves shall be of the manufacturer, size, and type indicated on the drawings.
2. Gate valves shall have threaded ASTM B-62 bronze body, bonnet and wedge, silicon bronze stem, and malleable iron handwheel.
3. All Gate valves shall have a minimum working pressure of not less than 150 psi and shall conform to AWWA standards.

B. Quick Coupler Valves:

1. Quick coupler valves shall be of the manufacturer, size, and type indicated on the drawings.
2. Quick coupler valves shall be brass with a wall thickness guaranteed to withstand normal working pressure of 150 psi without leakage. Valves shall have ¾ female threads opening at base, with two-piece body. Valves to be operated only with a coupler key, designed for that purpose. Coupler key is inserted into valve and a positive, watertight connection shall be made between the coupler key and valve. Hinge cover shall be the locking type constructed of brass with a rubber-like vinyl cover.

C. Automatic Control Valves:

1. Automatic control valves shall be of the manufacturer, size, and type indicated on the drawings.
2. Automatic control valves shall be electrically operated.
3. Automatic control valves shall include manual flow adjustment.

D. Anti-drain Valves:

1. Anti-drain valves shall be of the manufacturer, size and type indicated on the drawings.
2. Anti-drain valves shall have 18-8 stainless steel springs and valve stems with Buna-N seals.
3. Anti-drain valves will have threaded connections the size of the riser or pipe they are to be installed onto, or the next available size. No slip connection anti-drain valves are allowed.

2.6 VALVE BOXES

A. Valve boxes shall be fabricated from a durable, weather-resistant plastic material resistant to sunlight and chemical action of soils.

B. The valve box cover shall be green in color and secured with a hidden latch mechanism or bolts.

C. The cover and box shall be capable of sustaining a load of 1,500 pounds.

D. Valve box extensions shall be by the same manufacturer as the valve box.

E. Automatic control valve boxes shall be 16 inch x11 inch x12 inch rectangular size. Valve box covers shall be marked “RCV” with the valve identification number “heat branded” onto the cover in 2-inch high letters/numbers.

F. Ball valve and quick coupler valve boxes shall be 10-inch diameter circular size. Valve box covers shall be marked with either “BV” or “QCV” with the valve identification “heat branded” onto the cover in 2-inch high letters.

2.7 AUTOMATIC CONTROLLER

A. Automatic controller shall be of the manufacturer, size, and type indicated on the drawings.
B. Automatic controller enclosures shall be of the manufacturer, size, and type indicated on the drawings. Enclosure shall be vandal-resistant, ventilated and waterproof.

2.8 ELECTRICAL

A. All electrical equipment shall be NEMA Type 3, waterproofed for exterior installations.

B. All electrical work shall conform to local codes and ordinances.

2.9 LOW VOLTAGE CONTROL WIRING

A. Remote control wire shall be direct-burial AWG-UF type, size in no case smaller than 14 gauge.

B. Connections shall be either epoxy-sealed packet type or Penn-Tite connectors.

C. Ground wires shall be white in color. Control wires shall be red (where two or more controllers are used, the control wires shall be a different color for each controller. These colors shall be noted on the “Record Drawings” plans located on controller door).

2.10 IRRIGATION HEADS

A. Sprinkler heads shall be of the manufacturer, size, type, with radius of throw, operating pressure and discharge rate indicated on the drawings.

B. Pop-up heads and riser heads shall be used.

2.11 DRIP IRRIGATION COMPONENTS

A. Dripline tubing shall be of the manufacturer, model number and distribution (emitter flow and spacing) indicated on the drawings.

B. Drip emitters, bubblers and micro-sprays shall be of the manufacturer and model number indicated on the drawings.

C. Distribution tubing, connectors and insert or compression fittings shall be of the manufacturer and type indicated on the drawings.

2.12 RAIN SENSOR

Rain sensor shall be of the manufacturer, size and type indicated on the drawings.

PART 3 - EXECUTION

3.1 SITE CONDITIONS

A. Inspections:

1. Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
2. Verify that irrigation system may be installed in accordance with all pertinent codes and regulations, the original design, the referenced standards, and the manufacturer's recommendations.

B. Discrepancies:

1. In the event of discrepancy, immediately notify the Landscape Architect or Owner's authorized representative.
2. Do not proceed with installation in areas of discrepancy until all discrepancies have been resolved.

C. Grades:

1. Before starting work, carefully check all grades to determine that work may safely proceed, keeping within the specified material depths with respect to finish grade.
2. Final grades shall be accepted by the Engineer before work on this section will be allowed to begin.

D. Field Measurements:

1. Make all necessary measurements in the field to ensure precise fit of items in accordance with the original design. Contractor shall coordinate the installation of all irrigation materials with all other work.
2. All scaled dimensions are approximate. The Contractor shall check and verify all size dimensions prior to proceeding with work under this section.

3. Exercise extreme care in excavating and working near existing utilities. Contractor shall be responsible for damages to utilities which are caused by his operations or neglect.

E. Diagrammatic Intent:

The drawings are essentially diagrammatic. The size and location of equipment and fixtures are drawn to scale where possible. Provide offsets in piping and changes in equipment locations as necessary to conform to structures and to avoid obstructions or conflicts with other work.

F. Layout:

1. Prior to installation, the Contractor shall stake out all pressure supply lines, routing and location of sprinkler heads, valves, backflow preventor, and automatic controller.
2. Layout irrigation system and make minor adjustments required due to differences between site and drawings. Where piping is shown on drawings under paved areas, but running parallel and adjacent to planted areas, install the piping in the planted areas.

G. Water Supply

Connections to, or the installation of, the water supply shall be at the locations shown on the drawings. Minor changes caused by actual site conditions shall be made.

H. Electrical Service:

1. Connections to the electrical supply shall be at the locations shown on the drawings. Minor changes caused by actual site conditions shall be made.
2. Contractor shall make 120 volt connection to the irrigation controllers. Electrical power source to controller locations shall be provided by others.

3.2 TRENCHING

A. Excavations shall be straight with vertical sides, even grade, and support pipe continuously on bottom of trench. Trenching excavation shall follow layout indicated on drawings to the depths below finished grade and as noted. Where lines occur under paved area, these dimensions shall be considered below subgrade.

B. Provide minimum cover of 24 inches on pressure supply lines 4 inches and larger. Provide minimum cover of 18 inches on pressure supply lines 3 inches and smaller.

C. Provide minimum cover of 18 inches for control wires.

D. Provide minimum cover of 12 inches for non-pressure lines.

E. Pipes installed in a common trench shall have a 6-inch minimum space between pipes.

3.3 BACKFILLING

A. Backfill material on all lines shall be the same as adjacent soil free of debris, litter, and rocks over 1/2 -inch in diameter.

B. Sand backfill material shall be washed, clean, non-plastic, free from deleterious or foreign matter, symmetrical shaped, natural or manufactured from crushed rock, conforming to the grading requirements of ASTM C 144, with 100% passing a 4.75mm sieve and a maximum silt content of 4%

C. Backfill shall be tamped in 4-inch layers under the pipe and uniformly on both sides for the full width of the trench and the full length of the pipe. Backfill materials shall be sufficiently damp to permit thorough compaction, free of voids. Backfill shall be compacted to dry density equal to adjacent undisturbed soil and shall conform to adjacent grades.

D. Flooding in lieu of tamping is not allowed.

E. Under no circumstances shall truck wheels be used to compact backfill.

F. Provide sand backfill a minimum of 6 inches over and under all piping under paved areas.

3.4 PIPING

A. Piping under existing pavement may be installed by jacking, boring, or hydraulic driving. No hydraulic driving is permitted under asphalt pavement.

B. Cutting or breaking of existing pavement is not permitted, unless specifically indicated on the drawings.

C. Carefully inspect all pipe and fittings before installation, removing dirt, scale, burrs and reaming. Install pipe with all markings up for visual inspection and verification.

D. Remove all dented and damaged pipe sections.

E. All lines shall have a minimum clearance of 6 inches from each other and 12 inches from lines of other trades.

F. Parallel lines shall not be installed directly over each other.

G. In solvent welding, use only the specified primer and solvent cement and make all joints in accordance with the manufacturer’s recommended methods including wiping all excess solvent from each weld. Allow solvent welds at least 15 minutes setup time before moving or handling and 24 hours curing time before filling.

H. PVC pipe shall be installed in a manner which will provide for expansion and contraction as recommended by the pipe manufacturer.

I. Centerload all plastic pipe prior to pressure testing.

J. All threaded plastic-to-plastic connections shall be assembled using Teflon tape.

K. For plastic-to-metal connections, work the metal connections first. Use a non-hardening pipe dope on all threaded plastic-to-metal. All plastic-to-metal connections shall be made with plastic female adapters.

L. All solvent weld mainline piping is to be secured with minimum one cubic foot thrust blocks at all directional changes. Bell and gasket pipe to have a Leemco joint restraint system installed on all fittings in lieu of thrust blocks.

3.5 CONTROLLER

A. The exact location of the controller shall be approved by the Landscape Architect or Owner's authorized representative before installation. The electrical service shall be coordinated with this location.

B. The Irrigation Contractor shall be responsible for the final electrical hook up to the irrigation controller.

C. The irrigation system shall be programmed to operate during the periods of minimal use of the design area or in accordance with the irrigation schedule provided.

3.6 CONTROL WIRING

A. Low voltage control wiring shall occupy the same trench and shall be installed along the same route as the pressure supply lines whenever possible.

B. Where more than one wire is placed in a trench, the wiring shall be taped together in a bundle at intervals of 10 feet. Bundle shall be secured to the mainline with tape at intervals of 20 feet.

C. All connections shall be of an approved type and shall occur in a valve box. Provide an 18-inch service loop at each connection.

D. An expansion loop of 12 inches shall be provided at each wire connection and/or directional change, and one of 24 inches shall be provided at each remote control valve.

E. A continuous run of wire shall be used between a controller and each remote control valve. Under no circumstances shall splices be used without prior approval.

F. Pull boxes for low voltage control wires shall be provided at a spacing of 480 feet on center along the wire route. An expansion loop of 24 inches shall be provided at each control wire pull box.

3.7 VALVES

A. Automatic control valves, manual valves, gate valves, and ball valves are to be installed in the approximate locations indicated on the drawings.

B. Valve shall be installed in shrub areas whenever possible.

C. Install all valves as indicated on the drawings.

D. Valves to be installed in valve boxes shall be installed one valve per box.

3.8 VALVE BOXES

A. Valve boxes shall be installed in shrub areas whenever possible.

B. Each valve box shall be installed on a foundation of 3/4 inch gravel backfill, 3 cubic feet minimum. Valve boxes shall be installed with their tops 1/2 inch above the surface of surrounding finish grade in lawn areas and 2 inches above finish grade in ground cover areas.

3.9 SPRINKLER HEADS

A. Sprinkler heads shall be installed as indicated on the drawings.

B. Spacing of heads shall not exceed maximum indicated on the drawings.

C. Riser nipples shall be of the same size as the riser opening in the sprinkler body.

D. Pop-up sprinkler heads shall not be installed using side outlet openings.

3.10 DRIP IRRIGATION

A. Provide sample layout for one complete drip valve control zone, including all components, dripline and/or emitter spacing for review and approval by Landscape Architect.

B. Thoroughly flush all driplines and distribution tubing prior to installing drip emitters, air relief valves, flush valves and similar components.

C. All drip irrigation shall be installed prior to installation of plant material.

3.11 MISCELLANEOUS EQUIPMENT

A. Install all assemblies specified herein according to the respective detail drawings or specifications, using best standard practices.

B. Quick coupler valves shall be set approximately 12 inches from walks, curbs, header boards, or paved areas where applicable.

C. Unless designed as an integral part of the irrigation head, anti-drain valves will be installed under every head. The anti-drain valve will be the same diameter as the riser and be integral to the riser assembly.

D. Install rain sensors as indicated on the drawings and as recommended by the manufacturer.

3.12 FLUSHING THE SYSTEM

A. Prior to installation of sprinkler nozzles, the valves shall be opened and a full head of water used to flush out the lines and risers.

B. Sprinkler nozzles shall be installed after flushing the system has been completed.

3.13 ADJUSTING THE SYSTEM

A. Contractor shall adjust valves, align heads, and check coverage of each system prior to coverage test.

B. If it is determined by the Landscape Architect or Owner's authorized representative that additional adjustments or nozzle changes will be required to provide proper coverage, all necessary changes or adjustments shall be made prior to any planting.

C. Automatic control valves are to be adjusted so that the sprinkler heads operate at the pressure recommended by the manufacturer.

3.14 TESTING AND OBSERVATION

A. Do not allow or cause any of the work of this section to be covered up or enclosed until it has been observed, tested and accepted by the Landscape Architect, Owner, and/or governing agencies.

B. The Contractor shall be solely responsible for notifying the Landscape Architect, Owner, and governing agencies, a minimum of 48 hours in advance, where and when the work is ready for testing.

C. When the sprinkler system is completed, the Contractor shall perform a coverage test of each system in its entirety to determine if the water coverage for the planted areas is complete and adequate in the presence of the Landscape Architect.

D. The Contractor shall furnish all materials and perform all work required to correct any inadequacies of coverage due to deviations from the plans, or where the system has been willfully installed when it is obviously inadequate, without bringing this to the attention of the Landscape Architect.

E. Final inspection will not commence without completed record drawings as prepared by the Irrigation Contractor.

3.15 MAINTENANCE

A. Maintenance period does not start until all elements of construction, planting, and irrigation for the complete project are in accordance with the contract documents for this project.

B. Request an inspection to begin maintenance period after all landscape elements have been completed in accordance with the contract documents. Maintenance period commences after date of Substantial Completion as determined by the Landscape Architect and confirmed in written notification by the Owner and continues for a minimum period of 90 days.

C. During the maintenance period the Contractor shall adjust and maintain the irrigation system in a fully operational condition providing complete irrigation coverage to all intended plantings.

3.16 COMPLETION CLEANING

Clean-up shall be made as each portion of the work progresses. Refuse and excess dirt shall be removed from the site, all walks and paving shall be broomed, and any damage sustained on the work of others shall be repaired to original conditions.

END OF SECTION

SECTION 329113 - SOIL PREPARATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes planting soils specified by composition of the mixes.

B. Related Requirements:

1. Section 311000 Site Clearing for topsoil stripping and stockpiling.

1.2 DEFINITIONS

A. Duff Layer: A surface layer of soil, typical of forested areas, that is composed of mostly decayed leaves, twigs, and detritus.

B. Imported Soil: Soil that is transported to Project site for use.

C. Manufactured Soil: Soil produced by blending soils, sand, stabilized organic soil amendments, and other materials to produce planting soil.

D. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified as specified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

E. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

F. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.

G. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil"; but in disturbed areas such as urban environments, the surface soil can be subsoil.

H. USCC: U.S. Composting Council.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. LEED Submittals:

1. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.

C. Samples: For each bulk-supplied material in sealed containers labeled with content, source, and date obtained; providing an accurate representation of composition, color, and texture.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent, state-operated, or university-operated laboratory; experienced in soil science, soil testing, and plant nutrition; with the experience and capability to conduct the testing indicated; and that specializes in types of tests to be performed.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Regional Materials: Imported soil, manufactured planting soil, and soil amendments and fertilizers shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

2.2 PLANTING SOILS SPECIFIED BY COMPOSITION

A. Planting Soil Type: Existing, on-site surface soil, with the duff layer, if any, retained; modified to produce viable planting soil. Blend existing, on-site surface soil with the following soil amendments and fertilizers in the following quantities to produce planting soil.

B. Planting-Soil Type: Imported, naturally formed soil from off-site sources and consisting of sandy loam soil according to USDA textures; and modified to produce viable planting soil.
   1. Sources: Take imported, unamended soil from sources that are naturally well-drained sites where topsoil occurs at least 4 inches deep, not from agricultural land, bogs, or marshes; and that do not contain undesirable organisms; disease-causing plant pathogens; or obnoxious weeds and invasive plants including, but not limited to, quackgrass, Bermuda grass, poison oak, nutsedge, Canada thistle, bindweed, bentgrass, ground ivy, perennial sorrel, and bromegrass.
   2. Additional Properties of Imported Soil before Amending: Soil reaction of pH 6 to 7 and minimum of 4 percent organic-matter content, friable, and with sufficient structure to give good tilth and aeration.
   3. Unacceptable Properties: Clean soil of the following:
      a. Unacceptable Materials: Concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.
      b. Unsuitable Materials: Stones, roots, plants, sod, clay lumps, and pockets of coarse sand that exceed a combined maximum of 8 percent by dry weight of the imported soil.
      c. Large Materials: Stones, clods, roots, clay lumps, and pockets of coarse sand exceeding 2 inches in any dimension.
   4. Amended Soil Composition: Blend imported, unamended soil with the soil amendments and fertilizers in the quantities as recommended in the soils report to produce planting soil.

C. Planting-Soil Type: Manufactured soil consisting of manufacturer's basic topsoil blended in a manufacturing facility with sand, stabilized organic soil amendments, and other materials to produce viable planting soil.
   1. Additional Properties of Manufacturer's Basic Soil before Amending: Soil reaction of pH 6 to 7 and minimum of 4 percent organic-matter content, friable, and with sufficient structure to give good tilth and aeration.
   2. Unacceptable Properties: Manufactured soil shall not contain the following:
      a. Unacceptable Materials: Concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.
      b. Unsuitable Materials: Stones, roots, plants, sod, clay lumps, and pockets of coarse sand that exceed a combined maximum of 5 percent by dry weight of the manufactured soil.
      c. Large Materials: Stones, clods, roots, clay lumps, and pockets of coarse sand exceeding 2 inches in any dimension.
   3. Blend manufacturer's basic soil with soil amendments and fertilizers in the quantities as recommended by the soils report to produce planting soil.

2.3 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:

1. Class: T, with a minimum of 99 percent passing through a No. 8 sieve and a minimum of 75 percent passing through a No. 60 sieve.
2. Class: O, with a minimum of 95 percent passing through a No. 8 sieve and a minimum of 55 percent passing through a No. 60 sieve.
3. Form: Provide lime in form of ground mollusk shells.

B. Sulfur: Granular, biodegradable, and containing a minimum of 99 percent elemental sulfur, with a minimum of 99 percent passing through a No. 6 sieve and a maximum of 10 percent passing through a No. 40 sieve.

C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.

D. Perlite: Horticultural perlite, soil amendment grade.

E. Agricultural Gypsum: Minimum 98 percent calcium sulfate, finely ground with 90 percent passing through a No. 50 sieve.

F. Sand: Clean, washed, natural or manufactured, free of toxic materials, and according to ASTM C 33/C 33M.

2.4 ORGANIC SOIL AMENDMENTS

A. Compost: Well-composted, stable, and weed-free organic matter produced by composting feedstock, and bearing USCC's "Seal of Testing Assurance," and as follows:

1. Feedstock: Limited to leaves.
2. Reaction: pH of 6.0 to 7.5.
3. Salinity: Ensure that saturation extract conductivity does not exceed 3.5 millimohs per centimeter at 25 degrees c. as determined by saturation extract method.
4. Moisture Content: 35 to 55 percent by weight.
5. Organic-Matter Content: 30 to 40 percent of dry weight.
6. Particle Size: 95 to 100 percent passing through a 6.33 mm standard sieve; 80 to 100 percent passing through a 2.33 mm sieve.
7. Iron Content: Minimum 0.08 percent dilute acid soluble Fe on dry weight basis.
8. Ash: 0 to 6 percent dry weight.

B. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or of granular texture with 100 percent passing through a 1/2-inch sieve, a pH of 3.4 to 4.8, and a soluble-salt content measured by electrical conductivity of dS/m.

C. Wood Derivatives: Shredded and composted, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture and free of chips, stones, sticks, soil, or toxic materials.

D. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, debris, and material harmful to plant growth.

2.5 FERTILIZER

A. Planting Fertilizer: Pelleted or granular form consisting of the following percents by weight and mixed by commercial fertilizer supplier: 6-nitrogen, 20-phosphoric acid, 20-potash.

B. Planting Tablets: Provide slow-release type with potential acidity of not more than 5 percent by weight containing the following percents by weight of nutrients listed: 20-nitrogen, 10-phosphoric acid, 5-potash, 2.6 combined calcium, 1.60 combined sulphur, 0.35-iron elemental from ferrous sulfate. Provide in 21 gram tablets manufactured by Agriform or other approved.

C. Hydroseeding Fertilizer: Provide ammonium phosphate which consists of the following percent by weight and mixed by a commercial fertilizer supplier: 16-nitrogen, 20-phosphoric acid, 0-potash.

D. Sulfate of potash: 0-0-50.

E. Single super-phosphate: Commercial product containing 18 to 20 percent available Phosphoric Pentoxide, or other approved.

F. Urea formaldehyde: 38-0-0.

PART 3 - EXECUTION

3.1 GENERAL

A. Place planting soil and fertilizers according to requirements of the Agronomic Soils Report recommendations.

B. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in planting soil.

3.2 BLENDING PLANTING SOIL IN PLACE

A. General: Mix amendments with in-place, unamended soil to produce required planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.

B. Preparation: Till unamended, existing soil in planting areas to a minimum depth of 12 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

C. Mixing: Apply soil amendments and fertilizer, if required, evenly on surface, and thoroughly blend them into full depth of unamended, in-place soil to produce planting soil.
   1. Mix sulfur with dry soil before mixing fertilizer.
   2. Mix fertilizer with planting soil no more than seven days before planting.

D. Compaction: Compact blended planting soil to 75 to 82 percent of maximum Standard Proctor density according to ASTM D 698.

E. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.3 PROTECTION AND CLEANING

A. Protection Zone: Identify protection zones according to Section 015639 "Temporary Tree and Plant Protection."

B. Protect areas of in-place soil from additional compaction, disturbance, and contamination. Prohibit the following practices within these areas except as required to perform planting operations:

   1. Storage of construction materials, debris, or excavated material.
   2. Parking vehicles or equipment.
   3. Vehicle traffic.
   4. Foot traffic.
   5. Erection of sheds or structures.
   6. Impoundment of water.
   7. Excavation or other digging unless otherwise indicated.

C. Remove surplus soil and waste material including excess subsoil, unsuitable materials, trash, and debris and legally dispose of them off Owner's property unless otherwise indicated.

   1. Dispose of excess subsoil and unsuitable materials on-site where directed by Owner.

END OF SECTION

SECTION 329200 - TURF AND GRASSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Seeding.
2. Sodding.
3. Turf renovation.
4. Erosion-control material(s).
5. Grass paving.

B. Related Requirements:

1. Section 328400 – Planting Irrigation
2. Section 329300 - Plants

1.2 DEFINITIONS

A. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.

B. Finish Grade: Elevation of finished surface of planting soil.

C. Manufactured Topsoil: Soil produced off-site by homogenously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

D. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

E. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

F. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

G. Subgrade: Surface or elevation of subsoil remaining after excavation is complete or top surface of a fill or backfill before planting soil is placed.

H. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

I. Surface Soil: Whatever soil is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil, but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.3 ACTION SUBMITTALS

A. Product Data: Prior to installation submit for review and approval specifications and product information on items being used on project. Submit bound with list of items as cover sheet. Conform to Section 013300 Submittal Procedures.

1.4 INFORMATIONAL SUBMITTALS

A. Certification of grass seed.

1. Certification of each seed mixture for turfgrass sod.

B. Product certificates.

C. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of turf and hydroseeded areas during a calendar year. Submit before expiration of required initial maintenance period.

1.5 OBSERVATION SCHEDULE

A. Notify Owner in advance for the following inspections, according to the time specified:

1. Pre-Job Conference – 7 days
2. Final grade review – 48 hours
3. Plant material review – 48 hours
4. Plant layout review – 48 hours
5. Soil preparation and planting operations review – 48 hours
6. Pre-maintenance – 7 days
7. Final inspection – 7 days

B. No site visits shall commence without all items noted in previous observation reports either completed or remedied unless such compliance has been waived by the Architect.

1.6 QUALITY ASSURANCE

A. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory.

1. The soil testing laboratory shall oversee soil sampling.
2. Report suitability of tested soil for turf growth.
    a. State recommendations for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil for suitable healthy, viable plants.
    b. Report presence of problem salts, minerals, or heavy metals; if present, provide additional recommendations for corrective action.

B. Source Quality:

1. At least days prior to seeding and/or sodding submit documentation that all plant materials are available. Sod is subject to inspection after confirmation of ordering.
2. Materials are subject to inspection at place of growth and upon delivery for conformity to specifications. Inspection, approval and rejection can also take place at other times during progress of work.
3. Request, in writing, inspection of plant materials at place of growth.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and Federal laws, as applicable.

B. Sod: Harvest, deliver, store, and handle sod according to requirements in “Specifications for Turfgrass Sod Materials” and “Specifications for Turfgrass Sod Transplanting and Installation” sections in TPI’s “Guideline Specifications to Turfgrass Sodding.” Deliver sod in time for planting within 24 hours of harvesting. Protect sod from breakage and drying.

1.8 MAINTENANCE SERVICE

A. Initial Turf Maintenance Service: Provide full maintenance by skilled employees of landscape installer. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until acceptable turf is established but for not less than the following periods:

1. Seeded Turf: 90 days from date of Substantial Completion.
2. Sodded Turf: 90 days from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SEED

A. Grass Seed: Label seed and provide in sealed containers with signed copies from vendor certifying that each container is fully labeled in compliance with State Agricultural Code and is in compliance with minimum requirements of these specifications. Provide fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology: Rules for Testing Seeds" for purity and germination tolerances. Wet, moldy or damaged seed will not be permitted. Provide seed mix per plan.

2.2 TURFGRASS SOD

A. Turfgrass Sod: Certified, including limitations on thatch, weeds, diseases, nematodes, and insects, complying with "Specifications for Turfgrass Sod Materials" in TPI's "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture that is strongly rooted and capable of vigorous growth and development when planted.

B. Turfgrass Species: Sod of grass species per plan.

2.3 INORGANIC SOIL AMENDMENTS

A. The following soil amendments are to be used for bid purposes only. Specific amendments and fertilizer will be selected and specified after rough grading operations are complete and Contractor has had soil samples tested.

B. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, and with a minimum of 99 percent passing through No. 6 (3.35-mm) sieve and a maximum of 10 percent passing through No. 40 (0.425-mm) sieve.

C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.

D. Agricultural Gypsum: Minimum 98 percent calcium sulfate, finely ground with 90 percent passing through No. 50 (0.30-mm) sieve.

E. Sand: Clean, washed, natural or manufactured, and free of toxic materials.

F. Calcium Carbonate: 95 percent lime as derived from oyster shells.

2.4 ORGANIC SOIL AMENDMENTS

A. The following soil amendments are to be used for bid purposes only. Specific amendments and fertilizer will be selected and specified after rough grading operations are complete and Contractor has had soil samples tested.

B. Nitrogen Stabilized: 0.56 to 0.84 percent N based on dry weight for wood residual or rice hulls.

C. Particle Size: 95 to 100 percent passing 6.35 mm standard sieve; 80 to 100 percent passing 2.33 mm standard sieve.

D. Salinity: Ensure that saturation extract conductivity does not exceed 3.5 millimohs per centimeter at 25 degrees C. as determined by saturation extract method.

E. Iron Content: Minimum 0.08 percent dilute acid soluble Fe on dry weight basis.

F. Ash: 0 to 6 percent dry weight.

2.5 FERTILIZERS

A. Planting Fertilizer: Granular or pelleted fertilizer consisting of the following percents by weight and mixed by commercial fertilizer supplier.

1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potash by weight.

B. Sulfate of potash: 0-0-50.

C. Single super-phosphate: Commercial product containing 18 to 20 percent available Phosphoric Pentoxide, or other approved.

D. Urea formaldehyde: 38-0-0.

2.6 PLANTING SOILS

A. Planting Soil: Ensure silt plus clay content of top soil does not exceed 20 percent by weight, with a minimum 95 percent passing the 2.0 mm sieve. Do not allow the sodium absorption rate SAR to exceed 6. The electrical conductivity (ECE) of the saturation extract cannot exceed 3.0 millimohs per centimeter at 25 degrees C. Ensure boron content is less than 1 part per million as measured on the saturation extract. To ensure compliance with these requirements, submit samples of soil for analysis prior to and following backfilling.

2.7 PESTICIDES

A. General: Pesticide, registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific

problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

2.8 WATER

A. Provide clean, potable water.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Obtain certification that final grades to 1/10 foot have been established prior to commencing landscaping operations. Provide for inclusion of all amendments, settling, etc. Be responsible for shaping all planting areas as indicted on drawings or as required.

3.2 TURF AREA PREPARATION

A. The following amendments are to be used for bid purposes only. Specific amendments and fertilizer will be selected and specified after rough grading operations are complete and Contractor has had soil samples tested.

B. After proper finished grades have been verified or established, cross-rip all planting areas to a depth of 12", condition and fertilize soil in accordance with recommendations of soil testing laboratory and as approved by Owner. The following is for bid purposes only. Uniformly spread and cultivate amendments thoroughly by means of mechanical tiller into top 6 inches of soil. Application rates per 1,000 square feet:

Nitrogen stabilized organic amendment 4 cubic yards

16-16-16 Commercial Fertilizers 15 lbs.

Agricultural Gypsum 100 lbs.

Soil sulphur 20 lbs.

C. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus ½ inch (13 mm) of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.

D. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

E. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.3 SEEDING

A. Do not broadcast or drop seed when wind velocity exceeds 5 mph (8 km/h). Evenly distribute seed by sowing equal quantities in two directions at right angles to each other. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.

B. Sow seed at total rate of 5 to 8 lb/1000 sq. ft. (2.3 to 3.6 kg/92.9 sq. m).

C. Rake seed lightly into top 1/8 inch (3 mm) of soil, roll lightly, and water with fine spray.

D. Protect seeded areas from hot, dry weather or drying winds by applying planting soil within 24 hours after completing seeding operations. Soak areas, scatter mulch uniformly to a thickness of 3/16 inch (4.8 mm) and roll surface smooth.

3.4 SODDING

A. Lay sod within 24 hours of harvesting. Do not lay sod if dormant or if ground is frozen or muddy.

B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to subgrade or sod during installation. Tamp and roll lightly to ensure contact with subgrade, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.

1. Lay sod across slopes exceeding 1:3.
2. Anchor sod on slopes exceeding 1:6 with steel staples spaced as recommended by sod manufacturer but not less than 2 anchors per sod strip to prevent slippage.

C. Saturate sod with fine water spray within two hours of planting. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches (38 mm) below sod.

3.5 TURF MAINTENANCE

A. Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.

B. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain height appropriate for species without cutting more than 1/3 of grass height. Remove no more than 1/3 of grass-leaf growth in initial or subsequent mowing.

C. Apply pesticides and other chemical products and biological control agents in accordance with authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

3.6 SATISFACTORY TURF

A. Turf installations shall meet the following criteria as determined by Architect:

1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. (0.92 sq. m) and bare spots not exceeding 5 by 5 inches (125 by 125 mm).
2. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.

B. Use specified materials to reestablish turf that does not comply with requirements, and continue maintenance until turf is satisfactory.

END OF SECTION

SECTION 329300 - PLANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Soil Preparation.
   2. Planting.
   3. Staking.
   4. Hydroseeding.
   5. Clean up.

B. Related Sections:
   1. Section 328400 – Planting Irrigation
   2. Section 329113 – Soil Preparation
   3. Section 329200 – Turf and Grasses

1.2 DEFINITIONS

A. Backfill: The earth used to replace or the act of replacing earth in an excavation.

B. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.

C. Finish Grade: Elevation of finished surface of planting soil.

D. Manufactured Topsoil: Soil produced off-site by homogenously blending mineral soils or san with stabilized organic soil amendments to produce topsoil or planting soil.

E. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoiliant, or desiccant.

F. Pests: Living organisms that occur where they are not desired, or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria and viruses.

G. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

H. Root Flare: Also called “trunk flare.” The area at the base of the plant’s stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.

I. Subgrade: Surface or elevation of subsoil remaining after excavation is complete or the top surface of a fill or backfill before planting soil is placed.

J. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

K. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.3 ACTION SUBMITTALS

A. Product Data: Prior to installation submit for review and approval specifications and product information on items being used on project. Submit bound with list of items as cover sheet. Conform to Section 01300. For each type of product indicated, including soils.
   1. Plant Materials: Include quantities, sizes, quality, and sources for plant materials.
   2. Pesticide and Herbicides: Include product label and manufacturer’s application instructions specific to the Project.
   3. Plant Photographs: Include color photographs in digital format of each required species and size of plant material as it will be furnished to the Project. Take photographs from an angle depicting true size and condition of the typical plant to be furnished. Include a scale rod or other measuring device in each photograph. For species where more than 20 plants are required, include a minimum of three photographs showing the average plant, the best quality plant, and the worst quality plant to be furnished. Identify each photograph with the full scientific name of the plant, plant size, and name of the growing nursery.

B. Samples of mineral and / or organic mulch.

1.4 INFORMATIONAL SUBMITTALS

A. Product certificates.

B. Material test reports.

C. Maintenance instructions: Recommended procedures to be established by Owner for maintenance of plants during a calendar year.

1.5 OBSERVATION SCHEDULE

A. Notify Architect in advance for the following inspections, according to the time specified:

1. Pre-Job conference – 7 days
2. Final grade review – 48 hours
3. Plant material review – 48 hours
4. Plant layout review – 48 hours
5. Soil preparation and planting operations review – 48 hours
6. Pre-maintenance – 7 days
7. Final inspection – 7 days

B. No site visits shall commence without all items noted in previous observation reports either completed or remedied unless such compliance has been waived by the Architect.

1.6 QUALITY ASSURANCE

A. Soils Analysis: For each un-amended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory.
   1. The soil-testing laboratory shall oversee soil sampling.
   2. Report suitability of tested soil for plant growth.
      a. State recommendations for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
      b. Report presence of problem salts, minerals, or heavy metals; if present, provide additional recommendations for corrective action.

B. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.

C. Source Quality:
   1. At least 60 days prior to planting submit documentation that all plant materials are available. Materials are subject to inspection after confirmation of ordering.
   2. Materials are subject to inspection at place of growth and upon delivery for conformity to specifications. Inspection, approval and rejection can also take place at other times during progress of work.
   3. Request, in writing, inspection of plant materials at place of growth. Identify place of growth and quantity of plants to be inspected.
   4. As described in the planting notes for tree tagging, the Architect may opt to either visit the tree nursery or review photographs submitted by the Contractor. In either case, visit the nursery and select trees conforming to specifications prior to review by the Architect.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and typing damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.

B. Handle planting stock by root ball.

C. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.

D. Deliver fertilizer to site in original unopened containers bearing manufacturer's guaranteed chemical analysis, name, trade mark, and conformance to State law.

E. Provide copies of receipts for all amendments specified in these specifications or in agronomic soils report.

F. Deliver plants with legible identification labels. Label trees, evergreens, bundles of containers of like shrubs and groundcover plants. State correct plant name and size indicated on plant list. Use durable waterproof labels with water-resistant ink which will remain legible for at least 60 days.

G. Protect plant material during delivery to prevent damage to root ball or desiccation of leaves.

H. Notify Architect 7 days in advance of delivery of plant materials and submit itemization of plants in each delivery.

I. Store plants in shade and protect from weather.

J. Maintain and protect plant material in a healthy, vigorous condition.

K. Exercise care in handling, loading, unloading and storing of plant materials. Replace damaged materials.

1.8 WARRANTY

A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.
   1. Warranty Periods from date of end of 90-day maintenance period.
      a. Trees: 12 months.

b. Shrubs, Vines, Ornamental Grasses, Ground Covers, Biennials, and Perennials: 90 days.
c. Annuals: 90 days.

1.9 MAINTENANCE SERVICE

A. Initial Maintenance Service: Provide maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Being maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than maintenance period below.
   1. Maintenance Period for Trees and Shrubs: 90 days from date of Substantial Completion.
   2. Maintenance Period for Ground Cover and Other Plants: 90 days from date of Substantial Completion.

B. Continuously maintain all site areas involved in this contract during the progress of work and during the maintenance period until final acceptance of the work by City. Improper maintenance or possible poor condition of the project at the termination of the scheduled maintenance period may cause postponement of the final completion date of the Contract. Continue maintenance until acceptable to the Owner.

C. Provide sufficient numbers of workers and adequate equipment to perform work during maintenance period.

D. Maintenance period does not start until all elements of construction, planting, and irrigation for the complete project are in accordance with the contract documents for this project.

E. Request an inspection to begi maintenance period after all planting and related work has been completed in accordance with other contract documents. Maintenance period commences after date of Substantial Completion as determined by Landscape Architect and confirmed in written notification by the Owner.

F. Prior to commencement of maintenance period, ensure that all ground cover and lawn areas have been planted and that all lawn areas show an even, healthy stand of grass seedlings or sod, grass having been mown twice.

G. Any day or days that there is failure to properly maintain plantings, replace suitable plants, perform week control or maintain hardscape areas will not be credited as part of the 90 days maintenance. The project will not be segmented into maintenance phases.

H. Keep paved areas free of silt, dirt, leaves and other planting area debris. Maintain these areas at least broom clean through the duration of the maintenance period, cleaning no less often than once per week.

I. Guarantee: Guarantee plant material against any and all poor, inadequate or inferior materials and workmanship for one year. Replace plants found to be dead or in poor condition due to faulty materials or workmanship, at no extra cost to owner.

J. Replacement: Replace materials found to be dead, missing or in poor condition during the maintenance period immediately. The Architect is the sole judge of the acceptability of condition. Make replacements of materials within 15 days after condition develops or written notification from Architect has been sent. Architect has the right to make emergency repairs without releasing Contractor's guarantee and warranty to Architect.

K. Prior to date of final inspection, acquire approved reproducible prints and finally record from the job record set, all changes made during construction and deliver them to Architect.

L. Deliver guarantees to Architect.

PART 2 - PRODUCTS

2.1 PLANT MATERIAL

A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant Legend shown on Drawings and complying with ANSI Z60.1. Provide plant materials in accordance with the State Department of Agriculture's regulation for nursery inspections, rules and ratings. Provide plants with a normal habit of growth, sound, healthy, vigorous and free from insect infestations, plant diseases, sunscalds, and other disfigurements. Ensure tree trunks are sturdy and have well-hardened systems and vigorous and fibrous root systems which are not root or pot-bound. In the event of disagreement as to condition of root system, the root conditions of the furnished plants in containers will be determined by removal of earth from the roots of not less than two plants, or more than 2 percent of the total number of plants of each species or variety. Where container grown plants are from several sources, roots of not less than two plants of each species or variety from each source will be inspected. In the event that the sample plants inspected are found to be defective, the entire lot or lots of plants represented by the defective samples may be rejected. Plants rendered unsuitable for planting due to this inspection will be considered samples and will be provided at no cost to the Owner.

B. Size of plants will comply with ANSI Z60.1 and correspond with that normally expected for species and variety of commercially available nursery stock or as specified on drawings. The minimum acceptable size of plants measured before pruning with the branches in normal position, must conform to the measurements specified in the plant list. If approved by the Owner, larger sized plants may be used. If larger plants are approved for use, the ball of earth or spread of roots for each plant will be increased proportionately.

C. Plants not meeting requirements of these specifications are considered to be defective whether in place or not. They must be immediately removed and replaced with new acceptable and approved plants of the required size, species and variety.

D. Pruning: Do not prune, trim, top or alter the shape of trees or plants except as approved.

E. Provide plant material true to botanical and common name and variety as specified in Annoted Checklist of Woody Ornamental Plants in California, Oregon and Washington, published by University of California School of Agriculture (latest edition).

F. Nursery Grown and Collected Stock: Grow under climatic conditions similar to those in locality of project; container-grown stock in vigorous, healthy condition, not root-bound or with root system hardened off. Use only liner stock plant material which is well established in removable containers or formed homogenous soil sections.

G. Select trees which are aesthetically desirable and are good examples of the species. Trees with gashes, misshapen trunks or branches, topped leaders, structural defects, badly crossed branches, or other visual defects will not be accepted. If formal arrangements or consecutive order of plants is shown on Drawings, select stock for uniform height and spread to assure symmetry in planting.

H. Seed: Label seed and provide in sealed containers with signed copies from vendor certifying that each container is fully labeled in compliance with State Agricultural Code and is in compliance with minimum requirements of these specifications. Wet, moldy or damaged seed will not be permitted, Provide seed mix per plan.

2.2 PLANTING SOILS

A. Planting Soil (Import or Amended Top Soil) Ensure silt plus clay content of top soil does not exceed 20 percent by weight, with a minimum 95 percent passing the 2.0 mm sieve. Do not allow the sodium absorption ratio SAR to exceed 6. The electrical conductivity (ECE) of the saturation extract cannot exceed 3.0 millimohs per centimeter at 25 degrees C. Ensure boron content is less than 1 part per million as measured on the saturation extract. To ensure compliance with these requirements submit samples of soil for analysis prior to and following backfilling.

2.3 PLANTER MIX

A. Planter Mix for all on-structure planters and plant container: provide custom topsoil (“Disney”) Mix by EarthWorks Soil Amendments, Inc., (951) 782-0260, to include the followings pre-blended items:
   1. Preblended items:
      a. 85% sandy loam topsoil
      b. 15% peat moss

c. 0.5 lbs. / cy Triple Super Phosphate (0-45-0)
d. 0.25 lbs. / cy Potassium Sulfate (0-0-50)
e. 1 lb. / cy Agricultural Gypsum
f. 0.2 lbs. / cy P.A.M. (soil aggregating polymer)

B. Roof Deck Soil Mix
1. On-structure Planter Soil (Mix “A”) – (bottom of planter to 8-inches below finish grade) – per cubic yard of mix.
a. 80% Over-structure Planter Sand (optional – 100% sand if weight is not a consideration).
b. 20% pumice (optional no pumice).
c. 2 lbs. Nitroform (38-0-0, 27% WIN).
d. 2 lbs. 12-12-12 General Planting Fertilizer.
e. 1 lb. iron sulfate.
f. 2 lbs. dolomite lime.
g. 2 lbs. calcium carbonate limestone.
h. Thoroughly blend mix before placing soil in 12” lightly compacted lifts.
2. On-structure Planter Soil (Mix “B”) – (8-inch layer – place on top of On-structure Planter Soil (Mix “A”) up to finish grade) – per cubic yard of mix:
a. 70% Over-structure Planter Sand.
b. 30% Organic Amendment.
c. 2 lbs. Nitroform (38-0-0, 27% WIN).
d. 1 lb. iron sulfate.
e. 2 lbs. dolomite lime.
f. 2 ls. Calcium carbonate limestone.
g. Thoroughly blend soil mix before placing soil in one lightly compacted lift.
3. Over-structure Planter-Sand:
a. Washed nursery sand which meets following U.S. Standard Sieve criteria:

Sieve No. (U.S. Standard)	Weight Percent Passing
10	100
18	100
35	92
60	16
100	2.1
140	1.3
270	0.1

2.4 MULCHES

A. Organic Mulch: Provide medium grind bard, consisting of organic, fibrous, woody bark mixture of varied particle size such that 90 to 100 percent passes 1 inch sieve, 80 59 100 percent passes 1/2 inch sieve, and 20 59 60 percent passes 1/4 inch sieve, or approved equal. Mulch shall be free of contaminants and weed seed and shall have a pleasant musty or moldy soil-like odor. Putrid, ammonia and sour-smelling materials will be deemed unacceptable. Recycled construction materials not be permitted.

2.5 HYDROSEEEDING FIBER MULCH

A. Provide Hydro-mulch as manufactured by Conwed, or other approved equal, composed of wood cellulose fiber and containing no germination or growth inhibiting factors. Ensure a consistent texture which disperses evenly and remains suspended in agitated water. Provide with a temporary green dye and the following percentage property analysis: moisture content 9 plus or minus 0.8; 3 o.d. basis, organic matter 99.2 plus or minus 0.8; ash content 0.8 plus or minus 0.2; pH 4.8 plus or minus 0.5; water holding capacity (grams of H20 per 100 grams of fiber 1150 minimum.

2.6 HYDROSEEDING ADDITIVE (BINDER)

A. Provide Ecology Control-M-Binder organic seeding additive.

2.7 GUYING AND STAKING MATERIALS

A. Wood Tree Stakes: lodge pole pine, full treated with Coppernaphthanate Wood Preservative in strict accordance with FS TT-W-572 Type I, Composition B, 2-inch minimal normal size diameter by 10 feet long, minimum, with no split stakes.

B. Ties: Provide cinch ties, size corresponding to tree box size as manufactured by VIT Company or other approved.

2.8 LANDSCAPE EDGINGS

A. Wood Edging:
   1. Provide 2-inch by 4-inch pressure treated Douglas Fir or Redwood construction grade headerboards. Make splices with 1-inch by 3-inch by 16-inch stakes at intervals of not more than 5 feet. Cut stakes level and set below top of headerboards.
   2. On sharp turns and curves, four 1/2 inch by 4-inch laminated boards, or two 1-inch by 4-inch laminated boards may be permitted.
   3. Nail stakes and splices with galvanized common nails. Nail as required for solid installation.
   4. Provide header as shown on drawings, laid true to line and grade, protect in-place adjacent improvements, shrubbery and other properties. Place stakes on ground cover side of header.

B. Steel Edging: Standard commercial-steel edging, rolled edge, fabricated in sections of standard lengths, with loops stamped from or welded to face of sections to receive stakes.

C. Aluminum Edging: Standard-profile extruded-aluminum edging, ASTMB221, Alloy 6063-T6, fabricated in standard lengths with interlocking sections with loops stamped from face of sections to receive stakes,

D. Plastic Edging: Standard black polyethylene or vinyl edging, horizontally grooved, extruded in standard lengths, with 9-inch steel stakes.

E. Concrete Mowstrip: 6-inch wide by 6-inch thick concrete mowstrip with 1/2 inch tooled edging and #3 continuous rebar.

2.9 MISCELLANEOUS PRODUCTS

A. Sand: Provide washed silica sand.

B. Water: Provide clean, potable water.

C. Root Barrier: provide UB24-2 by Deep Root Corporation, (800) 458-7668. Install at all trees within 5 feet of concrete paving, curbs or mow strips or as shown on plans. Install barrier with vertical ribs facing forward the tree and wit the top edge 1/2 inch above finish grade. Length of root barrier shall extend 10’ minimum in each direction from center of tree trunk. Provide linear root barrier adjacent to paving or curbing; root barrier shall not circle the rootball.

D. Tree Trunk Protector: Provide ArborGard model AG 9-4 by Deep Root Corporation, (800) 458-7668.

E. Erosion Control Fabric: Provide Rollmax SC-150 rolled erosion control fabric by North American Green, (800) 772-2040.

2.10 QUALITY CONTROL

A. Provide standard, approved and first-grade quality materials, in prime condition when installed and accepted. Deliver commercially processed and packaged materials in manufacturer’s unopened containers bearing the manufacturer’s guaranteed analysis. Supply a sample of all supplied materials accompanied by analytical data from an approved laboratory source illustrating compliance, or bearing the manufacturer’s guaranteed analysis.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Obtain certification that final grades to 1/10 foot have been established prior to commencing landscaping operations. Provide for inclusion of all amendments, settling, etc. Be responsible for shaping all planting areas as indicated on drawings or as required.

B. Inspect trees, shrubs and liner stock plant material for injury, insect infestation and trees and shrubs for improper pruning.

C. Do not begin planting of trees until deficiencies are corrected or plants replaced.

3.2 PLANTING AREA ESTABLISHMENT

A. Soil Preparation: After proper finish grades have been verified or established, cross-rip all planting areas to a depth of 12 inches, condition and fertilize soil in accordance with recommendations of soil testing laboratory.

B. At time of planting, ensure that top 2 inches of all areas to be planted or seeded are free of stones, stumps and other deleterious matter 1 inch in diameter or larger, and free from wire, plaster, concrete, wood and similar materials which would cause hindrance to planting or maintenance.

C. Finish Grading: Make minor modifications to grade as may be necessary to establish required final grade. Ensure that finish grade provides proper drainage of the site and surface drainage is away from building. Final grades are to be 1-inch below adjacent paved areas, sidewalks, valve boxes, headers, clean-outs, drains, manholes, etc., or as shown on drawings or required by City. Eliminate erosion scars prior to commencing maintenance period.

D. Pre-Plant Weed Control:
   1. After irrigation system is operational, use a non-selective systemic contact herbicide as recommended and applied by an approved licensed landscape pest control advisor and applicator. Leave sprayed plants intact for at least 15 days.
   2. Clear and remove these existing weeds by mowing or grubbing off all plant parts at least 2 inches below surface of soil over entire areas to be planted.
   3. After irrigation system is operational, apply water for 10 days as needed to achieve weed germination. Apply contact herbicides and wait as needed before planting. Repeat as required.
   4. Maintain weed free site until acceptance by Owner.

3.3 PLANTING INSTALLATION

A. General:
   1. The irrigation system shall be operational and approved prior to planting.
   2. Perform actual planting only during those periods when weather and soil conditions are suitable and in accordance with locally accepted practice, as approved.
   3. Distribute in planting areas only as many plants as can be planted and watered that same day.
   4. Ensure that containers which are opened and plants removed are handled with care such that ball of earth surrounding roots is not broken and that plants are planted and watered immediately. Do not open containers prior to placing plants in planting areas.

B. Layout: Mark locations for plants and outlines of areas to be planted before any plant pits are dug. Gain City approval. If underground construction or utility lines are encountered in the excavation of planting areas, other locations for planting may be selected by Owner. Accomplish layout with flagged grade stakes indicating plant names and specified container size on each stake. Confirm location and depth of underground utilities and obstructions.

3.4 EXCAVATION FOR TREES AND SHRUBS

A. Planting Pits and Trenches: Excavate circular planting pits with sides sloping inward at a 45-degree angle. Trim perimeter of bottom leaving center area of bottom raised slightly to support rootball and assist in drainage away from center. Do not further disturb base. Ensure that rootball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.
   1. Excavate approximately two times as wide as rootball diameter.
   2. Do not excavate deeper than depth of the rootball, measured form the root flare to the bottom of the rootball.

B. Subsoil and topsoil removed from excavations may be used as planting soil backfill.

C. Strip and stack approved excavation for planting which is encountered within areas for trenches, tree holes, plant pits and planting beds.

D. Remove from site excess soil generated from planting holes and not used for backfilling.

E. Protect areas from excessive compaction when trucking plants or other materials to planting areas.

3.5 TREE, SHRUB, AND VINE PLANTING

A. Before planting, verify that root flare is visible at top of rootball according to ANSI Z60.1.

B. Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.

C. Set stock plumb and in center of planting pit or trench with root flare 1 inch above adjacent finish grades.
   1. Use planting soil for backfill.
   2. Container Grown: Cut cans on two sides with acceptable can cutter only. Carefully remove rootball from container without damaging rootball or plant. Superficially loosen edge roots on three sides after removing form can.
   3. Boxed Trees: Remove bottom of plant boxes before planting. Remove sides without damage to rootball after positioning plant and partially backfilling
   4. Boxed Trees: Remove bottom of plant boxes before planting. Remove sides without damage to rootball after positioning plant and partially backfilling.
   5. Face lants wit fullest growth into prevailing wind.
   6. Backfill around rootball in layers, tamping to settle soil and eliminate voids and air pockets. Hold plant rigidly and plumb until soil has been firmed around ball or roots. Raise all plants which settle deeper than the surrounding grade. When planting pit is approximately one-half filled, add water to the top of the planting pit and thoroughly saturate rootball and adjacent soil.
   7. Set planting tablets with each plant on top of rootball while plants are still in their containers so the required number of tablets can be verified. After water has completely drained, place planting tablets as follows or in amounts recommended in soil reports from soil-testing laboratory.
      1 tablet per 1-gallon container
      2 tablets per 5-ballon container
      3 tablets per 15-gallon container
      4 tablets per 24-inch box
      6 tablets per 36-inch box
      8 tablets per 48-inch box
      Place tablets beside the rootball about 1 inch form root tips; do not place tablets in bottom of the hole.
   8. Continue backfilling process. Construct an earthen basin around each plant after backfilling. Provide basin of depth sufficient to hold at least 2 inches of water. Construct basins with amended backfill. Remove basin in all turf areas after initial watering. Water again after placing and tamping final layer of soil.
   9. Limit pruning to minimum necessary. Remove injured twigs and branches. Pruning may not be done prior to delivery of plants. Paint cuts over 3/4 inch in diameter with tree paint.
   10. Stake or guy trees immediately after planting. Install stakes plumb. Locate stakes so that a straight line drawan between the stakes is perpendicular to the prevailing wind direction.

11. Do not bring iron sulfate into contact with concrete surfaces due to potential staining. Contractor is responsible for cleaning and replacing stained surfaces.

D. When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the rootball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the rootball.

3.6 TREE, SHRUB, AND VINE PRUNING

A. Remove only dead, dying, or broken twigs or branches. Do not prune for shape. Pruning may not be done prior to delivery of plants.

B. Prune, thin, and shape trees, shrubs, and vines according to standard professional horticultural and arboricultural practices. Unless otherwise indicated by Architect, do not cut tree leaders; remove only injured, dying, or dead branches from trees and shrubs; and prune to retain natural character.

3.7 GROUNDCOVER AND OTHER SMALL CONTAINER PLANTING

A. Set out and space ground cover and plants from flats or containers smaller than 1-gallon as indicated on planting plan in even rows with triangular spacing.

B. Ensure that groundcover remains in the flats until transplanting. Flats soil must contain sufficient moisture so it will not fall apart when lifting plants.

C. Use planting soil for backfill. Plant each rooted plant with its proportionate amount of flat soil.

D. Dig holes large enough to allow spreading of roots.

E. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.

F. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

G. Protect plants for damage and trampling.

3.8 HYDROSEEDING

A. Install large trees and shrubs (t gallon and larger) if they occur in hydroseeded areas.

B. Install trees and shrubs (1 gallon) and groundcovers from flats if they occur in hydroseeded areas.

C. Provide seed mixes as shown on plan.

D. Apply hydroseed by an approved hydro-mulch company.

E. Apply in a form of slurry consisting of cellulose fiber, seed, chemical additives, commercial fertilizer and water. When hydraulically sprayed on soil, ensure that hydro-mulch forms a blotter like ground cover impregnated uniformly with seed and fertilizer and allows the absorption of moisture and rainfall to percolate to the underlying soil.

F. Prepare the slurry at the site by first adding water to the tank when the engine is at half throttle. When water level has reached height of agitator shaft, provide full circulation, then add seed, followed by fertilizer, than mulch. Only add the mulch to the mixture after the seed and the tank is at least 1/3 filled with water. By the time the tank is 2/3 to 3/4 full, all mulch shall be in. Commence spraying immediately when tank is full.

G. Spray uniform visible coat by using the green color as a guide. Apply the slurry in a sweeping motion, in an arched stream so as to fall like rain allowing the wood fibers to build on each other until a good coat is achieved and the material is spread at the required rates.

H. Remove slurry not used within two hours from the site.

I. Fill out the daily worksheets by the nozzle main with the following information: Seed type and amount, mulch type and amount, number of loads and amount of water, seeding additive type and amount, area covered and equipment used, capacity and license number.

J. Do not allow any slurry to be sprayed into any reservoir basin or drainage ditches and channels which may impede the flow of rain or irrigation water. Clean up any spilled slurry.

K. After application of hydro-mulch, wash excess material from previously planted materials and architectural features. Avoid washing or eroding mulch materials.

L. Ensure that application equipment has a built-in agitation system and operating capacity sufficient to agitate, suspend and mix a slurry containing not less than 40 pounds of fiber mulch plus a combined total of 7 pounds fertilizer solids for each 100 gallons of water.

M. Slurry distribution lines shall be large enough to prevent stoppage and shall be equipped with a set of hydraulic spray nozzles which will provide a continuous non-fluctuating discharge. Capacity requirement is 1,500 gallons, mounted on a traveling unit, either self-propelled or drawing by a separate unit which will place slurry tank and nozzles within sufficient proximity of areas to be seeded.

N. Hydraulic equipment used for pesticide applications shall consist of a clean 150-gallon capacity fiberglass tank, complete with mechanical agitation. Pump volume shall be 10 gallons per minute, while operating at a pressure of 100 pounds per square inch. Distribution lines shall be large enough to carry the volume of water necessary for even

chemical distribution. Spray nozzle must cover a 15-foot swatch, with a minimum ouput of 5 gallons per minute at 80 pounds per square inch.

3.9 PLANTING AREA MULCHING

A. Mulch backfilled surfaces of planting areas with 3 inch layer of mulch except slopes that are 2:1 or steeper, hydroseeded areas, turf areas and bioretention basin bottoms.

3.10 CLEAN-UP

A. After all planting operations are complete; remove all trash, excess soil, empty plant containers, and rubbish from the property. Repair scars, ruts and other marks in the ground and leave ground in a neat and orderly condition.

B. Leave the site in a broom-clean condition and wash down all paved areas within the project site. Leave walks in a clean and safe condition.

3.11 LANDSCAPE MAINTENANCE

A. Weed and cultivate all areas at intervals of not more than 10 days.

B. Perform watering, mowing, rolling, edging, trimming, fertilization, spraying, pest control, and cleaning as may be required.

C. Street gutters and curbs are to be included.

D. Maintain adequate protection for people and property, and be financially responsible for damages and injuries. Notify the Architect immediately should damage occur as a result of maintenance operations and provide repair or remuneration.

E. Between the 15th and 20th calendar day of the maintenance period, reseed or resod all spots or areas within the lawn where normal turf growth is not evident.

3.12 TREE AND SHRUB CARE

A. Watering: Maintain a large enough water basin around plants so that enough water can be applied to establish moisture through the major root zone. When hand watering, use a water wand to break force of water.

B. Pruning:
   1. Prior to any pruning, obtain written approval from the Architect to proceed.
   2. Trees:
      a. Propose tree pruning to the Architect should there be health or structural reasons for doing so, including the need to eliminate structurally unsound

growth, reduce potential for wind toppling or wind damage, or maintain growth within limited space.

b. Tree pruning that is required during the Maintenance Period for tree health or structural reasons, or as direct by the City, shall be performed in accordance with ANSI A-300 ISA standards.

c. Major pruning of deciduous trees shall be during their dormant season.

3. Shrubs:

a. The objectives of shrub pruning are the same as for trees. Do not clip shrubs into balled or boxed forms unless such is required by the design.

b. Make pruning cuts to lateral branches or buds or flush with trunk. Stubbing will not be permitted.

C. Staking and guying: Ensure that stakes and guys remain in place through acceptance and monitor to prevent girdling of trunks or branches and to prevent rubbing that causes bark wounds. All nursery stakes shall be removed.

D. Weed control: Keep all areas free of weeds. Use recommended legally approved herbicides. Avoid frequent soil cultivation that destroys shallow roots. Use mulches per specifications to help prevent week seed germination.

E. Insect and disease control: Maintain a reasonable control with approved materials.

F. Fertilize as specified by the agronomic soils testing recommendations and as follows for bid purposes

1. Commencement of maintenance period – 6 pounds per 1,000 square feet with top dress fertilizer.
2. At the end of first 30 days of maintenance period – 6 pounds per 1,000 square feet with top dress fertilizer.
3. At end of maintenance period and at 30 day intervals should maintenance period be extended for any reason – 6 pounds per 1,000 square feet with fertilizer mix.
4. Avoid applying fertilizer to the rootball and base of main stem: rather, spread evenly under plant to dripline. Rates will vary from about a cup of nitrate fertilizer (depending upon nitrogen percentage) around a newly installed small plant to about ½ pound of actual nitrogen per inch of trunk diameter measured four feet from the ground for mature trees.

G. Replacement of plants: Replace dead, dying and missing plants with plants of a size, condition and variety acceptable to the Architect.

3.13 GROUND COVER CARE

A. Weed control: Control weeds, preferably with pre-emergent herbicides, but also by hand or with selective systemic herbicides. Hoe weeds as little as possible since this may result in plant damage.

B. Watering: Water enough that moisture penetrates throughout root zone and only as frequently as is necessary to maintain healthy growth.

C. Trash: Remove as it accumulates, but no less often than weekly.

D. Edging and trimming: Edge groundcover to keep in bounds.

E. Replace dead and missing plants.

3.14 LAWN AND TURF CARE

A. Turf must be well-established prior to final acceptance.

B. Watering: Water lawns at such frequency as weather conditions required to replenish soil moisture below root zone.

C. Weed control: If needed, control broad leaf weeds with selective herbicides.

D. Mowing:
1. Perform mowing at such times of the day or week as may be requested by the Owner so as not to impede the Owner's operations. Mowing times may be at times other than normal working hours or days. Perform work at Owner's convenience.
2. Clean up grass clippings during and after mowing, and remove legally from site. Use of blowing type equipment in lieu of sweeping or vacuuming is not acceptable.

E. Renovating:
1. If required, remove thatch by verticutting preferable in the Fall of the year, but otherwise in the Spring. At this time, fertilize with nitrate and over-seed if needed. Over-seeding must precede pre-emergent herbicides by at least 4 to 6 weeks. Normally, this means that lawns which have been invaded by crabgrass would be renovated and over-seeded in the Fall and treated for crabgrass control in the following late Winter.
2. Clean up grass clippings during and after mowing, and remove legally from site. Use of blowing type equipment in lieu of sweeping or vacuuming is not acceptable.

3.15 IRRIGATION SYSTEM

A. Inspection: Check all systems for proper operation. Lateral lines must be flushed out after removing the last sprinkler head or two at each end of the lateral. Adjust heads as necessary for unimpeded coverage and no overspray.

B. Controllers: Set and program automatic controllers for seasonal water requirements. Give Owner a key to controllers and instruction on how to turn off system in case of emergency as specified in other sections of these specifications.

C. Repair all damages to irrigation system. Make all repairs within one watering period.

END OF SECTION 329300

SECTION 416323 - ELECTRIC PALLET JACK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The general provisions of the contract, including General and Supplementary Conditions and Division 1, General Requirements, apply to the work specified in this Section.

1.2 DESCRIPTION

A. Furnish a walking pallet truck as manufactured by Big Lift LLC as specified below.

1.3 SUBMITTALS

A. Catalog Cuts: Before the Big Joe D40 electric pallet truck is delivered to the job site, submit catalog cuts to the Architect in accordance with these specifications, showing all details of the product and all requirements for work by other trades.

B. Product Data: Manufacturer’s product specifications, standard details and recommendations for project conditions; indicate selected sizes and installation details specific to the project.

1.4 OPERATION AND MAINTENANCE DATA

A. Warranty Documents: Issued and executed by the manufacturer and distributor.

1.5 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer: Minimum five (5) years-documented experience producing products specified in this section.
2. Distributor: Approved by the Manufacture and having a minimum of five (5) years experience.

1.6 RELATED WORK BY OTHERS SPECIFIED ELSEWHERE

A. The following work is excluded from the scope of work in this section 14 and is included in other divisions of the specifications for inclusion in the scope of work of others.

1. Modifications to trash bin(s) or dumpster(s).

1.7 WARRANTY

A. Manufacturer's warranty: Furnish manufacturer's standard one (1) year warranty from date of temporary certificate of occupancy or similar, locally mandated permission to use the project common areas for their intended use. Warranty shall apply to defects in product workmanship and materials.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable manufacturers: Big Lift LLC.

B. Substitutions: Not permitted.

C. Components & Features:

1. Lift height: Minimum 7.5"
2. Overall length: Minimum 64"
3. Overall weight: 650 lb.
4. Powertrain Type: Motorized Pallet Truck
5. Outside fork spread: 22"
6. Operator type: Walk
7. System Voltage 24V ZAPI ACO Travel Controller
8. Load capacity: 4000 lb.
9. Grade-ability (fully loaded): 6%
10. Under-clearance: 3.25"
11. Integral Battery/ Charger: 12- Volt Absorbed Glass Matt (AGM) 85AH maintenance free batteries with 10 AMP 110VAC plug-in automatic charger.
12. Battery discharge indicator, key switch, emergency power disconnect and built-in automatic battery charger.

PART 3 - EXECUTION

3.1 DEMONSTRATION

A. Arrange demonstration of system operation, conducted by manufacturer's representative, to Owner's maintenance personnel.

END OF SECTION

SECTION 443100 - ODOR CONTROL SYSTEM

PART 1 - GENERAL

1.1 RELATION TO DIVISION 1

A. Drawings and applicable provisions of the General Conditions, Supplementary General Conditions and General Requirements in Division 1 govern work under this Section.

1.2 SCOPE

A. This section includes specifications for a Piian Mini Vaporizer System, a small scale Vaporizer type odor control system for control of odors emitting from garbage compactors, garbage dumpsters and or garbage chutes. Included are the following topics:

1. Piian Mini Vaporizer Unit.
2. Piian Odor Neutralizer - the odor neutralizing solution sprayed from the unit.

1.3 RELATED WORK (BY OTHERS)

A. Division 26 - Electrical Power Distribution, provide 115 vAC 15 Amp receptacle at Mini VAPORIZER location.

1.4 SUBMITTALS

A. Include manufacturer cuts sheets, dimensions, capacities, options included, materials of construction, ratings, weights, motors, installation instructions, startup instructions, operating instructions and maintenance instructions.

1.5 QUALITY ASSURANCE

A. Manufacturer to have minimum 5 years experience producing products specified in the section and be able to provide adequate references of other buildings or sites implementing this type of odor control technology.

B. Installer to be approved by manufacturer and have minimum 5 years experience working with this type of equipment.

1.6 WARRANTY

A. Furnish manufacturers standard one-year warranty for equipment and extended warranty provisions for odor neutralizer consumption.

PART 2 - PRODUCTS

2.1 GENERAL

A. System to operate with minimum dripping and not to cause wetting or other moisture related problems.

B. System to produce a uniform “VAPOR” of 1 Micron (mean) sized fluid droplets.

C. System to be industrial quality construction suitable for constant operation.

D. System to dispense Piian all natural odor neutralizer solution only.

E. Odor neutralizer solution to have independent laboratory test data which confirms odor reduction safety and toxicity properties.

F. Odor neutralizer solution to be non-hazardous, non-flammable, non-toxic, non-corrosive and water soluble.

2.2 PIIAN MINI VAPORIZER SPRAY UNIT

A. Ultrasonic vaporizing nozzle and tube.

B. 115-vAC 1PH 60 Hz 1/3 HP air compressor motor.

C. One year between scheduled refills.

D. NEMA 4X electrical enclosure with clear Lexan lockout cover.

E. Custom designed electronic circuit control board with easy to use programming and operation buttons.

F. Automatic shut down upon freezing conditions.

G. Digital display timer independent set buttons for time off and time on.

H. Low tank alert and tank empty alarm.

I. 304 L stainless steel chassis and cabinet construction with wall mount flanges.

J. 5-gallon container capacity lower cabinet.

K. Lockable cabinet door.

2.3 PIIAN ODOR NEUTRALIZER

A. All natural components and formulation.

B. Completely derived from essential oils and plant extracts.

C. All contents GRAS by FDA (generally recognized as safe).

D. Product is to destroy common odorous gases and compounds by absorbing and biodegrading action.

E. Product to have no added fragrance or masking properties.

F. Provide independent laboratory test data conforming destructive properties relating to common odorous gases and compounds.

G. Independent laboratory test data confirmation of safety and toxicity properties.

H. Product to be non-hazardous, non-toxic, non-flammable and non-volatile.

I. Product to be water-soluble.

J. Must not require special handling or packaging, spills capable of being flushed with water to drain.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Mini Vaporizer Unit to be mounted on a wall close to odor source, vapor outlet to be positioned to deliver odor neutralizer directly at odor source.

B. Installer to read installation instructions supplied with Mini Vaporizer Unit.

C. Mini Vaporizer System to be started up by installer and cycling function adjusted to provide suitable level of odor control.

D. Installer to brief building owner on operation on function and operation principles of Mini Vaporizer Unit.

END OF SECTION

SECTION 445129 – MATERIAL HANDLING CART

PART 1 - GENERAL

1.1 DECRIPTION

A. The general provisions of the contract, including General and Supplementary Conditions and Division 1, General Requirements, apply to the work specified in this Section.

B. Furnish and install 1-cubic yard 2-bar material handling cart (AKA “Tilt Truck”).

1.2 QUAILITY ASSURANCE

A. Manufacturer: Minimum shall have five (5) years-experience in the manufacture of the specified equipment and shall maintain a serving and replacement parts system for at least 3 years after installation of the equipment.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer’s product specifications, performance data sheets and installation instructions.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Protection: Equipment shall be protected from physical damage, dirt, water etc.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. 1-cubic yard material handling cart or tilt truck made by Akro-Mils or equivalent.

B. Dumpster specifications:

1. Cart Dimensions (WxDxH): 33” x 68” x 42”
2. Load Rating: 1000 lb.
3. Metal Frame: 13 gauge, fully welded, tubular
4. Lifters: Works with ANY 2-bar lifter
5. Wheel Type: Molded on Rubber
6. Wheel Size: 10” diameter.

PART 3 - EXECUTION

3.1 DEMONSTRATION

A. Arrange demonstration of system operation, conducted by manufacturer's representative, to Owner's maintenance personnel.

END OF SECTION