PROJECT MANUAL

Exeter Township
Emergency Services Facility

70 Gibraltar Road
Reading, Pennsylvania 19606

Bid Set
October 01, 2026

PREPARED FOR:
Exeter Township
4975 DEMOSS ROAD
READING, PENNSYLVANIA 19606

PREPARED BY:
MW Studios
8098 SANDPIPER CIRCLE, SUITE H
NOTTINGHAM, MARYLAND 21236
25-049

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PART 1 GENERAL

1.1 PROJECT IDENTIFICATION INFORMATION

A. Project:
1. Exeter Township
2. Emergency Services Facility
3. 70 Gibraltar Road, Reading, Pennsylvania19606.
4. Architect's Project Number: 25-049.

B. Owner: Exeter Township.
1. Address: 4975 DeMoss Road, Reading, Pennsylvania 19606

C. Architect: Design Professional of Record
1. MW Studios.
2. Address: 8098 Sandpiper Circle, Suite H, Nottingham, Maryland 21236
3. Phone Number: 410-344-1460

D. Project Submission Title: Bid Set.

E. Project Submission Date: October 01, 2026.

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PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 00 0101

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SECTION 00 0103 - PROJECT DIRECTORY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Identification of project team members and their contact information.

B. Architect and Architect's Consultants:
1. Structural Engineering Consultant.
2. Mechanical, Plumbing, Electrical Engineering Consultant.

C. Owner's Other Consultants:
1. Construction Manager.
2. Civil Engineering Consultant.

1.2 OWNER:

A. Name: Exeter Township
1. Address: 4975 DeMoss Road .
2. City: Reading.
3. State: Pennsylvania.
4. Zip Code: 19606.
5. Telephone: 610-779-5660.

B. Primary Contact: All correspondence from Contractor to the Architect will be direct, with copies to this party, unless alternate arrangements are mutually agreed upon at preconstruction meeting.
1. Title: Township Manager.
2. Name: William Heim.
3. Phone: 610-779-5660.

1.3 ARCHITECT AND ARCHITECT'S CONSULTANTS:

A. Correspondence: All correspondence from the Contractor regarding construction documents authored by the Architect or the Architect's consultants will be through this party, unless alternate arrangements are mutually agreed upon at the preconstruction meeting and recorded within the meeting minutes.

B. Architect: Design Professional of Record.
1. Company Name: MW Studios.
a. Address: 8098 Sandpiper Circle, Suite H.
b. City: Nottingham.
c. State: Maryland.
d. Zip Code: 21236.
e. Telephone: 410-344-1460.
f. Fax: 443-403-2460.
2. Primary Contact - Construction Administrator/Technician:

a. Name: Jessica Spencer.
b. Phone Number: 410-777-5090.
c. Email: jspencer@mwsarch.com.

3. Primary Contact - Project Manager:
   a. Name: Mike Gerding.
   b. Phone Number: 410-967-1090.
   c. Email: mgerding@mwsarch.com.
4. Primary Contact - Architect/Designer:
   a. Name: Nate McNeill.
   b. Phone Number: 443-988-8045.
   c. Email: nmcneill@mwsarch.com.

C. Structural Engineering Consultant:
1. Company Name: Providence Engineering.
   a. Address: 10 Eisenhower Boulevard, Lancaster, Pennsylvania 17603.
   b. Telephone: 717-509-7000.
   c. Primary Contact:
      1) Name: Michelle Benoit, Senior Project Manager.
      2) Email: michelleb@proveng.com.

D. Mechanical, Plumbing, Electrical Engineering Consultant
1. Company Name: DEDC, LLC.
   a. Address: 315 S Chapel Street, Newark, Delaware 19711.
   b. Telephone: 302-738-7172.
   c. Primary Contact:
      1) Name: Scott Frenck.
      2) Email: sfrenck@dedc-eng.com.

1.4 OWNER'S OTHER CONSULTANTS

A. Construction Manager:
1. Company Name: Boyle Construction, Inc.
   a. Address: 3850 Sierra Circle, Suite 400, Center Valley, Pennsylvania 18304.
   b. Telephone: 484-223-0726.
   c. Primary Contact: Robert Lenosky, Project Manager.
      1) Name: 484-357-0716.
      2) Email: rlenosky@boyleconstruction.com.

B. Civil Engineering Consultant:
1. Company Name: Herbert, Rowland & Grubic, Inc.
   a. Address: 1275 Glenlivet Drive, Suite 145, Allentown, Pennsylvania 18106.
   b. Telephone: 610-351-0311.
   c. Primary Contact:
      1) Name: Dennis Reichel.
      2) Email: dreichel@hrg-inc.ocm.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 00 0103

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SECTION 00 0115 - LIST OF DRAWING SHEETS

PART 1 GENERAL

1.1 LIST OF DRAWINGS

A. Drawings shall consist of the following separately bound drawing sets or separate drawings:
1. General, Civil, Architectural, Structural, Mechanical, Plumbing, Fire Protection, and Electrical:
a. Drawings shall include, but not be limited to, the Contract Drawings and drawings listed within the DRAWING INDEX located on sheet G000 "COVER SHEET" of the separately bound drawing set titled Exeter Township Emergency Services Facility dated October 01, 2026, as modified by subsequent Addenda and Contract Modifications.

END OF SECTION 00 0115

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SECTION 00 11 00 – INSTRUCTIONS TO BIDDERS

1. GENERAL

1.1 The drawings and specifications are complimentary via the Building Connected Program. Any labor and/or material not shown on the drawings but called for in the specifications or any labor and/or material not called for in the specifications but shown on the drawings, shall be furnished by the contractor as shown and called for in both.

1.2 DEFINED TERMS

1.2.1 Terms used in these Instructions to Bidders, which are defined in the General Conditions of the Contract for Construction (the “General Conditions”), have the meanings assigned to them in the General Conditions. The term "Bidder" means one who submits a Bid directly to Owner, as distinct from a sub-Bidder, who submits a bid to a Bidder. The term "Successful Bidder" means the lowest, qualified, responsible, and responsive Bidder to whom Owner (on the basis of Owner's evaluation as hereinafter provided) makes an award. The term "Bidding Documents" includes the Advertisement for Bids, Instructions to Bidders, the Bid Form, and the Contract Documents (including all Addenda issued prior to receipt of Bids). The numbering system refers to Articles.

2. COPIES OF BIDDING DOCUMENTS

2.1 In order to Bid the Project, complete sets of PDF documents must be obtained.

2.2 Complete sets of Bidding Documents must be used in preparing Bids; neither Owner, Architect, or Construction Manager assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents. Bidding Documents consist of Contract Documents (and all reference standards), specifications, addenda, and drawings. Bidder is responsible to make sure that the set of Bidding Documents is complete and that any printed contract document is legible and represents properly all the information as represented in the PDF file.

2.3 Owner, Architect, and Construction Manager, in making copies of the Bidding Documents available on the above terms, do so only for the purpose of obtaining Bids for the Work and do not confer a license or grant for any other use.

3. QUALIFICATIONS OF BIDDERS

3.1 **The following information must be completed and submitted when requested by the Construction Manager.**

3.1.1 The Contractors Qualification Statement A305-2020 found in Section 00 1940. Use additional pages to complete any of the sections if more space is needed. Bidder’s failure to fully and accurately disclose all information requested in the Request for Qualifications questionnaire shall constitute grounds for Bidder’s disqualification from being considered the lowest responsive, responsible Bidder.

3.2 To demonstrate qualifications to perform the Work, each Bidder must be prepared to submit with their bid proposal, written evidence such as financial data, insurance certificates, previous experience of the Bidder and its assigned personnel, present commitments, and any other information that may be requested by the Owner. Each Bid must contain evidence of Bidder's qualification to do business in the Commonwealth of Pennsylvania, or covenant to obtain such qualification prior to award of the Contract. Owner reserves the right to reject Bidder if he cannot satisfy all of the Qualification Requirements, including those listed in the Technical Specifications.

3.3 In determining the lowest responsible Bidder, the Owner will consider the integrity, efficiency, experience of the Bidder and its assigned personnel, promptness, current workload, financial capability, performance on recent projects, references from owners, architects, and engineers, list of potential sub-contractors, schedule of values, and ability to successfully and timely complete the Project**.** The apparent low Bidder must demonstrate competency and provide any or all of the above information requested within three (3) calendar days of request. Owner reserves the right to reject the Bidder as non-responsive if all the information is not received on time and/or does not reasonably satisfy the Owner's evaluation process.

3.4 In addition to all the requirements specified in Articles 3.1, 3.2 and 3.3 regarding qualifications of Bidders, the Owner will evaluate Bidders using the following additional criteria:

3.4.1 The Bidder and its assigned personnel must have successfully performed a minimum of 3 previous Pennsylvania public municipal projects within the last 5 years of similar type or a contract value of at least seventy-five percent (75%) of the amount of the Bidder's Base Bid. Provide references including telephone number and contact person.

3.4.2 The Bidder shall perform not less than ten percent (10%) of the actual construction Work with staff employed directly by the Bidder. Project Management and Office Staff shall NOT be included in this percentage.

3.4.3 The Bidder, or its assigned personnel, must have successfully performed at least 3 Pennsylvania public municipal projects within the last 5 years where they have managed multiple trades and coordinated and scheduled all the activities for projects as per Article 3.4.1. Provide references including telephone number and contact person.

3.4.4 An Agreement of Surety certifying that the Surety Company is committed to provide the Bidder with a Performance Bond and Payment Bond each in the amount of one hundred percent (100%) of the contract amount. The Surety Company must have an AM Best rating of A- or higher and a financial rating of Class X or higher.

3.4.5 The Bidder's performance on previous projects including claims, litigation, coordination of work, staffing, and timely completion. If it is determined that the Bidder has not fully performed previous projects in a coordinated, timely, and good and workmanlike manner, the Owner reserves the right to reject the Bid.

3.4.6 The Bidder shall also refer to Article 11.

3.5 Owner shall be entitled to recover attorneys' fees and costs incurred in defending any unsuccessful challenge brought by a Bidder in its own name or as proxy for a Municipality resident to Owner's award

of a contract to another Bidder, from the Bidder who brought the unsuccessful challenge as more fully set forth in Section 13.8.1 of the General Conditions of Contract.

3.6 All Bidders should be aware that the Owner encourages and promotes MBE (Minority Business Enterprise) and WBE (Women's Business Enterprise) participation for this Project. Bidders are encouraged to do their own research on the qualifications, and other factors, in preparing a comprehensive and responsible bid.

4. EXAMINATION OF CONTRACT DOCUMENTS AND SITE

4.1 It is the responsibility of each Bidder, before submitting a Bid, to:

1. Examine the Contract Documents thoroughly.
2. Visit the site to become familiar with local conditions that may affect the cost, progress, performance, or furnishing the Work.
3. Consider federal, state, and local laws and regulations that may affect cost, progress, performance, or furnishing of the Work.
4. Study and carefully correlate Bidder's observations with the Contract Documents.
5. Notify Architect and Construction Manager of any conflicts, errors, or discrepancies discovered in the Contract Documents.

4.1.1 REVIEW OF DRAWINGS AND SPECIFICATIONS

A. Bidders shall thoroughly examine and be familiar with the Specifications and Drawings. The failure or omission of any Bidder to receive or examine any form, instrument, document, or visit the site and acquaint himself with conditions there existing, shall in no way relieve any Bidder from obligation with respect to his or her Bid. By submitting a Bid, the Bidder agrees and warrants that he/she has examined the site and the Specifications and Drawings and, where Specifications and/or Drawings require in any part of the Work a given result to be produced, that the Specifications and Drawings are adequate, and the required result can be produced under the Specifications and Drawings. No claim for any additional costs will be allowed because of alleged impossibilities in the production of the results specified or because of inadequate or improper plans and specifications and whenever a result is required, the successful Bidder shall furnish any and all extras and make any changes needed to produce the required result for the sum stated in the form of proposal.

B. Should any Bidder find discrepancies, duplications, or omissions in the documents or have doubt as to the meaning expressed by the Contract Documents, he/she shall make inquiry at once in writing to the Architect and Construction Manager. Where changes, corrections, or clarifications to Contract Documents are deemed necessary by the Architect and/or Construction Manager, he will issue written Addenda accordingly. Addenda shall be a part of the Contract Documents. No oral, telephone, email, or letter instructions will be considered as having effect upon the Contract Documents; Addenda only shall constitute change to them. Bidders and sub-Bidders are urged to make early examination of Contract Documents and make inquiries about them, if necessary, even though prices may not be determined until late in the bidding period.

4.2 The site may be made available for visits at the pre-bid conference and at the other specific designated dates and times determined at the pre-bid conference.

4.3 Information and data reflected in the Contract Documents with respect to underground facilities at or contiguous to the site is based upon information and data furnished to Owner and Architect and/or Construction Manager by owners of such underground facilities or others, and Owner and Architect and/or Construction Manager do not assume responsibility for the accuracy or completeness thereof. Successful Bidder shall verify the location of all underground utilities prior to any excavation.

4.4 Successful Bidder for the Site Contract is responsible, on behalf of the Owner, for providing the physical markings of all existing utilities including those on site as indicated on the drawings or that may be identified in the field. The locations shown on the drawings are approximate. The Bidder must include in his proposal the cost for hand-dug test holes, or other means, to ascertain the precise position of such underground facilities on the site owned by the Owner. This verification should be performed for any utilities to be relocated, removed, modified, or that may otherwise interfere with planned work. The utilities in the public right of way will be identified and marked by the appropriate facility owner as per the requirements of the PA One Call Act as amended. Physical layout is to be performed in full compliance with the PA One Call PA Act 287 of 1974 as amended by Act 18 of 1996 and Act 50 of 2017.

4.5 The Owner, Architect, and Construction Manager will not be responsible for the adequacy of data furnished to prospective Bidders on subsurface conditions, underground facilities, and other physical conditions. This information is provided based on information available. Bidder assumes responsibility for verifications, adjustments, and modifications that may be required since this is generally recognized as inherent to the work of the Contract Documents.

4.6 Before submitting a Bid, each Bidder will, at Bidder's expense, make or obtain any additional examinations, investigations, explorations, tests and studies, and obtain any additional information and data which pertain to the physical conditions (surface, subsurface, and underground facilities) at or contiguous to the site or otherwise which may affect cost, progress, performance, or furnishing the Work and which Bidder deems necessary to determine its Bid for performing and furnishing the Work in accordance with the time, price, and other terms and conditions of the Contract Documents.

4.7 On request in advance, Owner will provide each Bidder access to the site to conduct such explorations and tests, as each Bidder deems necessary for submission of a Bid. Bidder shall fill all holes, clean up, and restore the site to its former condition upon completion of such explorations.

4.8 The lands upon which the Work is to be performed, rights-of-way, and easements for access thereto and other lands designated for use by the Bidder in performing the Work are identified in the Contract Documents. All additional lands and access thereto required for temporary construction facilities or storage of materials and equipment are to be provided by Bidder. Easements for permanent structures or permanent changes in existing structures are to be obtained and paid for by Owner unless otherwise provided in the Contract Documents.

4.9 The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of the Bidding Documents and, that without exception, the Bid is premised upon performing and furnishing the Work required by the Contract Documents and such means, methods, techniques, sequences, or procedures of construction as may be indicated in or required by the Contract Documents, and that the Contract Documents are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performance and furnishing of the

Work.

5. SCOPE

5.1 Contracts will be awarded in (6) prime contracts: Separate bids shall be submitted for: (BP-01) Site Construction, (BP-02) General Construction, (BP-03) Fire Protection Construction, (BP-04) Plumbing Construction, (BP-05) Mechanical Construction and (BP-06) Electrical Construction.

5.2 Each prime contractor shall furnish all labor, equipment, and materials necessary to complete the work called for and implied by the plans and specifications.

6. TIME

6.1 The Contract Documents include potential assessment of Liquidated Damages. Refer to AIA Document A132 – 2019, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition.

7. INTERPRETATIONS OF CONTRACT DOCUMENTS PRIOR TO BIDDING

7.1 If any person submitting a bid for construction of the Work is in doubt as to the true meaning or intent of any part of the proposed Contract Documents, or find discrepancies or omissions, they shall submit a request for information to the Architect and Construction Manager no later than the date indicated in the Bid Schedule.

7.2 Interpretation or correction of proposed Contract Documents will be made only by Addendum and will be released to all prime contract bidders of record. The Owner, Architect, and Construction Manager will not be responsible for any other explanations or interpretations of the proposed Contract Documents.

7.3 During the bidding period, Bidders may be furnished these Bid Addenda modifying the Bid Documents. Any such Addenda shall be taken into account in submitting a Bid and shall form a part of the Contract Documents. Receipt of Bid Addenda must be identified on Bid Form.

7.4 When mistakes or omissions occur in the drawings and/or specifications, they shall be brought to the Construction Manager's attention before proceeding with the work.

7.5 All construction shall be in accordance with all federal, state, and local building codes and ordinances, which shall take precedence over these drawings and specifications.

7.6 Manufacturer's directions – All manufacturer's articles, materials and equipment shall be supplied, installed, connected, cleaned or conditioned in strict accordance with the manufacturer's printed directions.

7.7 If there is a discrepancy between the contract documents and the information on Building Connected the contract document requirements shall prevail in all cases.

8. REQUESTS FOR INFORMATION

8.1 If additional information is required concerning the meaning or intent of the Bid Documents, all questions and requests for information must be submitted electronically via Building Connected.

9. SUBMISSION OF PROPOSALS

9.1 Bids shall be submitted at the time and place indicated in the Advertisement for Bids and shall be enclosed in an opaque, sealed envelope, marked with the Project title, Contract No., and, if applicable, the designated portion of the Project for which the Bid is submitted. Envelopes shall contain the name and address of the Bidder and accompanied by the documents listed below. If the Bid is sent through the mail or other delivery system, the sealed envelope shall be enclosed in another envelope with the notation "BID ENCLOSED" on the face if it. One (1) hard copy of all documents listed below along with one (1) electronic USB are required to be submitted at the time of the Bid. Receipt of Bid is acknowledged when delivered to the Owner and not when mailed.

9.2 **Each Bidder shall submit one (1) hard copy of the complete bid submission and one (1) electronic USB.**

The following shall be included in the bid submission:

1. Form of Proposal, fully executed and notarized
2. Bid Bond or Certified Check or Cashier's check in the amount of 10% of the Bid total and shall include Consent of Surety and Power of Attorney
3. Non-Collusion Affidavit, Signed and Sealed
4. Non-Discrimination Clause, Signed and Sealed
5. PA Public Works Employment Verification Form (E-Verify)

Note that the following will be required to be submitted by ALL Bidders at the request of the Construction Manager within 48 hours of bid submission:

1. Bidder's Qualifications, AIA A305, completed
2. Schedule of Values
3. List of Subcontractors
4. Safety Questionnaire

Note that the successful bidder will be required to submit the following documents and any other documents deemed necessary by the Construction Manager upon issuance of Letter of Intent to Award:

1. Certificate of Insurance
2. Performance Bond in the amount of 100%
3. Payment Bond in the amount of 100%
4. No Lien Agreement
5. Maintenance Bond

10. BIDDERS RESPONSIBILITIES

10.1 Bidders will be given permission to withdraw any proposal after it has been received by the Owner, provided the Bidder or his agent duly authorized to act for him, personally appears at the Owner's Business Office with a written request signed by the Bidder prior to the time set forth for the opening of the Bids. At the time set for the opening of Bids, the withdrawn proposal will be returned to the Bidder. Such withdrawn proposals will not be opened or read at the Bid opening. Bids may not be modified after submittal.

10.2 Bids shall be irrevocable for ninety (90) days after the actual day of opening thereof unless the Owner is delayed in awarding the Contract due to the failure to receive a required approval/permit from one or more reviewing bodies/governmental agencies having jurisdiction over the Project, the sale of bonds or the award of a grant, in which case, Bids shall be irrevocable for (120) calendar days after Bid opening. Absent an exception for extending time for the award of the Contract, the Owner and the lowest responsible and responsive Bidder may mutually agree in writing to extend the time for the Owner to award the Contract.

10.3 Neither the designation of the apparent lowest responsible Bidder, nor the issuance of a Notice of Intent to Award to the Bidder so designated shall operate to release any other Bidder from its Bid. Each such other Bidder, unless earlier released from its Bid by specific action of the Owner, shall remain bound by its Bid until the earlier of (1) the date of actual execution by Owner of the Agreement Between Owner and Contractor with the Bidder whom the Award of Contract has been made, or (2) the expiration of the firm Bid period stipulated above.

10.4 Negligence by the Bidder in preparing his Bid confers no right of withdrawal or modification of his proposal after such proposal has been opened. No claims on account of mistakes or omissions of any proposal will be considered. Notwithstanding the above, a Bidder may withdraw his Bid within two (2) business days after the Bid opening time in accordance with the Public Contracts – Withdrawal of Bids Law, Act of January 23, 1974, P.L. 9, No. 4, 73 P.S. §1601 et seq., as amended. A Bid which has been opened may be withdrawn only in accordance with the causes set forth in said Act and for no other reasons. Strict compliance with said Act is required to withdraw a Bid after opening.

10.5 By submitting a bid, the bidder covenants and agrees that he has carefully examined the site, the existing building and details, the documents and the Contract and that, from his own investigations, he has satisfied himself as to the nature and location of the work, the general and local conditions and all matters which may in any way affect the work or its performance and that as a result of such examination, he fully understands the intent and purpose thereof and his obligations thereunder, and that he will not make any claim for, or have any right to, damages because of any lack of information.

10.6 Each bidder is highly encouraged to visit the site to familiarize themselves with the existing conditions thereon pertaining to the work. The bidder shall examine all the documents relating to the Contract on which he is bidding before submitting a Bid. Each Contractor shall obtain the full knowledge by personal and careful inspection of all existing conditions at the site and of all requirements of the Bid Documents that affect the work. The Contractor accepts all such conditions and requirements and hereby assumes all responsibilities and costs resulting from their failure to obtain full knowledge of them.

10.7 The Bids are to include all work as shown or specified, including but not limited to Unit Prices, Alternates and Allowances as may be requested or noted. These prices are important and should be carefully considered when Bids are submitted, and in the form, as quoted, on the Bid forms, attached to these

specifications. It is requested upon any bidder, to include all Alternate Bids or Unit Prices. Should any bidder fail to submit requested Alternate Bids or Unit Prices the bidder will be responsible for his omission and shall have no claim against the Owner, should the Owner award the Contract to a bidder who has submitted a more satisfactory and complete bid.

10.8 Any Unit Prices furnished by the Bidder as part of his Proposal Form shall be made a part of the Agreement and shall be the basis of compensation for any Unit Price work required on the Project.

10.9 The Bidder shall identify and list Prior to Award of Contract each Major Subcontractor or material supplier, with their respective prices, to be used on this Project in accordance with the General Conditions of the Contract.

10.10 Bidders shall also secure and submit Major Subcontractors Qualification Statements accordingly as noted below.

10.11 Bidder warrants to execute the Contract, furnish required Bonds in form as incorporated in the contract documents and furnish required insurance certificates and other items, in amounts specified or required, by the owner. Bidder shall also warrant beginning work in accordance with the Project Contract agreement.

10.12 All permits and inspections shall be obtained by each prime contractor and paid for by the owner. The contractors will be required to pay all license and/ or registration fees by the local community.

10.13 A Waiver of Liens shall be signed by The Contractor as requested by the CM or prior to the beginning of the ordering of material and before any work is performed on the property. The Waiver of Lien to be filed and indexed in the Berks County Prothonotary's Office is found as an attachment at the end of these specifications. The Contractor shall provide a Release of Liens for themselves and all suppliers prior to application of final payment.

10.14 All work to be in accordance with applicable codes and ordinances adopted and/or as amended by the local Municipality, and the Commonwealth of Pennsylvania, Pennsylvania Uniform Construction Code, Act 45, The International Code Council, International Building Code – 2021 and Chapter 11 of the IBC 2018.

10.15 This Project falls under the Commonwealth of Pennsylvania Public Works Employment Verification Act, Act 127 of 2012, 43 P.S. § 167.1, which requires all public work contractors and subcontractors to utilize the Federal Government's E-Verify system to ensure that all employees performing work on public work projects are authorized to work in the United States. All Bidders are required to submit a Public Works Employment Verification Form as a precondition for the Contract Award.

10.16 The "Bid Bond," A.I.A. Document No. A310, of the American Institute of Architects, 2010 Edition, is hereby made a part of the Specifications as bound herein. The Bond is subject to all modifications as set forth hereinafter.

10.16.1 A bank cashier's, bank treasurer's certified check or bid bond in favor of Berks County in the amount of 10% of all base bids plus the amount of all add alternates, is required from each bidder and must be submitted electronically with the bid. It is understood the Bid Deposit will be forfeited to and retained by the owner as liquidated damages if the Proposal, or any part thereof, is accepted by the Owner and the Bidder fails to execute the contract and furnish

Bonds within ten (10) days from the date of "Notice of Award". Should the owner fail to make any awards through no fault or failures on the part of the bidders, the Owner shall return said Bid Deposits.

10.16.2 Agreement of Surety: The "Agreement of Surety" form is to be provided to the Owner along with the bid proposal should the bid deposit submitted be other than a "Bid Bond". Attached is a 1-page sample letter to be signed and sealed from a corporate surety agreeing to provide a Performance Bond and Payment Bond in favor of the Owner as required for faithful performance and proper fulfillment of the contract. The Agreement is subject to all modifications as set forth hereinafter.

10.16.3 Non-Collusion Affidavit: The "Non-Collusion Affidavit" form is to be provided to the Owner along with the bid proposal by all prospective bidders. Attached is a document to be signed by all prospective bidders and sealed by notary, assuring the owner that the proposal for work is being submitted in good faith and without collusion with any other contractors or sub-contractors. The Affidavit is subject to all modifications as set forth hereinafter.

10.17 Non-Discrimination Clause: The "Non-Discrimination Clause" form is to be provided to the Owner along with the bid proposal by all prospective bidders. Attached is a document to be signed by all prospective bidders, assuring the owner that the proposal for work is being submitted in good faith and without collusion with any other contractors or subcontractors. The Clause is subject to all modifications as set forth hereinafter.

10.18 Performance and Payment Bonds: The "Performance Bond" and the "Payment Bond," A.I.A. Documents No. A312-2010, of the American Institute of Architects, are hereby made a part of the Specifications as bound herein. The Bonds are subject to all modifications as set forth hereinafter.

10.19 Maintenance Bond – the execution of a maintenance bond is required, per Section 00 4316.

10.20 CONTRACTOR'S QUALIFICATION STATEMENT

10.20.1 Each Bidder is required to submit a Contractor's Qualification Statement (AIA A305-2020) with a sworn statement of his financial responsibility, technical qualifications and evidence that he has completed at least Five similar construction contracts within the last five (5) years, each with a minimum value of 75% of the total amount of the proposal submitted. In addition, the designated Project Manager and Superintendent must have at least ten (10) years' experience in similar projects with similar values and phased construction. The Owner /CM has the right to reject a Project Manager or Superintendent if they do not specifically meet the qualifications.

10.21 REJECTION OR WITHDRAWAL OF PROPOSALS

10.21.1 A bidder on any Prime Contract may withdraw his bid from consideration within forty-eight (48) hours of the bid opening without forfeiture of the certified check, bank cashier's check, surety bid bond or other security filed with the bid if the price bid was submitted in good faith, and the bidder submits credible evidence that the reason for the price bid being substantially lower was a clerical mistake as opposed to a judgment mistake, and was actually due to an unintentional and substantial arithmetical error or an unintentional

omission of a substantial quantity of work, labor, material or services made directly in compilation of the bid; provided, 1.) the mistake or error must be proven and submitted to the Owner / CM for review and approval: 2.) notice of a claim of the right to withdraw such bid is made in writing with the contracting body within two business days after the opening of bids; and 3.) the withdrawal of the bid would not result in the awarding of the contract on another bid of the same bidder, his partner, or to a corporation or business venture owned by or in which he has a substantial interest.. No bidder who is permitted to withdraw a bid shall supply any material or labor or perform any subcontract or other work on the project without written approval of the contracting body. No accepted bid may be withdrawn for ninety (90) calendar days after the Bid Opening. Initial determination as to whether there was a clerical mistake or arithmetical error or unintentional omission of substantial quantity of work, labor, material, or services will be within the discretion of the Architect, a representative of the Owner, with the assistance of the Construction Manager, and such decision shall be considered final and determinative.

10.21.2 The Township reserves the right to reject any bid received if the bidder's responses to the Contractor's Qualification Statement (AIA Document A305) fail to satisfy the Township that such bidder is qualified to carry out the obligations of the Contract and to complete work, as specified. By way of specific example, a default in a contract in the last five years will, absent extraordinary justification, disqualify a bidder, as will litigation on a construction contract which, in the past five years, resulted in an award against the interest of the bidder.

10.22 PA PREVAILING WAGE

10.22.1 The Schedule of Minimum Wages as determined by the Department of Labor and Industry, Commonwealth of Pennsylvania, is hereby made a part of this Specification. A copy of these rates is attached in Section 007343 Prevailing Wage Requirements.

10.22.2 Copies of these forms may be obtained from the Prevailing Wage Division. The Project is subject to the Pennsylvania Prevailing Wage Act (Act of 1961, P.L. 987 No. 442) as amended. The pages titled, "Duties of Awarding Agencies Under Pennsylvania Prevailing Wage Act" may be obtained from the Prevailing Wage Division. These duties include requirements of both the awarding agency (Owner), the Contractor(s) and Subcontractors. It is understood that the Owner will comply with its required duties. The Contractor(s) and Subcontractors shall comply with all duties and instructions required of them. All items mentioned as "contract requirements" in the documents are hereby made a part of the contract to the same extent as if included in the Owner-Contractor Agreement.

10.22.3 "Payroll Certification for Public Works Projects". All Contractors and Subcontractors shall complete this form for each week worked on this project. Each Weekly Payroll Certification form shall be Notarized and forwarded to the Construction Manager for inclusion in the Owner's records. Payroll Certification Forms covering work periods included in an application for payment shall be submitted before or with the respective Application For Payment. If the certifications Forms are not submitted with the Application for Payments, the Owner will withhold payment until received.

10.22.4 US Steel Act 132. The Steel Products Procurement Act, 73 P.S. §§1881-1887, and the Trade

Practices Act, 71 P.S. §773.101 et seq.

10.22.4.1 If any steel products are to be used or supplied in the performance of the Contract, only steel products produced in the United States shall be used or supplied in the performance of the Contract or any subcontract thereunder. This provision shall not apply in any case where the head of the public agency, in writing, determines that the type of steel products necessary to the performance of the Contract are not produced in the United States in sufficient quantities to meet the requirement of the Contract.

10.22.4.2 Contractors must ensure compliance with all provisions of the above which place restrictions upon the source of certain steel, cast iron and aluminum products allowed to be used in the performance of public agency contracts. The provisions of the above sited statutes are incorporated herein as if the same were set out at length herein.

10.22.4.3 Bidding will be public and utilize Pennsylvania State Prevailing Wage Rates established by the Commonwealth of PA Department of Labor and Industry.

11. INDEMNITY

11.1 The undersigned shall indemnify and hold harmless Exeter Township, Boyle Construction, Inc., Manns Woodward Studios and Herbert, Rowland & Grubic, Inc., all consultants and each officer and employees, with respect to any claims, losses, expenses, costs and reasonable attorney's fees incurred by Exeter Township, Boyle Construction, Inc., Manns Woodward Studios and Herbert, Rowland & Grubic, Inc., all consultants and each officer and employees, with regard to the undersigned's failure to comply with these Bid Documents and procedures.

11.2. Additional Insureds: All shall be named as "Additional Insureds" under all policies of insurances. Coverage shall be primary and non-contributory.
1. Exeter Township - its members, officers, employees and consultants.
2. Boyle Construction, Inc., Manns Woodward Studios, and Herbert, Rowland & Grubic, Inc. - and their members, officers, employees and consultants.
3. The Commonwealth of Pennsylvania.

12. Extra Work – No extra work will be considered unless the Exeter Township authorizes such work, in advance, in writing.

13. Safety and Health Regulations – The Bidder further agrees that should he enter into a Contract with the Exeter Township to perform all or any portion of the work included herein, he will comply with all the provisions of the Department of Labor, Occupational Safety and Health Administration, Safety and Health Regulations for Construction, contained in the Federal Register Volume 37, Number 243, Part II, dated Saturday, December 16, 1972.

14. SPECIFICATION AND PRODUCT DESCRIPTION

14.1 Substitute Material and Equipment – Proposal shall include furnishing and installing material in strict accordance with Contract Documents. No substitutions or deviations will

be considered except as provided for in Contract Documents

14.2 Any product substitution requests must be made in writing including all product literature and specification at least ten (10) calendar days prior to the bid due date.

15. This project is financed by Exeter Township.

16. OPENING OF PROPOSALS

16.1 The Owner will, as soon as practical, award the Contracts to the Bidders, and shall have the right to reject any or all Bids, to waive technical defects, and to accept or reject any part of any Bid if in the judgment of the Owner its best interest shall be served by such action; and the Bidder, in submitting a Bid accepts these conditions. No rights shall accrue to any person submitting a Bid or Proposal until such Bid has been accepted, and a contract awarded, and such contract completely executed in writing by both parties.

17. AWARD OF CONTRACT

17.1 The Owner's intent is to enter into Contracts with the lowest responsible and qualified Bidders.

17.2 The Owner reserves the right to reject any and all bids. The Owner reserves the right to waive non-material defects, informalities or technicalities in any Bid in accordance with law. The Owner reserves the right to disregard all nonconforming, non-responsive, unbalanced, or conditional bids. Also, Owner reserves the right to reject the Bid of any Bidder if Owner believes that it would not be in the best interest of the Project to make an award to that Bidder, whether because the Bid is not responsive, or the Bidder is unqualified or of doubtful financial ability or fails to meet any other pertinent standard or criteria established by the Bidding Documents.

17.3 In evaluating Bids, Owner will consider the qualifications of such Bidders (see Article 3), whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices and other data, as may be requested in the Bid Form or prior to the Notice of Award.

17.4 Owner may consider the qualifications and experience of Subcontractors, suppliers, and other persons or organizations proposed for any portions of the Work requested by Owner. Owner also may consider the operating costs, maintenance requirements, performance data, and guarantees of major items of materials and equipment proposed for incorporation in the Work when such data is required to be submitted prior to the Notice of Award.

17.5 Owner may conduct such investigations as Owner deems necessary to assist in the evaluation of any Bid and to establish the responsibility, qualification, and financial ability of Bidders, subcontractors, suppliers, and other persons or organizations to perform and furnish the Work in accordance with the Contract Documents to Owner's satisfaction within the prescribed time.

17.6 If the Contract is to be awarded, Owner will give the Successful Bidder a Notice of Intent to Award within sixty (60) days after the day of Bid opening unless extended as set forth in these Instructions to Bidders.

17.7 The Owner reserves the right to waive non-material defects, informalities, or technicalities in any Bid in accordance with the law.

18. CONTRACT SECURITY & INSURANCE

18.1 The General Conditions set forth the Owner's requirements as to Performance Bonds, Payment Bonds, and insurance requirements.

18.2 The apparent low Bidder must provide Payment and Performance Bonds in the forms included in the Contract Documents and all Certificates of Insurance or other insurance information as required pursuant to the General Conditions of the Contract within ten (10) days of the issuance of Notice of Intent to Award. **Other bond forms will not be accepted**. Failure of the apparent low Bidder to provide original executed Payment and Performance Bonds in the required form within the required time will result in forfeiture of the Bid Security.

19. SIGNING OF AGREEMENT

When Owner/Construction Manager issues a Notice of Intent to Award to the Successful Bidder, the Successful Bidder shall within ten (10) days thereafter, deliver to the Owner/Construction Manager, One (1) original copy of the required bonds, insurance certificates, and any other documents that may be requested with the Notice of Intent to Award. Within ten (10) days thereafter, the Construction Manager will send contract agreements via DocuSign to Successful Bidder. The Successful Bidder shall sign the agreements and DocuSign will automatically send the agreements to the Owner for signature. Once signed by the Owner DocuSign will automatically return an executed agreement to all parties.

20. RETAINAGE

Retainage will be in accordance with the Contract Documents. Reference Article 9 of the General Conditions.

21. PREVAILING WAGES

Pennsylvania Prevailing wage rates will apply to this project. The Contractor and its subcontractors shall comply with the provisions, duties, obligations, remedies, and penalties of the Pennsylvania Prevailing Wage Act, 43 P.S. § 165-1 et seq. which is incorporated herein by reference as if fully set forth herein. The general prevailing minimum wage rates, as determined by the Secretary of Labor and Industry shall be paid for each craft or classification of all workmen needed to perform work on the Project during the term hereof for the locality in which the work is to be performed.

22. COMPETENT WORKMEN

No person shall be employed to perform any work under the Contract if they are not legally eligible to be employed under applicable state and federal law or if they are not a trained, competent workman, or mechanic, as applicable. For purposes of this Section, no workman or mechanic, as applicable, shall be regarded as competent unless he shall be duly skilled in the applicable branch of labor, and paid the applicable prevailing wage.

22.1 The Commonwealth of Pennsylvania enacted Act 127 of 2012, known as the Public Works Employment Verification Act ('the Act') which requires all public work contractors and subcontractors to utilize the Federal Government's E-Verify system to ensure that all employees performing work on public work projects are authorized to work in the United States. The Contractor and its Subcontractor (as such term is defined in the Act) are required to comply with the Act and the Statement of Policy as published in the Pennsylvania Bulletin, December 29, 2012, and effective January 1, 2013.

23. EROSION CONTROL

The Successful Bidders shall comply with all rules and regulations of Chapter 102, Title 25 of Pennsylvania Code, relating to Soil Erosion and Sedimentation Control.

24. PUBLIC WORKS CONSTRUCTION CONTRACTS

In consideration of the funds awarded and activities funded under the Contract which involves construction, reconstruction, alteration, repair, improvement, or maintenance of a building, structure, or improvement ("The Work"), the Successful Bidder agrees to perform in accordance with the following:

24.1 Steel Products Procurement Act.

24.2 Trade Practices Act.

24.3 Public Works Contractor's Bond Law of 1967. Prior to the award of any Contract for any Work on the Project, the contractor to whom the contract is to be awarded must furnish the following bonds which shall become binding upon the award of such Contract:

24.3.1 A performance bond at 100 percent of the Contract Sum, conditioned upon the faithful performance of the Contract in accordance with the plans, specifications, and conditions of the Contract. Such bond shall solely for the protection of the Owner which awarded said contract.

24.3.2 A payment bond at 100 percent of the Contract Sum. Such bond shall be solely for the protection of claimants supplying labor or materials to the Successful Bidder, its contractor(s) or to any of its Subcontractors, in the prosecution of the work provided for in such Contract and shall be conditioned for the prompt payment of all such material furnished or labor supplied or performed in the prosecution of the Work. "Labor or materials" shall include public utility services

and reasonable rentals of equipment, but only for periods when the equipment rented is actually used at the site.

24.3.3 Reference Article 11.1.2 of the General Conditions for additional requirements.

25. SEVERABILITY

25.1 Should any section or any part of any section of the Contract be rendered void, invalid, or unenforceable by any court of law, for any reason, such a determination shall not render void, invalid, or unenforceable any other section or part of any section of the Contract.

26. AMERICANS WITH DISABILITIES ACT

During the term of this Contract, the Successful Bidder agrees as follows:

26.1 Pursuant to federal regulations promulgated under the authority of The Americans with Disabilities Act, 28 C.F.R. § 35.101 et. Seq., the Successful Bidder understands and agrees that no individual with a disability shall, on the basis of the disability, be excluded from participation in this Contract or from activities provided for under this Contract. As a condition of accepting and executing the Contract, the Successful Bidder agrees to comply with the General Prohibitions Against Discrimination, 28 C.F.R. § 35.130, and all other regulations promulgated under Title II of The Americans with Disabilities Act which are applicable to all benefits, services, programs, and activities provided by the Commonwealth of Pennsylvania through contracts.

27. HEALTH AND SAFETY

27.1 Reference Article 10 of the General Conditions.

28. BONDS & INSURANCE

28.1 The Bidder will be required to furnish a Bid Bond, Performance Bond, and Labor and Material Payment Bonds in the amount of one hundred percent (100%) of the Contract Price in the form provided in the Contract Documents. Said Sureties shall be listed on the current Federal Register and have an AM Best rating of 'A-' or better and a financial rating of Class X or higher.

28.2 Insurance companies must be rated 'A-' or better in A.M. Best.

28.3 Bidder shall include the cost of the Bonds & Insurance in their Bid.

28.4 Bidder shall provide the insurance required in the General Conditions.

29. PRE-BID CONFERENCE

29.1 The Mandatory Pre-bid Conference will be held on the date and time listed in the Advertisement for Bids. Representatives of Owner, Construction Manager (CM), Architect and Civil Engineer will be present to discuss the Project. CM will transmit to all prospective Bidders of record such Addenda, as CM considers necessary in response to questions arising at the Conference. **Non-attendees will not be permitted to bid.**

30. PROJECT FINANCING

The Work to be done under the Contract is public work and may be financed in whole or part by the Owner (a public body) by issuance of bonds, which are subject to various qualifications and restrictions. The Owner, in such case and in good faith, intends to consummate such financing, but its ability to do so is subject to many factors beyond its control. It is therefore expressly understood and agreed to by each Bidder that, notwithstanding any other provision of the Contract Documents, the Owner may at any time cancel any award made by it, or cancel any contract entered into with any Bidder, without liability to the Bidder, at any time before the Bidder has been given written notice to proceed and has actually begun Work under the Contract if financing satisfactory to the Owner cannot reasonably be consummated as contemplated, or if any court of competent jurisdiction shall enjoin or otherwise prohibit the Owner from proceeding with the Work.

30.1 The Work to be done under the Contract is funded in part by a Redevelopment Assistance Capital Program (RACP) Grant from the Commonwealth of Pennsylvania, Office of the Budget. Bidders are notified that Projects funded by state funds are subject to various qualifications, restrictions, and special requirements.

31. FAILURE TO EXECUTE CONTRACT

Failure of the Successful Bidder to whom Notice of Intent to Award has been given to deliver appropriate Payment and Performance Bonds, Certificates of Insurance, or execute the Contract within the time specified, shall constitute a default by such Bidder and the Owner may, at its sole discretion, award the contract to the next lowest responsive and responsible Bidder or re-advertise for Bids, and the defaulting Bidder shall pay to the Owner the difference between the amounts of his Bid and any higher amount for which the Owner may contract for the required work, plus any advertising, consulting, legal or other expenses incurred by reason of the default. The Bid Security of such defaulting Bidder shall be applied on account of said damages, and if the amount of said damages exceeds the amount of the Bid Security, the defaulting Bidder shall pay to the Owner the full amount of the excess.

END OF SECTION 00 1100

SECTION 00 1113 – ADVERTISEMENT FOR BIDS

Exeter Township will receive sealed bids for the Exeter Township Emergency Services Facility Project located in Exeter Township, Berks County, Pennsylvania. Sealed Bids for all contracts shall be delivered to Larry Piersol, Township Manager, no later than 2:00 PM prevailing time on Tuesday, November 10, 2026, to the Township Building, 4975 DeMoss Road, Reading, PA 19606 at which time bids will be publicly opened and read.

A **MANDATORY** pre-bid conference for **ALL** contracts will be held **IN-PERSON**, on Wednesday, October 7, 2026, **at 2:00 PM** at the Township Building, located at 4975 DeMoss Road, Reading, PA 19606. **Attendance of all Prime Contract Bidders is mandatory.**

Construction will be bid for the following Prime Contracts:

SITE CONSTRUCTION - BP-01
GENERAL CONSTRUCTION - BP-02
FIRE PROTECTION - BP-03
PLUMBING CONSTRUCTION - BP-04
MECHANICAL CONSTRUCTION - BP-05
ELECTRICAL CONSTRUCTION - BP-06

Bid Documents will be available at no cost through Building Connected at 1:00 PM prevailing time on Thursday, October 1, 2026. Bidders may obtain electronic access to the documents by contacting Tracey Glad via email at tglad@boyleconstruction.com.

All bids must be accompanied by a certified check or bank draft, payable to Exeter Township, or a satisfactory Bid Bond executed by the Bidder and an acceptable surety in the amount equal to ten percent (10%) of the total bid shall be submitted with each bid, along with all required items as indicated in the Bid Documents checklist. Performance and Payment Bonds will be required from the lowest responsible bidders at a later date along with all other required documentation.

The Project Architect is Manns Woodward Studios, 8098 Sandpiper Circle, Suite H, Nottingham, MD 21236. The Project Construction Manager is Boyle Construction, 3850 Sierra Circle, Suite 400, Center Valley, PA 18034.

This project is subject to the provisions of the PA Prevailing Wage Act.

The award will be made to the lowest responsible and responsive bidder submitting a bid in conformity with the specifications. However, the Township reserves the right to reject any or all bids.

By Resolution of the Exeter Township Board of Supervisors
Mr. Larry Piersol
Township Manager

Adv #1: Monday, September 21, 2026
Adv #2: Tuesday, September 29, 2026
Adv #3: Monday, October 5, 2026

END OF SECTION 00 1113

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SECTION 00 1155 – LETTER OF INSURER

DATE: _____

TO: Larry Piersol, Township Manager
Exeter Township
4975 DeMoss Road
Reading, PA 19606

Dear Mr. Piersol:

The undersigned insurance agent, licensed to do business in the Commonwealth of Pennsylvania and authorized to issue this letter on behalf of the following insurance company or companies:

_____

_____

hereby represents that if

_____
(Insert name of Bidder)

is awarded the contract for the construction of the project, as is described in the Contract for Construction, then the above-named insurance company or companies will issue insurance, naming Exeter Township and its consultants, Boyle Construction, Inc. and all consultants, Manns Woodward Studios. Inc. and all consultants, the Commonwealth of Pennsylvania and all consultants and each of the above named officers, agents, and employees as additional insured, for the coverages and in the amounts required by the Contract Documents, as set forth in Article 11 of the General Conditions.

_____
(Name of Agent)

By: _____
(Authorized Representative)

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Exeter Township
Emergency Services Facility
70 Gibraltar Road
Reading, PA 19606

Bid Form
Bid Package #01 – Site Construction

Bids Due: 11/10/26 @ 2:00 PM

Deliver Sealed bids to:
Exeter Township
Attn: Larry Piersol, Township Manager
Exeter Township Building
4975 DeMoss Road
Reading, PA 19606

Date: _____

Firm Name: _____

Firm Address: _____

_____

Contact: _____

Phone Number: _____

Email: _____

THIS BID FORM SHALL NOT BE ALTERED IN ANY MANNER. ANY ALTERED BID FORMS SHALL BE CONSIDERED NON-RESPONSIVE AND WILL BE REJECTED.

This Bid is submitted in accordance with your Advertisement inviting bids to be received for the Exeter Township Emergency Services Facility Bid Package #01 Site Construction.

The undersigned BIDDER proposes and agrees, if this Bid is accepted, to enter into an Agreement with OWNER in the form included in the Contract Documents to complete all Work as specified or indicated in the Contract Documents for the Contract Price and within the Contract Time indicated in this Bid and in accordance with the Contract Documents.

In submitting this Bid, BIDDER represents, as more fully set forth in the agreement that:

a. BIDDER has carefully examined the Contract Documents including all Addenda which are incorporated with these documents indicating various conditions affecting this contract, the undersigned herein agrees to furnish all materials, perform all labor and do all else necessary to complete the work for the Bid Package #01 indicated above for the Contract for the above named Project in accordance with said Contract Documents.

b. BIDDER has examined the site and locality where the Work is to be performed, the legal requirements (federal, state, and local laws, ordinances, rules and regulations) and the conditions affecting cost, progress or performance of the Work and has made such independent investigations as BIDDER deems necessary. Failure to visit and not be familiar with the Project site shall be no reason for future requests for additional compensation or costs of any kind.

LUMP SUM BASE BID – The contractor shall state the price for the completion of all work as indicated by the Contract Documents that is not included in the bid alternates listed below. This price shall be the base bid. **The base bid below shall include any and all allowances as described below**. All allowances MUST include all overhead and profit.

	BASE BID LINE ITEM SUB-TOTALS	
	Line Item Scope of Work	**Line Item Scope of Work Bid Subtotal**
BB1	Contractors' Cost of Work	Words: _____ Dollars Figures: ($_____)
BB2	SC-1: Owner Contingency Allowance, Site Construction Contract	Words: One Hundred Thousand Dollars Figures: ($100,000.00)

	UNIT PRICE ITEMIZATION SCHEDULE			**UNIT PRICE ALLOWANCE SCHEDULE**
BB3	**Unit Price No.**	**Contractor's Unit Price Bid**	**Bid Quantity**	**Unit Price Allowance (UPA) Amount** *(To be included in Base Bid)*
	Unit Price No. 1 – Trench Rock Excavation by Hammer in excess of 1CY at individual locations	$_____/CY	150 CY	**Unit Price Allowance No. UPA-1** **$**_____
	Unit Price No. 2 – Bulk Rock Excavation by Ripping in excess of 1CY at individual locations	$_____/CY	100 CY	**Unit Price Allowance No. UPA-2** **$**_____
	Unit Price No. 3 – Unsuitable Soil Removal and Replacement with 2A stone	$_____/CY	100 CY	**Unit Price Allowance No. UPA-3** **$**_____
	Unit Price No. 4 – Unsuitable Soil Removal and Replacement with Suitable Soil	$_____/CY	100 CY	**Unit Price Allowance No. UPA-4** **$**_____
	Unit Price No. 5 – Placement of Flow Fill	$_____/CY	50 CY	**Unit Price Allowance No. UPA-5** **$**_____

TOTAL LUMP SUM BASE BID Contractors' Cost for the Work (**BB1**) + Owner Contingency Allowances (**BB2**) + Unit Price Allowances (**BB3**)
Words: _____Dollars
Figures: ($_____)

Accompanying this Proposal is a certified check, bank cashier's check, bank treasurer's check or Bid Bond required by the Checklist and Instructions to Bidders, which is deposited as a proposal guarantee, and is to be retained by you and applied as provided in the Instruction to Bidders, in case the undersigned shall default in executing the Contract or in furnishing the required Bonds and insurance certificates within the time specified by the Contract Documents.

The undersigned hereby certifies that this Proposal is genuine and not sham or collusive or made in the interest of or in behalf of any person, firm or corporation not herein named and that the undersigned has not directly or indirectly induced or solicited any bidder to refrain from bidding and that the undersigned has not in any manner sought by collusion to secure for himself any advantages over any other bidder.

The undersigned, intending to be legally bound, agrees that this Proposal shall be irrevocable and shall remain subject to your acceptance for 90 days after date set for bid opening unless the Owner is delayed in awarding the Contract due to the failure to receive a required approval or permit from one or more reviewing bodies/governmental agencies having jurisdiction over the Project, the sale of bonds, or the award of a grant, in which case, Bids shall remain open for 120 days after the day of Bid Opening. BIDDER will sign the Agreement and submit the Contract Security and other documents required by the Contract Documents within ten (10) days after the date of OWNER'S Notice of Award, except as provided by Act 317 of 1978, approved November 26, 1978, which provides for possible extensions of the holding period.

The undersigned submit this Proposal with the full knowledge of the Contract Document and Project requirements and hereby agrees that each phase of the work of this Project, under this Contract, shall be fully and finally completed and ready for occupancy and use on or before the completion date identified for that specific phase in the Contract Documents.

Bidder accepts the provisions of the Agreement as to the liquidated damages for failure to meet the milestone dates defined and substantial completion of the project shall be calculated at One Thousand Five Hundred Dollars ($1,500.00) per day for each calendar day of delay until the work is substantially complete.

The contract amount stated above includes all sales taxes, excise, and other taxes for all materials and appliances subject to and upon which taxes are levied.

The undersigned must enclose the following required attachments to this Bid Form. **Each bidder shall submit two (2) hard copies of the complete bid submission and one (1) electronic USB.**

The following shall be included in the bid submission:

1. Form of Proposal, fully executed and notarized
2. Bid Bond or Certified Check or Cashier's check in the amount of 10% of the Bid total and shall include Consent of Surety and Power of Attorney
3. Non-Collusion Affidavit, Signed and Sealed
4. Non-Discrimination Clause, Signed and Sealed
5. PA Public Works Employment Verification Form (E-Verify)

Note that the following will be required to be submitted by ALL Bidders at the request of the Construction Manager within 48 hours of bid submission:

1. Bidder's Qualifications, AIA A305, completed
2. Schedule of Values
3. List of Subcontractors
4. Safety Questionnaire

Note that the successful bidder will be required to submit the following documents and any other documents deemed necessary by the Construction Manager upon issuance of Letter of Intent to Award:

1. Certificate of Insurance
2. Performance Bond in the amount of 100%
3. Payment Bond in the amount of 100%
4. No Lien Agreement
5. Maintenance Bond

The undersigned shall indemnify and hold harmless Exeter Township, Boyle Construction, Inc., Manns Woodward Studios and Herbert, Rowland & Grubic, Inc., all consultants and each officer and employees, with respect to any claims, losses, expenses, costs and reasonable attorney's fees incurred by Exeter Township, Boyle Construction, Inc., Manns Woodward Studios and Herbert, Rowland & Grubic, Inc., all consultants and each officer and employees, with regard to the undersigned's failure to comply with these Bid Documents and procedures.

Permits and Inspections: Any required permit fee will be paid by the Owner. Upon award, the successful prime contractor must complete any applicable permit form (and business licenses if required) and submit to the Township. Inspection fees will be paid for by the Owner. Any additional costs incurred due to failed inspections shall be paid by the prime contractor. Any required contractor or business license fees required by the Township are to be paid by the prime contractor.

The Owner also reserves the right to solicit independent proposals as required by Exeter Township guidelines, under a separate contract to perform the services required. **The responsiveness of the Bid and if the Bid is responsible, may be determined by the Owner on the basis of the Unit Prices proposed by the bidder. Unit Prices shall be consistent with verifiable average costs for the work to be performed. Bidders agree that a proposal may be rejected if the Unit Prices submitted are inconsistent with the average cost.** Under NO circumstances will BIDDER perform Unit Price Work without prior written authorization from the OWNER. Contract Unit Price shall include costs for furnishing and installing all materials, labor, tools, equipment, and other incidentals necessary to complete the specified operation. Contract Unit Price shall also apply to deletion of "furnishing and installing" items from the Project.

UNIT PRICE ALLOWANCES: The Contractor must provide a change in scope of work (no change in Contract Sum or Contract Time) Change Order for the allowance work, indicating the allowance amount to be utilized, in which the Construction Manager (CMa) must review with the Owner and approve prior to the Contractor performing the Work. Should the allowance amount be exceeded and the Work approved to be performed, the Contractor will provide a Change Order for the additional Work and only be paid by an approved Change Order for the additional related Work. Similarly, should the allowance used be less than the allowance amount, the Contractor will credit the Owner for the unused allowance amount by a Change Order credit. All OH&P for allowances MUST be included within the Base Bid of the Project. NO additional OH&P will be allowed in allowances. Change Orders for the utilization of allowances shall not include OH&P. Change Orders for additional Work exceeding allowance amounts shall include OH&P. Change Orders for credit of unused allowance amounts shall be provided with OH&P in addition to the remaining allowance amount. OH&P for all stipulations noted above is to be a maximum of 5% combined.

ALTERNATES: The Bidder agrees that the Owner shall have the right to accept or reject any or all of the following alternates, which acceptance or rejection shall enter into the determination of the lowest Bidder. The Bidder agrees that the Contract Time shall not be increased on account of the acceptance of any one or combination of alternates unless specifically stated in such alternate description(s). The Bidder agrees that the Owner shall have the right to accept an alternate that is higher in price than the Base Bid or other alternate. Alternates' prices shall include the cost of furnishing and installing all materials, labor, tools, equipment and other incidentals necessary to complete the Work in accordance with the design intent, manufacturers' recommendations, building codes, authorities having jurisdiction, and the Construction Documents. Do not adjust material allowances under any alternate bid items. Indicate whether alternate cost is an Add or Deduct when a choice is provided. If there is no change in the contract amount for any alternate write "NO CHANGE" or "Zero (0)" in the blank. The failure to enter an amount or "NO CHANGE" in the blanks for an alternate shall be treated conclusively as a Bid of zero dollars for the work described in the alternate.

Alternate #1: The Bidder shall state the adjustment in price to be added to or deducted from the Base Bid to increase the Contractor's Warranty period from one-year to two-year from the date of substantial completion (excluding landscaping). This alternate does not affect other warranties required by the Contract Documents or provided by manufacturers.

ADD/DEDUCT_____Dollars.
(Words)

($ _____)
(Figures)

Alternate #2: The Bidder shall state the adjustment in price to be added to, or deducted from, the Base Bid to perform all earthwork excavations as UNCLASSIFIED in lieu of CLASSIFIED as specified in the Bid Documents. Under this Alternate, rock removal shall be performed through hydraulic/mechanical means (no blasting permitted) and the surplus soils and rock are to be disposed of legally by the contractor offsite or processed to the equivalent of 2A modified for re-use as structural fill onsite.

ADD/DEDUCT_____Dollars.
(Words)

($ _____)
(Figures)

Alternate #3: The Site Contract Bidder shall state the adjustment in price to be added to or deducted from the Base Bid to provide engineered structural fill or 2A modified stone in lieu of using on-site materials for all fills required below the bottom of subgrade stone for the entire building pad and up to 10' outside the new buildings exterior wall line as identified on the Special Excavation Plan. Under this alternate, the resulting excess soils are to be disposed of legally by the contractor off-site. Under this Alternate, the General Contract, Mechanical Contract, Electrical Contract, and Plumbing Contract Bidders shall state the adjustment in price to be added to, or deducted from, the Base Bid to perform their scope of work within the engineered structural fill or 2A modified stone in lieu of on-site materials as identified in the Bid Documents.

ADD/DEDUCT_____Dollars.
(Words)

($ _____)
(Figures)

Alternate #4: The Bidder shall state the adjustment in price to be added to or deducted from the Base Bid to provide heavy duty PennDOT spec asphalt drive in lieu of concrete.

ADD/DEDUCT_____Dollars.
(Words)

($ _____)
(Figures)

Alternate #5: The Bidder shall state the adjustment in price to be added to or deducted from the Base Bid to provide concrete filled permanent bollards in lieu of removable bollards.

ADD/DEDUCT_____Dollars.
(Words)

($ _____)
(Figures)

Alternate #6: The Bidder shall state the adjustment in price to be added to or deducted from the Base Bid to provide sod in lieu of seeded lawn in the areas shown on the drawings.

ADD/DEDUCT_____Dollars.
(Words)

($ _____)
(Figures)

Alternate #7: The Bidder shall state the adjustment in price to be deducted from the Base Bid landscaping from the Project (Plantings and Mulch).

DEDUCT _____ Dollars.
(Words)

($ _____
(Figures)

Alternate #8: Not Applicable.

Alternate #9: Not Applicable.

Alternate #10: Not Applicable.

Alternate #11: The Bidder shall state the adjustment in price to be added to or deducted from the Base Bid to provide 3" river stone in five (5) beds adjacent to the building in lieu of landscape and mulch. This includes soil sterilant and geotextile (class 2, Type B) fabric as specified.

ADD/DEDUCT _____ Dollars.
(Words)

($ _____)
(Figures)

Alternate #12: Not Applicable.

The undersigned hereby acknowledge receipt of following Addenda and has prepared this bid accordingly:

ADDENDUM #_____ Dated_____

ADDENDUM #_____ Dated_____

ADDENDUM #_____ Dated_____

ADDENDUM #_____ Dated_____

ADDENDUM #_____ Dated_____

ADDENDUM #_____ Dated_____

ADDENDUM #_____ Dated_____

SIGNATURES:

In witness whereof, the undersigned has caused this Proposal to be executed this _____ day of _____, 20_____.

INDIVIDUAL, PARTNERSHIP, LLC OR CORPORATION

_____
(Firm Name)

By: _____
(Signature)

_____
(Print Name and Title of Authorized Person to Sign)

State of Incorporation: _____

Business Address: _____

_____

_____

Telephone Number: _____

Email Address: _____

_____
Attest By

_____
Print Name of Person

Business/Corporate Seal:

Exeter Township
Emergency Services Facility
70 Gibraltar Road
Reading, PA 19606

Bid Form
Bid Package #02 – General Construction

Bids Due: 11/10/26 @ 2:00 PM

Deliver Sealed bids to:
Exeter Township
Attn: Larry Piersol, Township Manager
Exeter Township Building
4975 DeMoss Road
Reading, PA 19606

Date: _____

Firm Name: _____

Firm Address: _____

_____

Contact: _____

Phone Number: _____

Email: _____

THIS BID FORM SHALL NOT BE ALTERED IN ANY MANNER. ANY ALTERED BID FORMS SHALL BE CONSIDERED NON-RESPONSIVE AND WILL BE REJECTED.

This Bid is submitted in accordance with the Advertisement inviting bids to be received for the Exeter Township Emergency Services Facility Bid Package #02 General Construction.

The undersigned BIDDER proposes and agrees, if this Bid is accepted, to enter into an Agreement with OWNER in the form included in the Contract Documents to complete all Work as specified or indicated in the Contract Documents for the Contract Price and within the Contract Time indicated in this Bid and in accordance with the Contract Documents.

In submitting this Bid, BIDDER represents, as more fully set forth in the agreement that:

a. BIDDER has carefully examined the Contract Documents including all Addenda which are incorporated with these documents indicating various conditions affecting this contract, the undersigned herein agrees to furnish all materials, perform all labor and do all else necessary to complete the work for the Bid Package #02 indicated above for the Contract for the above named Project in accordance with said Contract Documents.

b. BIDDER has examined the site and locality where the Work is to be performed, the legal requirements (federal, state, and local laws, ordinances, rules and regulations) and the conditions affecting cost, progress or performance of the Work and has made such independent investigations as BIDDER deems necessary. Failure to visit and not be familiar with the Project site shall be no reason for future requests for additional compensation or costs of any kind.

LUMP SUM BASE BID – The contractor shall state the price for the completion of all work as indicated by the Contract Documents that is not included in the bid alternates listed below. This price shall be the base bid. **The base bid below shall include any and all allowances as described below**. All allowances MUST include all overhead and profit.

	BASE BID LINE ITEM SUB-TOTALS	
	Line Item Scope of Work	**Line Item Scope of Work Bid Subtotal**
BB1	Contractors' Cost of Work	Words: _____ Dollars Figures: ($_____)
BB2	GC-1: Owner Contingency Allowance, General Construction Contract	Words: Two Hundred and Fifty Thousand Dollars Figures: ($250,000.00)
	GC-2: Pre-Engineered Metal Buildings Foundation Design Variation Allowance	Words: Fifty Thousand Dollars Figures: ($50,000.00)

	UNIT PRICE ITEMIZATION SCHEDULE				**UNIT PRICE ALLOWANCE SCHEDULE**
BB3	**Unit Price No.**	**Contractor's Unit Price Bid**	**Bid Quantity**		**Unit Price Allowance (UPA) Amount** *(To be included in Base Bid)*
	Unit Price No. 1 – Furnish and Install additional miscellaneous structural steel	$_____/TON	2 TON		**Unit Price Allowance No. UPA-1** **$**_____
	Unit Price No. 2 – Furnish and Install additional miscellaneous metals	$_____/TON	12 TON		**Unit Price Allowance No. UPA-2** **$**_____

TOTAL LUMP SUM BASE BID Contractors' Cost for the Work (**BB1**) + Owner Contingency Allowances (**BB2**) + Unit Price Allowances (**BB3**)
Words: _____ Dollars
Figures: ($_____)

Accompanying this Proposal is a certified check, bank cashier's check, bank treasurer's check or Bid Bond required by the Checklist and Instructions to Bidders, in the amount of 10% of the total Base Bid plus ALL possible ADD Alternates, which is deposited as a proposal guarantee, and is to be retained by you and applied as provided in the Instruction to Bidders, in case the undersigned shall default in executing the Contract or in furnishing the required Bonds and insurance certificates within the time specified by the Contract Documents.

The undersigned hereby certifies that this Proposal is genuine and not sham or collusive or made in the interest of or in behalf of any person, firm or corporation not herein named and that the undersigned has not directly or indirectly induced or solicited any bidder to refrain from bidding and that the undersigned has not in any manner sought by collusion to secure for himself any advantages over any other bidder.

The undersigned, intending to be legally bound, agrees that this Proposal shall be irrevocable and shall remain subject to your acceptance for 90 days after date set for bid opening unless the Owner is delayed in awarding the Contract due to the failure to receive a required approval or permit from one or more reviewing bodies/governmental agencies having jurisdiction over the Project, the sale of bonds, or the award of a grant, in which case, Bids shall remain open for 120 days after the day of Bid Opening. BIDDER will sign the Agreement and submit the Contract Security and other documents required by the Contract Documents within ten (10) days after the date of OWNER'S Notice of Award, except as provided by Act 317 of 1978, approved November 26, 1978, which provides for possible extensions of the holding period.

The undersigned submit this Proposal with the full knowledge of the Contract Document and Project requirements and hereby agrees that each phase of the work of this Project, under this Contract, shall be fully and finally completed and ready for occupancy and use on or before the completion date identified for that specific phase in the Contract Documents.

Bidder accepts the provisions of the Agreement as to the liquidated damages for failure to meet the milestone dates defined and substantial completion of the project shall be calculated at One Thousand Five Hundred Dollars ($1,500.00) per day for each calendar day of delay until the work is substantially complete.

The contract amount stated above includes all sales taxes, excise, and other taxes for all materials and appliances subject to and upon which taxes are levied.

The undersigned must enclose the following required attachments to this Bid Form. **Each bidder shall submit two (2) hard copies of the complete bid submission and one (1) electronic USB.**

The following shall be included in the bid submission:

1. Form of Proposal, fully executed and notarized
2. Bid Bond or Certified Check or Cashier’s check in the amount of 10% of the Bid total and shall include Consent of Surety and Power of Attorney
3. Non-Collusion Affidavit, Signed and Sealed
4. Non-Discrimination Clause, Signed and Sealed
5. PA Public Works Employment Verification Form (E-Verify)

Note that the following will be required to be submitted by ALL Bidders at the request of the Construction Manager within 48 hours of bid submission:

1. Bidder’s Qualifications, AIA A305, completed
2. Schedule of Values
3. List of Subcontractors
4. Safety Questionnaire

Note that the successful bidder will be required to submit the following documents and any other documents deemed necessary by the Construction Manager upon issuance of Letter of Intent to Award:

1. Certificate of Insurance
2. Performance Bond in the amount of 100%
3. Payment Bond in the amount of 100%
4. No Lien Agreement
5. Maintenance Bond

The undersigned shall indemnify and hold harmless Exeter Township, Boyle Construction, Inc., Manns Woodward Studios and Herbert, Rowland & Grubic, Inc., all consultants and each officer and employees, with respect to any claims, losses, expenses, costs and reasonable attorney's fees incurred by Exeter Township, Boyle Construction, Inc., Manns Woodward Studios and Herbert, Rowland & Grubic, Inc., all consultants and each officer and employees, with regard to the undersigned's failure to comply with these Bid Documents and procedures.

Permits and Inspections: Any required permit fee will be paid by the Owner. Upon award, the successful prime contractor must complete any applicable permit form (and business licenses if required) and submit to the Township. Inspection fees will be paid for by the Owner. Any additional costs incurred due to failed inspections shall be paid by the prime contractor. Any required contractor or business license fees required by the Township are to be paid by the prime contractor.

The Owner also reserves the right to solicit independent proposals as required by Exeter Township guidelines, under a separate contract to perform the services required. **The responsiveness of the Bid and if the Bid is responsible, may be determined by the Owner on the basis of the Unit Prices proposed by the bidder. Unit Prices shall be consistent with verifiable average costs for the work to be performed. Bidders agree that a proposal may be rejected if the Unit Prices submitted are inconsistent with the average cost.** Under NO circumstances will BIDDER perform Unit Price Work without prior written authorization from the OWNER. Contract Unit Price shall include costs for furnishing and installing all materials, labor, tools, equipment, and other incidentals necessary to complete the specified operation. Contract Unit Price shall also apply to deletion of "furnishing and installing" items from the Project.

In submitting this Bid, it is understood that the OWNER reserves the unrestricted right to reject any and all bids, or to waive any informalities or technicalities in said Bids.

UNIT PRICE ALLOWANCES: The Contractor must provide a change in scope of work (no change in Contract Sum or Contract Time) Change Order for the allowance work, indicating the allowance amount to be utilized, in which the Construction Manager (CMa) must review with the Owner and approve prior to the Contractor performing the Work. Should the allowance amount be exceeded and the Work approved to be performed, the Contractor will provide a Change Order for the additional Work and only be paid by an approved Change Order for the additional related Work. Similarly, should the allowance used be less than the allowance amount, the Contractor will credit the Owner for the unused allowance amount by a Change Order credit. All OH&P for allowances MUST be included within the Base Bid of the Project. NO additional OH&P will be allowed in allowances. Change Orders for the utilization of allowances shall not include OH&P. Change Orders for additional Work exceeding allowance amounts shall include OH&P. Change Orders for credit of unused allowance amounts shall be provided with OH&P in addition to the remaining allowance amount. OH&P for all stipulations noted above is to be a maximum of 5% combined.

ALTERNATES: The Bidder agrees that the Owner shall have the right to accept or reject any or all of the following alternates, which acceptance or rejection shall enter into the determination of the lowest Bidder. The Bidder agrees that the Contract Time shall not be increased on account of the acceptance of any one or combination of alternates unless specifically stated in such alternate description(s). The Bidder agrees that the Owner shall have the right to accept an alternate that is higher in price than the Base Bid or other alternate. Alternates' prices shall include the cost of furnishing and installing all materials, labor, tools, equipment and other incidentals necessary to complete the Work in accordance with the

design intent, manufacturers' recommendations, building codes, authorities having jurisdiction, and the Construction Documents. Do not adjust material allowances under any alternate bid items. Indicate whether alternate cost is an Add or Deduct when a choice is provided. If there is no change in the contract amount for any alternate write "NO CHANGE" or "Zero (0)" in the blank. The failure to enter an amount or "NO CHANGE" in the blanks for an alternate shall be treated conclusively as a Bid of zero dollars for the work described in the alternate.

Alternate #1: The Bidder shall state the adjustment in price to be added to or deducted from the Base Bid to increase the Contractor's Warranty period from one-year to two-year from the date of substantial completion (excluding landscaping). This alternate does not affect other warranties required by the Contract Documents or provided by manufacturers.

ADD/DEDUCT_____Dollars.
(Words)

($ _____)
(Figures)

Alternate #2: The Bidder shall state the adjustment in price to be added to, or deducted from, the Base Bid to perform all earthwork excavations as UNCLASSIFIED in lieu of CLASSIFIED as specified in the Bid Documents. Under this Alternate, rock removal shall be performed through hydraulic/mechanical means (no blasting permitted) and the surplus soils and rock are to be disposed of legally by the contractor offsite or processed to the equivalent of 2A modified for re-use as structural fill onsite.

ADD/DEDUCT_____Dollars.
(Words)

($ _____)
(Figures)

Alternate #3: The Site Contract Bidder shall state the adjustment in price to be added to or deducted from the Base Bid to provide engineered structural fill or 2A modified stone in lieu of using on-site materials for all fills required below the bottom of subgrade stone for the entire building pad and up to 10' outside the new buildings exterior wall line as identified on the Special Excavation Plan. Under this alternate, the resulting excess soils are to be disposed of legally by the contractor off-site. Under this Alternate, the General Contract, Mechanical Contract, Electrical Contract, and Plumbing Contract Bidders shall state the adjustment in price to be added to, or deducted from, the Base Bid to perform their scope of work within the engineered structural fill or 2A modified stone in lieu of on-site materials as identified in the Bid Documents.

ADD/DEDUCT_____Dollars.
(Words)

($ _____)
(Figures)

Alternate #4: Not Applicable.

Alternate #5: Not Applicable.

Alternate #6: Not Applicable.

Alternate #7: Not Applicable.

Alternate #8A: The Bidder shall state the adjustment in price to be added to or deducted from the Base Bid to provide Four-Fold doors in lieu of Fully Glazed Sectional overhead doors of Apparatus Bay doors OHD1, OHD2, OHD3, OHD4, OHD5, OHD6, and OHD7.

ADD/DEDUCT _____ Dollars.
(Words)

($ _____
(Figures)

Alternate #8B: The Bidder shall state the adjustment in price to be added to or deducted from the Base Bid to provide Fully Glazed Sectional overhead doors in lieu of Four-Fold doors of Apparatus Bay doors FFD1, FFD2, FFD3, FFD4, FFD5, FFD6, and FFD7.

ADD/DEDUCT _____ Dollars.
(Words)

($ _____
(Figures)

Alternate #9: The Bidder shall state the adjustment in price to be added to or deducted from the Base Bid to provide resinous floor finish and wall base in Corridor 106, Watch Office 111, Kitchen & Day Room 122, and Laundry 125 in lieu of Base Bid Terrazzo floor and wall base.

ADD/DEDUCT _____ Dollars.
(Words)

($ _____
(Figures)

Alternate #10: The Bidder shall state the adjustment in price to be added to or deducted from the Base Bid to provide resinous floor finish and wall base in Corridor 145, EMS Dayroom 146, and Equipment 147 in lieu of Base Bid Terrazzo floor finish and wall base.

ADD/DEDUCT _____ Dollars.
(Words)

($ _____
(Figures)

Alternate #11: Not Applicable.

Alternate #12: The Bidder shall state the adjustment in price to be added to or deducted from the Base Bid to supply and install all complete systems to include but not limited to masonry, concrete, steel, and fence material for the Dumpster Enclosure in lieu of the chain link fence with privacy slats enclosure per the basis of design.

ADD/DEDUCT _____ Dollars.
(Words)

($ _____
(Figures)

The undersigned hereby acknowledge receipt of following Addenda and has prepared this bid accordingly:

ADDENDUM #_____ Dated_____

ADDENDUM #_____ Dated_____

ADDENDUM #_____ Dated_____

ADDENDUM #_____ Dated_____

ADDENDUM #_____ Dated_____

ADDENDUM #_____ Dated_____

ADDENDUM #_____ Dated_____

ADDENDUM #_____ Dated_____

SIGNATURES:

In witness whereof, the undersigned has caused this Proposal to be executed this _____ day of _____, 20_____.

INDIVIDUAL, PARTNERSHIP, LLC OR CORPORATION

_____
(Firm Name)

By: _____
(Signature)

_____
(Print Name and Title of Authorized Person to Sign)

State of Incorporation: _____

Business Address: _____

_____

_____

Telephone Number: _____

Email Address: _____

_____
Attest By

_____
Print Name of Person

Business/Corporate Seal:

Exeter Township
Emergency Services Facility
70 Gibraltar Road
Reading, PA 19606

Bid Form
Bid Package #03 – Fire Protection Construction

Bids Due: 11/10/26 @ 2:00 PM

Deliver Sealed bids to:
Exeter Township
Attn: Larry Piersol, Township Manager
Exeter Township Building
4975 DeMoss Road
Reading, PA 19606

Date: _____

Firm Name: _____

Firm Address: _____

_____

Contact: _____

Phone Number: _____

Email: _____

THIS BID FORM SHALL NOT BE ALTERED IN ANY MANNER. ANY ALTERED BID FORMS SHALL BE CONSIDERED NON-RESPONSIVE AND WILL BE REJECTED.

This Bid is submitted in accordance with your Advertisement inviting bids to be received for the Exeter Township Emergency Services Facility Bid Package #03 Fire Protection Construction.

The undersigned BIDDER proposes and agrees, if this Bid is accepted, to enter into an Agreement with OWNER in the form included in the Contract Documents to complete all Work as specified or indicated in the Contract Documents for the Contract Price and within the Contract Time indicated in this Bid and in accordance with the Contract Documents.

In submitting this Bid, BIDDER represents, as more fully set forth in the agreement that:

a. BIDDER has carefully examined the Contract Documents including all Addenda which are incorporated with these documents indicating various conditions affecting this contract, the undersigned herein agrees to furnish all materials, perform all labor and do all else necessary to complete the work for the Bid Package #03 indicated above for the Contract for the above named Project in accordance with said Contract Documents.

b. BIDDER has examined the site and locality where the Work is to be performed, the legal requirements (federal, state, and local laws, ordinances, rules and regulations) and the conditions affecting cost, progress or performance of the Work and has made such independent investigations as BIDDER deems necessary. Failure to visit and not be familiar with the Project site shall be no reason for future requests for additional compensation or costs of any kind.

LUMP SUM BASE BID – The contractor shall state the price for the completion of all work as indicated by the Contract Documents that is not included in the bid alternates listed below. This price shall be the base bid. **The base bid below shall include any and all allowances as described below**. All allowances MUST include all overhead and profit.

	BASE BID LINE ITEM SUB-TOTALS	
	Line Item Scope of Work	**Line Item Scope of Work Bid Subtotal**
BB1	Contractors' Cost of Work	Words: _____ Dollars Figures: ($_____)
BB2	FP-1: Owner Contingency Allowance, Fire Protection Construction Contract	Words: Thirty-Five Thousand Dollars Figures: ($35,000.00)

TOTAL LUMP SUM BASE BID Contractors' Cost for the Work (**BB1**) + Owner Contingency Allowances (**BB2**)
Words: _____ Dollars
Figures: ($_____)

Accompanying this Proposal is a certified check, bank cashier's check, bank treasurer's check or Bid Bond required by the Checklist and Instructions to Bidders, which is deposited as a proposal guarantee, and is to be retained by you and applied as provided in the Instruction to Bidders, in case the undersigned shall default in executing the Contract or in furnishing the required Bonds and insurance certificates within the time specified by the Contract Documents.

The undersigned hereby certifies that this Proposal is genuine and not sham or collusive or made in the interest of or in behalf of any person, firm or corporation not herein named and that the undersigned has not directly or indirectly induced or solicited any bidder to refrain from bidding and that the undersigned has not in any manner sought by collusion to secure for himself any advantages over any other bidder.

The undersigned, intending to be legally bound, agrees that this Proposal shall be irrevocable and shall remain subject to your acceptance for 90 days after date set for bid opening unless the Owner is delayed in awarding the Contract due to the failure to receive a required approval or permit from one or more reviewing bodies/governmental agencies having jurisdiction over the Project, the sale of bonds, or the award of a grant, in which case, Bids shall remain open for 120 days after the day of Bid Opening. BIDDER will sign the Agreement and submit the Contract Security and other documents required by the Contract Documents within ten (10) days after the date of OWNER'S Notice of Award, except as provided by Act 317 of 1978, approved November 26, 1978, which provides for possible extensions of the holding period.

The undersigned submit this Proposal with the full knowledge of the Contract Document and Project requirements and hereby agrees that each phase of the work of this Project, under this Contract, shall be fully and finally completed and ready for occupancy and use on or before the completion date identified for that specific phase in the Contract Documents.

Bidder accepts the provisions of the Agreement as to the liquidated damages for failure to meet the milestone dates defined and substantial completion of the project shall be calculated at One Thousand Five Hundred Dollars ($1,500.00) per day for each calendar day of delay until the work is substantially complete.

The contract amount stated above includes all sales taxes, excise, and other taxes for all materials and appliances subject to and upon which taxes are levied.

The undersigned must enclose the following required attachments to this Bid Form. **Each bidder shall submit two (2) hard copies of the complete bid submission and one (1) electronic USB.**

The following shall be included in the bid submission:

1. Form of Proposal, fully executed and notarized
2. Bid Bond or Certified Check or Cashier's check in the amount of 10% of the Bid total and shall include Consent of Surety and Power of Attorney
3. Non-Collusion Affidavit, Signed and Sealed
4. Non-Discrimination Clause, Signed and Sealed
5. PA Public Works Employment Verification Form (E-Verify)

Note that the following will be required to be submitted by ALL Bidders at the request of the Construction Manager within 48 hours of bid submission:

1. Bidder's Qualifications, AIA A305, completed
2. Schedule of Values
3. List of Subcontractors
4. Safety Questionnaire

Note that the successful bidder will be required to submit the following documents and any other documents deemed necessary by the Construction Manager upon issuance of Letter of Intent to Award:

1. Certificate of Insurance
2. Performance Bond in the amount of 100%
3. Payment Bond in the amount of 100%
4. No Lien Agreement
5. Maintenance Bond

The undersigned shall indemnify and hold harmless Exeter Township, Boyle Construction, Inc., Manns Woodward Studios and Herbert, Rowland & Grubic, Inc., all consultants and each officer and employees, with respect to any claims, losses, expenses, costs and reasonable attorney's fees incurred by Exeter Township, Boyle Construction, Inc., Manns Woodward Studios and Herbert, Rowland & Grubic, Inc., all consultants and each officer and employees, with regard to the undersigned's failure to comply with these Bid Documents and procedures.

Permits and Inspections: Any required permit fee will be paid by the Owner. Upon award, the successful prime contractor must complete any applicable permit form (and business licenses if required) and submit to the Township. Inspection fees will be paid for by the Owner. Any additional costs incurred due to failed inspections shall be paid by

the prime contractor. Any required contractor or business license fees required by the Township are to be paid by the prime contractor.

The Owner also reserves the right to solicit independent proposals as required by Exeter Township guidelines, under a separate contract to perform the services required. **The responsiveness of the Bid and if the Bid is responsible, may be determined by the Owner on the basis of the Unit Prices proposed by the bidder. Unit Prices shall be consistent with verifiable average costs for the work to be performed. Bidders agree that a proposal may be rejected if the Unit Prices submitted are inconsistent with the average cost.** Under NO circumstances will BIDDER perform Unit Price Work without prior written authorization from the OWNER. Contract Unit Price shall include costs for furnishing and installing all materials, labor, tools, equipment, and other incidentals necessary to complete the specified operation. Contract Unit Price shall also apply to deletion of "furnishing and installing" items from the Project.

THERE ARE NO UNIT PRICES and UNIT PRICES ALLOWANCES IN CONTRACT.

ALTERNATES: The Bidder agrees that the Owner shall have the right to accept or reject any or all of the following alternates, which acceptance or rejection shall enter into the determination of the lowest Bidder. The Bidder agrees that the Contract Time shall not be increased on account of the acceptance of any one or combination of alternates unless specifically stated in such alternate description(s). The Bidder agrees that the Owner shall have the right to accept an alternate that is higher in price than the Base Bid or other alternate. Alternates' prices shall include the cost of furnishing and installing all materials, labor, tools, equipment and other incidentals necessary to complete the Work in accordance with the design intent, manufacturers' recommendations, building codes, authorities having jurisdiction, and the Construction Documents. Do not adjust material allowances under any alternate bid items. Indicate whether alternate cost is an Add or Deduct when a choice is provided. If there is no change in the contract amount for any alternate write "NO CHANGE" or "Zero (0)" in the blank. The failure to enter an amount or "NO CHANGE" in the blanks for an alternate shall be treated conclusively as a Bid of zero dollars for the work described in the alternate.

Alternate #1: The Bidder shall state the adjustment in price to be added to or deducted from the Base Bid to increase the Contractor's Warranty period from one-year to two-year from the date of substantial completion (excluding landscaping). This alternate does not affect other warranties required by the Contract Documents or provided by manufacturers.

ADD/DEDUCT_____Dollars.
(Words)

($ _____)
(Figures)

Alternate #2: Not Applicable.

Alternate #3: Not Applicable.

Alternate #4: Not Applicable.

Alternate #5: Not Applicable.

Alternate #6: Not Applicable.

Alternate #7: Not Applicable.

Alternate #8: Not Applicable.

Alternate #9: Not Applicable.

Alternate #10: Not Applicable.

Alternate #11: Not Applicable.

Alternate #12: Not Applicable.

The undersigned hereby acknowledge receipt of following Addenda and has prepared this bid accordingly:

ADDENDUM #_____ Dated_____

ADDENDUM #_____ Dated_____

ADDENDUM #_____ Dated_____

ADDENDUM #_____ Dated_____

ADDENDUM #_____ Dated_____

ADDENDUM #_____ Dated_____

ADDENDUM #_____ Dated_____

ADDENDUM #_____ Dated_____

SIGNATURES:

In witness whereof, the undersigned has caused this Proposal to be executed this _____ day of _____, 20_____.

INDIVIDUAL, PARTNERSHIP, LLC OR CORPORATION

_____
(Firm Name)

By: _____
(Signature)

_____
(Print Name and Title of Authorized Person to Sign)

State of Incorporation: _____

Business Address: _____

_____

_____

Telephone Number: _____

Email Address: _____

_____
Attest By

_____
Print Name of Person

Business/Corporate Seal:

Exeter Township
Emergency Services Facility
70 Gibraltar Road
Reading, PA 19606

Bid Form
Bid Package #04 – Plumbing Construction

Bids Due: 11/10/26 @ 2:00 PM

Deliver Sealed bids to:
Exeter Township
Attn: Larry Piersol, Township Manager
Exeter Township Building
4975 DeMoss Road
Reading, PA 19606

Date: _____

Firm Name: _____

Firm Address: _____

_____

Contact: _____

Phone Number: _____

Email: _____

THIS BID FORM SHALL NOT BE ALTERED IN ANY MANNER. ANY ALTERED BID FORMS SHALL BE CONSIDERED NON-RESPONSIVE AND WILL BE REJECTED.

This Bid is submitted in accordance with your Advertisement inviting bids to be received for the Exeter Township Emergency Services Facility Bid Package #04 Plumbing Construction.

The undersigned BIDDER proposes and agrees, if this Bid is accepted, to enter into an Agreement with OWNER in the form included in the Contract Documents to complete all Work as specified or indicated in the Contract Documents for the Contract Price and within the Contract Time indicated in this Bid and in accordance with the Contract Documents.

In submitting this Bid, BIDDER represents, as more fully set forth in the agreement that:

a. BIDDER has carefully examined the Contract Documents including all Addenda which are incorporated with these documents indicating various conditions affecting this contract, the undersigned herein agrees to furnish all materials, perform all labor and do all else necessary to complete the work for the Bid Package #04 indicated above for the Contract for the above named Project in accordance with said Contract Documents.

b. BIDDER has examined the site and locality where the Work is to be performed, the legal requirements (federal, state, and local laws, ordinances, rules and regulations) and the conditions affecting cost, progress or performance of the Work and has made such independent investigations as BIDDER deems necessary. Failure to visit and not be familiar with the Project site shall be no reason for future requests for additional compensation or costs of any kind.

LUMP SUM BASE BID – The contractor shall state the price for the completion of all work as indicated by the Contract Documents that is not included in the bid alternates listed below. This price shall be the base bid. **The base bid below shall include any and all allowances as described below**. All allowances MUST include all overhead and profit.

	BASE BID LINE ITEM SUB-TOTALS	
	Line Item Scope of Work	**Line Item Scope of Work Bid Subtotal**
BB1	Contractors' Cost of Work	Words: _____ Dollars Figures: ($_____)
BB2	PC-1: Owner Contingency Allowance, Plumbing Construction Contract	Words: Fifty Thousand Dollars Figures: ($50,000.00)

TOTAL LUMP SUM BASE BID Contractors' Cost for the Work (**BB1**) + Owner Contingency Allowances (**BB2**)
Words: _____ Dollars
Figures: ($_____)

Accompanying this Proposal is a certified check, bank cashier's check, bank treasurer's check or Bid Bond required by the Checklist and Instructions to Bidders, which is deposited as a proposal guarantee, and is to be retained by you and applied as provided in the Instruction to Bidders, in case the undersigned shall default in executing the Contract or in furnishing the required Bonds and insurance certificates within the time specified by the Contract Documents.

The undersigned hereby certifies that this Proposal is genuine and not sham or collusive or made in the interest of or in behalf of any person, firm or corporation not herein named and that the undersigned has not directly or indirectly induced or solicited any bidder to refrain from bidding and that the undersigned has not in any manner sought by collusion to secure for himself any advantages over any other bidder.

The undersigned, intending to be legally bound, agrees that this Proposal shall be irrevocable and shall remain subject to your acceptance for 90 days after date set for bid opening unless the Owner is delayed in awarding the Contract due to the failure to receive a required approval or permit from one or more reviewing bodies/governmental agencies having jurisdiction over the Project, the sale of bonds, or the award of a grant, in which case, Bids shall remain open for 120 days after the day of Bid Opening. BIDDER will sign the Agreement and submit the Contract Security and other documents required by the Contract Documents within ten (10) days after the date of OWNER'S Notice of Award, except as provided by Act 317 of 1978, approved November 26, 1978, which provides for possible extensions of the holding period.

The undersigned submit this Proposal with the full knowledge of the Contract Document and Project requirements and hereby agrees that each phase of the work of this Project, under this Contract, shall be fully and finally completed and ready for occupancy and use on or before the completion date identified for that specific phase in the Contract Documents.

Bidder accepts the provisions of the Agreement as to the liquidated damages for failure to meet the milestone dates defined and substantial completion of the project shall be calculated at One Thousand Five Hundred Dollars ($1,500.00) per day for each calendar day of delay until the work is substantially complete.

The contract amount stated above includes all sales taxes, excise, and other taxes for all materials and appliances subject to and upon which taxes are levied.

The undersigned must enclose the following required attachments to this Bid Form. **Each bidder shall submit two (2) hard copies of the complete bid submission and one (1) electronic USB.**

The following shall be included in the bid submission:

1. Form of Proposal, fully executed and notarized
2. Bid Bond or Certified Check or Cashier's check in the amount of 10% of the Bid total and shall include Consent of Surety and Power of Attorney
3. Non-Collusion Affidavit, Signed and Sealed
4. Non-Discrimination Clause, Signed and Sealed
5. PA Public Works Employment Verification Form (E-Verify)

Note that the following will be required to be submitted by ALL Bidders at the request of the Construction Manager within 48 hours of bid submission:

1. Bidder's Qualifications, AIA A305, completed
2. Schedule of Values
3. List of Subcontractors
4. Safety Questionnaire

Note that the successful bidder will be required to submit the following documents and any other documents deemed necessary by the Construction Manager upon issuance of Letter of Intent to Award:

1. Certificate of Insurance
2. Performance Bond in the amount of 100%
3. Payment Bond in the amount of 100%
4. No Lien Agreement
5. Maintenance Bond

The undersigned shall indemnify and hold harmless Exeter Township, Boyle Construction, Inc., Manns Woodward Studios and Herbert, Rowland & Grubic, Inc., all consultants and each officer and employees, with respect to any claims, losses, expenses, costs and reasonable attorney's fees incurred by Exeter Township, Boyle Construction, Inc., Manns Woodward Studios and Herbert, Rowland & Grubic, Inc., all consultants and each officer and employees, with regard to the undersigned's failure to comply with these Bid Documents and procedures.

Permits and Inspections: Any required permit fee will be paid by the Owner. Upon award, the successful prime contractor must complete any applicable permit form (and business licenses if required) and submit to the Township. Inspection fees will be paid for by the Owner. Any additional costs incurred due to failed inspections shall be paid by

the prime contractor. Any required contractor or business license fees required by the Township are to be paid by the prime contractor.

The Owner also reserves the right to solicit independent proposals as required by Exeter Township guidelines, under a separate contract to perform the services required. **The responsiveness of the Bid and if the Bid is responsible, may be determined by the Owner on the basis of the Unit Prices proposed by the bidder. Unit Prices shall be consistent with verifiable average costs for the work to be performed. Bidders agree that a proposal may be rejected if the Unit Prices submitted are inconsistent with the average cost.** Under NO circumstances will BIDDER perform Unit Price Work without prior written authorization from the OWNER. Contract Unit Price shall include costs for furnishing and installing all materials, labor, tools, equipment, and other incidentals necessary to complete the specified operation. Contract Unit Price shall also apply to deletion of "furnishing and installing" items from the Project.

THERE ARE NO UNIT PRICES and UNIT PRICES ALLOWANCES IN CONTRACT.

ALTERNATES: The Bidder agrees that the Owner shall have the right to accept or reject any or all of the following alternates, which acceptance or rejection shall enter into the determination of the lowest Bidder. The Bidder agrees that the Contract Time shall not be increased on account of the acceptance of any one or combination of alternates unless specifically stated in such alternate description(s). The Bidder agrees that the Owner shall have the right to accept an alternate that is higher in price than the Base Bid or other alternate. Alternates' prices shall include the cost of furnishing and installing all materials, labor, tools, equipment and other incidentals necessary to complete the Work in accordance with the design intent, manufacturers' recommendations, building codes, authorities having jurisdiction, and the Construction Documents. Do not adjust material allowances under any alternate bid items. Indicate whether alternate cost is an Add or Deduct when a choice is provided. If there is no change in the contract amount for any alternate write "NO CHANGE" or "Zero (0)" in the blank. The failure to enter an amount or "NO CHANGE" in the blanks for an alternate shall be treated conclusively as a Bid of zero dollars for the work described in the alternate.

Alternate #1: The Bidder shall state the adjustment in price to be added to or deducted from the Base Bid to increase the Contractor's Warranty period from one-year to two-year from the date of substantial completion (excluding landscaping). This alternate does not affect other warranties required by the Contract Documents or provided by manufacturers.

ADD/DEDUCT_____Dollars.
(Words)

($ _____)
(Figures)

Alternate #2: Not Applicable.

Alternate #3: The Site Contract Bidder shall state the adjustment in price to be added to or deducted from the Base Bid to provide engineered structural fill or 2A modified stone in lieu of using on-site materials for all fills required below the bottom of subgrade stone for the entire building pad and up to 10' outside the new buildings exterior wall line as identified on the Special Excavation Plan. Under this alternate, the resulting excess soils are to be disposed of legally by the contractor off-site. Under this Alternate, the General Contract, Mechanical Contract, Electrical Contract, and Plumbing Contract Bidders shall state the adjustment in price to be added to, or deducted from, the Base Bid to perform their scope of work within the engineered structural fill or 2A modified stone in lieu of on-site materials as identified in the Bid Documents.

ADD/DEDUCT _____ Dollars.
(Words)

($ _____)
(Figures)

Alternate #4: Not Applicable.

Alternate #5: Not Applicable.

Alternate #6: Not Applicable.

Alternate #7: Not Applicable.

Alternate #8: Not Applicable.

Alternate #9: Not Applicable.

Alternate #10: Not Applicable.

Alternate #11: Not Applicable.

Alternate #12: Not Applicable.

The undersigned hereby acknowledge receipt of following Addenda and has prepared this bid accordingly:

ADDENDUM #_____ Dated_____

ADDENDUM #_____ Dated_____

ADDENDUM #_____ Dated_____

ADDENDUM #_____ Dated_____

ADDENDUM #_____ Dated_____

ADDENDUM #_____ Dated_____

ADDENDUM #_____ Dated_____

ADDENDUM #_____ Dated_____

SIGNATURES:

In witness whereof, the undersigned has caused this Proposal to be executed this _____ day of _____, 20_____.

INDIVIDUAL, PARTNERSHIP, LLC OR CORPORATION

_____
(Firm Name)

By: _____
(Signature)

_____
(Print Name and Title of Authorized Person to Sign)

State of Incorporation: _____

Business Address: _____

_____

_____

Telephone Number: _____

Email Address: _____

_____
Attest By

_____
Print Name of Person

Business/Corporate Seal:

Exeter Township
Emergency Services Facility
70 Gibraltar Road
Reading, PA 19606

Bid Form
Bid Package #05 – Mechanical Construction

Bids Due: 11/10/26 @ 2:00 PM

Deliver Sealed bids to:
Exeter Township
Attn: Larry Piersol, Township Manager
Exeter Township Building
4975 DeMoss Road
Reading, PA 19606

Date: _____

Firm Name: _____

Firm Address: _____

_____

Contact: _____

Phone Number: _____

Email: _____

THIS BID FORM SHALL NOT BE ALTERED IN ANY MANNER. ANY ALTERED BID FORMS SHALL BE CONSIDERED NON-RESPONSIVE AND WILL BE REJECTED.

This Bid is submitted in accordance with your Advertisement inviting bids to be received for the Exeter Township Emergency Services Facility Bid Package #05 Mechanical Construction.

The undersigned BIDDER proposes and agrees, if this Bid is accepted, to enter into an Agreement with OWNER in the form included in the Contract Documents to complete all Work as specified or indicated in the Contract Documents for the Contract Price and within the Contract Time indicated in this Bid and in accordance with the Contract Documents.

In submitting this Bid, BIDDER represents, as more fully set forth in the agreement that:

a. BIDDER has carefully examined the Contract Documents including all Addenda which are incorporated with these documents indicating various conditions affecting this contract, the undersigned herein agrees to furnish all materials, perform all labor and do all else necessary to complete the work for the Bid Package #05 indicated above for the

Contract for the above named Project in accordance with said Contract Documents.

b. BIDDER has examined the site and locality where the Work is to be performed, the legal requirements (federal, state, and local laws, ordinances, rules and regulations) and the conditions affecting cost, progress or performance of the Work and has made such independent investigations as BIDDER deems necessary. Failure to visit and not be familiar with the Project site shall be no reason for future requests for additional compensation or costs of any kind.

LUMP SUM BASE BID – The contractor shall state the price for the completion of all work as indicated by the Contract Documents that is not included in the bid alternates listed below. This price shall be the base bid. **The base bid below shall include any and all allowances as described below**. All allowances MUST include all overhead and profit.

	BASE BID LINE ITEM SUB-TOTALS	
	Line Item Scope of Work	**Line Item Scope of Work Bid Subtotal**
BB1	Contractors' Cost of Work	Words: _____ Dollars Figures: ($_____)
BB2	MC-1: Owner Contingency Allowance, Mechanical Construction Contract	Words: One Hundred Thousand Dollars Figures: ($100,000.00)

TOTAL LUMP SUM BASE BID Contractors' Cost for the Work (**BB1**) + Owner Contingency Allowances (**BB2**)
Words: _____ Dollars
Figures: ($_____)

Accompanying this Proposal is a certified check, bank cashier's check, bank treasurer's check or Bid Bond required by the Checklist and Instructions to Bidders, which is deposited as a proposal guarantee, and is to be retained by you and applied as provided in the Instruction to Bidders, in case the undersigned shall default in executing the Contract or in furnishing the required Bonds and insurance certificates within the time specified by the Contract Documents.

The undersigned hereby certifies that this Proposal is genuine and not sham or collusive or made in the interest of or in behalf of any person, firm or corporation not herein named and that the undersigned has not directly or indirectly induced or solicited any bidder to refrain from bidding and that the undersigned has not in any manner sought by collusion to secure for himself any advantages over any other bidder.

The undersigned, intending to be legally bound, agrees that this Proposal shall be irrevocable and shall remain subject to your acceptance for 90 days after date set for bid opening unless the Owner is delayed in awarding the Contract due to the failure to receive a required approval or permit from one or more reviewing bodies/governmental agencies having jurisdiction over the Project, the sale of bonds, or the award of a grant, in which case, Bids shall remain open for 120 days after the day of Bid Opening. BIDDER will sign the Agreement and submit the Contract Security and other documents required by the Contract Documents within ten (10) days after the date of OWNER'S Notice of Award,

except as provided by Act 317 of 1978, approved November 26, 1978, which provides for possible extensions of the holding period.

The undersigned submit this Proposal with the full knowledge of the Contract Document and Project requirements and hereby agrees that each phase of the work of this Project, under this Contract, shall be fully and finally completed and ready for occupancy and use on or before the completion date identified for that specific phase in the Contract Documents.

Bidder accepts the provisions of the Agreement as to the liquidated damages for failure to meet the milestone dates defined and substantial completion of the project shall be calculated at One Thousand Five Hundred Dollars ($1,500.00) per day for each calendar day of delay until the work is substantially complete.

The contract amount stated above includes all sales taxes, excise, and other taxes for all materials and appliances subject to and upon which taxes are levied.

The undersigned must enclose the following required attachments to this Bid Form. **Each bidder shall submit two (2) hard copies of the complete bid submission and one (1) electronic USB.**

The following shall be included in the bid submission:

1. Form of Proposal, fully executed and notarized
2. Bid Bond or Certified Check or Cashier's check in the amount of 10% of the Bid total and shall include Consent of Surety and Power of Attorney
3. Non-Collusion Affidavit, Signed and Sealed
4. Non-Discrimination Clause, Signed and Sealed
5. PA Public Works Employment Verification Form (E-Verify)

Note that the following will be required to be submitted by ALL Bidders at the request of the Construction Manager within 48 hours of bid submission:

1. Bidder's Qualifications, AIA A305, completed
2. Schedule of Values
3. List of Subcontractors
4. Safety Questionnaire

Note that the successful bidder will be required to submit the following documents and any other documents deemed necessary by the Construction Manager upon issuance of Letter of Intent to Award:

1. Certificate of Insurance
2. Performance Bond in the amount of 100%
3. Payment Bond in the amount of 100%
4. No Lien Agreement
5. Maintenance Bond

The undersigned shall indemnify and hold harmless Exeter Township, Boyle Construction, Inc., Manns Woodward Studios and Herbert, Rowland & Grubic, Inc., all consultants and each officer and employees, with respect to any claims, losses, expenses, costs and reasonable attorney's fees incurred by Exeter Township, Boyle Construction, Inc., Manns Woodward Studios and Herbert, Rowland & Grubic, Inc., all consultants and each officer and employees, with regard to the undersigned's failure to comply with these Bid Documents and procedures.

Permits and Inspections: Any required permit fee will be paid by the Owner. Upon award, the successful prime

contractor must complete any applicable permit form (and business licenses if required) and submit to the Township. Inspection fees will be paid for by the Owner. Any additional costs incurred due to failed inspections shall be paid by the prime contractor. Any required contractor or business license fees required by the Township are to be paid by the prime contractor.

The Owner also reserves the right to solicit independent proposals as required by Exeter Township guidelines, under a separate contract to perform the services required. **The responsiveness of the Bid and if the Bid is responsible, may be determined by the Owner on the basis of the Unit Prices proposed by the bidder. Unit Prices shall be consistent with verifiable average costs for the work to be performed. Bidders agree that a proposal may be rejected if the Unit Prices submitted are inconsistent with the average cost.** Under NO circumstances will BIDDER perform Unit Price Work without prior written authorization from the OWNER. Contract Unit Price shall include costs for furnishing and installing all materials, labor, tools, equipment, and other incidentals necessary to complete the specified operation. Contract Unit Price shall also apply to deletion of "furnishing and installing" items from the Project.

THERE ARE NO UNIT PRICES and UNIT PRICES ALLOWANCES IN CONTRACT.

ALTERNATES: The Bidder agrees that the Owner shall have the right to accept or reject any or all of the following alternates, which acceptance or rejection shall enter into the determination of the lowest Bidder. The Bidder agrees that the Contract Time shall not be increased on account of the acceptance of any one or combination of alternates unless specifically stated in such alternate description(s). The Bidder agrees that the Owner shall have the right to accept an alternate that is higher in price than the Base Bid or other alternate. Alternates' prices shall include the cost of furnishing and installing all materials, labor, tools, equipment and other incidentals necessary to complete the Work in accordance with the design intent, manufacturers' recommendations, building codes, authorities having jurisdiction, and the Construction Documents. Do not adjust material allowances under any alternate bid items. Indicate whether alternate cost is an Add or Deduct when a choice is provided. If there is no change in the contract amount for any alternate write "NO CHANGE" or "Zero (0)" in the blank. The failure to enter an amount or "NO CHANGE" in the blanks for an alternate shall be treated conclusively as a Bid of zero dollars for the work described in the alternate.

Alternate #1: The Bidder shall state the adjustment in price to be added to or deducted from the Base Bid to increase the Contractor's Warranty period from one-year to two-year from the date of substantial completion (excluding landscaping). This alternate does not affect other warranties required by the Contract Documents or provided by manufacturers.

ADD/DEDUCT _____ Dollars.
(Words)

($ _____)
(Figures)

Alternate #2: Not Applicable.

Alternate #3: The Site Contract Bidder shall state the adjustment in price to be added to or deducted from the Base Bid to provide engineered structural fill or 2A modified stone in lieu of using on-site materials for all fills required below the bottom of subgrade stone for the entire building pad and up to 10' outside the new buildings exterior wall line as identified on the Special Excavation Plan. Under this alternate, the resulting excess soils are to be disposed of legally by the contractor off-site. Under this Alternate, the General Contract, Mechanical Contract, Electrical Contract, and Plumbing Contract Bidders shall state the adjustment in price to be added to, or deducted from, the Base Bid to perform their scope of work within the engineered structural fill or 2A modified stone in lieu of on-site materials as identified in the Bid Documents.

ADD/DEDUCT _____ Dollars.
(Words)

($ _____)
(Figures)

Alternate #4: Not Applicable.

Alternate #5: Not Applicable.

Alternate #6: Not Applicable.

Alternate #7: Not Applicable.

Alternate #8: Not Applicable.

Alternate #9: Not Applicable.

Alternate #10: Not Applicable.

Alternate #11: Not Applicable.

Alternate #12: Not Applicable.

The undersigned hereby acknowledge receipt of following Addenda and has prepared this bid accordingly:

ADDENDUM #_____ Dated_____

ADDENDUM #_____ Dated_____

ADDENDUM #_____ Dated_____

ADDENDUM #_____ Dated_____

ADDENDUM #_____ Dated_____

ADDENDUM #_____ Dated_____

ADDENDUM #_____ Dated_____

ADDENDUM #_____ Dated_____

SIGNATURES:

In witness whereof, the undersigned has caused this Proposal to be executed this _____ day of _____, 20_____.

INDIVIDUAL, PARTNERSHIP, LLC OR CORPORATION

_____
(Firm Name)

By: _____
(Signature)

_____
(Print Name and Title of Authorized Person to Sign)

State of Incorporation: _____

Business Address: _____

_____

_____

Telephone Number: _____

Email Address: _____

_____
Attest By

_____
Print Name of Person

Business/Corporate Seal:

Exeter Township
Emergency Services Facility
70 Gibraltar Road
Reading, PA 19606

Bid Form
Bid Package #06 – Electrical Construction

Bids Due: 11/10/26 @ 2:00 PM

Deliver Sealed bids to:
Exeter Township
Attn: Larry Piersol, Township Manager
Exeter Township Building
4975 DeMoss Road
Reading, PA 19606

Date: _____

Firm Name: _____

Firm Address: _____

_____

Contact: _____

Phone Number: _____

Email: _____

THIS BID FORM SHALL NOT BE ALTERED IN ANY MANNER. ANY ALTERED BID FORMS SHALL BE CONSIDERED NON-RESPONSIVE AND WILL BE REJECTED.

This Bid is submitted in accordance with your Advertisement inviting bids to be received for the Exeter Township Emergency Services Facility Bid Package #06 Electrical Construction.

The undersigned BIDDER proposes and agrees, if this Bid is accepted, to enter into an Agreement with OWNER in the form included in the Contract Documents to complete all Work as specified or indicated in the Contract Documents for the Contract Price and within the Contract Time indicated in this Bid and in accordance with the Contract Documents.

In submitting this Bid, BIDDER represents, as more fully set forth in the agreement that:

a. BIDDER has carefully examined the Contract Documents including all Addenda which are incorporated with these documents indicating various conditions affecting this contract, the undersigned herein agrees to furnish all materials, perform all labor and do all else necessary to complete the work for the Bid Package #06 indicated above for the Contract for the above named Project in accordance with said Contract Documents.

b. BIDDER has examined the site and locality where the Work is to be performed, the legal requirements (federal, state, and local laws, ordinances, rules and regulations) and the conditions affecting cost, progress or performance of the Work and has made such independent investigations as BIDDER deems necessary. Failure to visit and not be familiar with the Project site shall be no reason for future requests for additional compensation or costs of any kind.

LUMP SUM BASE BID – The contractor shall state the price for the completion of all work as indicated by the Contract Documents that is not included in the bid alternates listed below. This price shall be the base bid. **The base bid below shall include any and all allowances as described below**. All allowances MUST include all overhead and profit.

	BASE BID LINE ITEM SUB-TOTALS	
	Line Item Scope of Work	**Line Item Scope of Work Bid Subtotal**
BB1	Contractors' Cost of Work	Words: _____ Dollars Figures: ($_____)
BB2	EC-1: Owner Contingency Allowance, Electrical Construction Contract	Words: One Hundred Fifty Thousand Dollars Figures: ($150,000.00)

TOTAL LUMP SUM BASE BID Contractors' Cost for the Work (**BB1**) + Owner Contingency Allowances (**BB2**)
Words: _____ Dollars
Figures: ($_____)

Accompanying this Proposal is a certified check, bank cashier's check, bank treasurer's check or Bid Bond required by the Checklist and Instructions to Bidders, in the amount of 10% of the total Base Bid plus ALL possible ADD Alternates, which is deposited as a proposal guarantee, and is to be retained by you and applied as provided in the Instruction to Bidders, in case the undersigned shall default in executing the Contract or in furnishing the required Bonds and insurance certificates within the time specified by the Contract Documents.

The undersigned hereby certifies that this Proposal is genuine and not sham or collusive or made in the interest of or in behalf of any person, firm or corporation not herein named and that the undersigned has not directly or indirectly induced or solicited any bidder to refrain from bidding and that the undersigned has not in any manner sought by collusion to secure for himself any advantages over any other bidder.

The undersigned, intending to be legally bound, agrees that this Proposal shall be irrevocable and shall remain subject to your acceptance for 90 days after date set for bid opening unless the Owner is delayed in awarding the Contract due to the failure to receive a required approval or permit from one or more reviewing bodies/governmental agencies having jurisdiction over the Project, the sale of bonds, or the award of a grant, in which case, Bids shall remain open for 120 days after the day of Bid Opening. BIDDER will sign the Agreement and submit the Contract Security and other documents required by the Contract Documents within ten (10) days after the date of OWNER'S Notice of Award,

except as provided by Act 317 of 1978, approved November 26, 1978, which provides for possible extensions of the holding period.

The undersigned submit this Proposal with the full knowledge of the Contract Document and Project requirements and hereby agrees that each phase of the work of this Project, under this Contract, shall be fully and finally completed and ready for occupancy and use on or before the completion date identified for that specific phase in the Contract Documents.

Bidder accepts the provisions of the Agreement as to the liquidated damages for failure to meet the milestone dates defined and substantial completion of the project shall be calculated at One Thousand Five Hundred Dollars ($1,500.00) per day for each calendar day of delay until the work is substantially complete.

The contract amount stated above includes all sales taxes, excise, and other taxes for all materials and appliances subject to and upon which taxes are levied.

The undersigned must enclose the following required attachments to this Bid Form. **Each bidder shall submit two (2) hard copies of the complete bid submission and one (1) electronic USB.**

The following shall be included in the bid submission:

1. Form of Proposal, fully executed and notarized
2. Bid Bond or Certified Check or Cashier's check in the amount of 10% of the Bid total and shall include Consent of Surety and Power of Attorney
3. Non-Collusion Affidavit, Signed and Sealed
4. Non-Discrimination Clause, Signed and Sealed
5. PA Public Works Employment Verification Form (E-Verify)

Note that the following will be required to be submitted by ALL Bidders at the request of the Construction Manager within 48 hours of bid submission:

1. Bidder's Qualifications, AIA A305, completed
2. Schedule of Values
3. List of Subcontractors
4. Safety Questionnaire

Note that the successful bidder will be required to submit the following documents and any other documents deemed necessary by the Construction Manager upon issuance of Letter of Intent to Award:

1. Certificate of Insurance
2. Performance Bond in the amount of 100%
3. Payment Bond in the amount of 100%
4. No Lien Agreement
5. Maintenance Bond

The undersigned shall indemnify and hold harmless Exeter Township, Boyle Construction, Inc., Manns Woodward Studios and Herbert, Rowland & Grubic, Inc., all consultants and each officer and employees, with respect to any claims, losses, expenses, costs and reasonable attorney's fees incurred by Exeter Township, Boyle Construction, Inc., Manns Woodward Studios and Herbert, Rowland & Grubic, Inc., all consultants and each officer and employees, with regard to the undersigned's failure to comply with these Bid Documents and procedures.

Permits and Inspections: Any required permit fee will be paid by the Owner. Upon award, the successful prime

contractor must complete any applicable permit form (and business licenses if required) and submit to the Township. Inspection fees will be paid for by the Owner. Any additional costs incurred due to failed inspections shall be paid by the prime contractor. Any required contractor or business license fees required by the Township are to be paid by the prime contractor.

The Owner also reserves the right to solicit independent proposals as required by Exeter Township guidelines, under a separate contract to perform the services required. **The responsiveness of the Bid and if the Bid is responsible, may be determined by the Owner on the basis of the Unit Prices proposed by the bidder. Unit Prices shall be consistent with verifiable average costs for the work to be performed. Bidders agree that a proposal may be rejected if the Unit Prices submitted are inconsistent with the average cost.** Under NO circumstances will BIDDER perform Unit Price Work without prior written authorization from the OWNER. Contract Unit Price shall include costs for furnishing and installing all materials, labor, tools, equipment, and other incidentals necessary to complete the specified operation. Contract Unit Price shall also apply to deletion of "furnishing and installing" items from the Project.

In submitting this Bid, it is understood that the OWNER reserves the unrestricted right to reject any and all bids, or to waive any informalities or technicalities in said Bids.

THERE ARE NO UNIT PRICES and UNIT PRICE ALLOWANCES IN CONTRACT.

ALTERNATES: The Bidder agrees that the Owner shall have the right to accept or reject any or all of the following alternates, which acceptance or rejection shall enter into the determination of the lowest Bidder. The Bidder agrees that the Contract Time shall not be increased on account of the acceptance of any one or combination of alternates unless specifically stated in such alternate description(s). The Bidder agrees that the Owner shall have the right to accept an alternate that is higher in price than the Base Bid or other alternate. Alternates' prices shall include the cost of furnishing and installing all materials, labor, tools, equipment and other incidentals necessary to complete the Work in accordance with the design intent, manufacturers' recommendations, building codes, authorities having jurisdiction, and the Construction Documents. Do not adjust material allowances under any alternate bid items. Indicate whether alternate cost is an Add or Deduct when a choice is provided. If there is no change in the contract amount for any alternate write "NO CHANGE" or "Zero (0)" in the blank. The failure to enter an amount or "NO CHANGE" in the blanks for an alternate shall be treated conclusively as a Bid of zero dollars for the work described in the alternate.

Alternate #1: The Bidder shall state the adjustment in price to be added to or deducted from the Base Bid to increase the Contractor's Warranty period from one-year to two-year from the date of substantial completion (excluding landscaping). This alternate does not affect other warranties required by the Contract Documents or provided by manufacturers.

ADD/DEDUCT _____ Dollars.
(Words)

($ _____)
(Figures)

Alternate #2: Not applicable.

Alternate #3: The Site Contract Bidder shall state the adjustment in price to be added to or deducted from the Base Bid to provide engineered structural fill or 2A modified stone in lieu of using on-site materials for all fills required below the bottom of subgrade stone for the entire building pad and up to 10' outside the new buildings exterior wall line as identified on the Special Excavation Plan. Under this alternate, the resulting excess soils are to be disposed of legally by the contractor off-site. Under this Alternate, the General Contract, Mechanical Contract, Electrical Contract, and Plumbing Contract Bidders shall state the adjustment in price to be added to, or deducted from, the Base Bid to perform their scope of work within the engineered structural fill or 2A modified stone in lieu of on-site materials as identified in the Bid Documents.

ADD/DEDUCT _____ Dollars.
(Words)

($ _____)
(Figures)

Alternate #4: Not Applicable.

Alternate #5: Not Applicable.

Alternate #6: Not Applicable.

Alternate #7: Not Applicable.

Alternate #8A: The Bidder shall state the adjustment in price to be added to or deducted from the Base Bid to provide all Electrical Components for Four-Fold doors in lieu of Fully Glazed Sectional overhead doors of Apparatus Bay doors OHD1, OHD2, OHD3, OHD4, OHD5, OHD6, and OHD7.

ADD/DEDUCT _____ Dollars.
(Words)

($ _____
(Figures)

Alternate #8B: The Bidder shall state the adjustment in price to be added to or deducted from the Base Bid to provide Fully Glazed Sectional overhead doors in lieu of Four-Fold doors of Apparatus Bay doors FFD1, FFD2, FFD3, FFD4, FFD5, FFD6, and FFD7.

ADD/DEDUCT _____ Dollars.
(Words)

($ _____
(Figures)

Alternate #9: Not Applicable.

Alternate #10: Not Applicable.

Alternate #11: Not Applicable.

Alternate #12: Not Applicable.

The undersigned hereby acknowledge receipt of following Addenda and has prepared this bid accordingly:

ADDENDUM #_____ Dated_____

ADDENDUM #_____ Dated_____

ADDENDUM #_____ Dated_____

ADDENDUM #_____ Dated_____

ADDENDUM #_____ Dated_____

ADDENDUM #_____ Dated_____

ADDENDUM #_____ Dated_____

ADDENDUM #_____ Dated_____

SIGNATURES:

In witness whereof, the undersigned has caused this Proposal to be executed this _____ day of _____, 20_____.

INDIVIDUAL, PARTNERSHIP, LLC OR CORPORATION

_____
(Firm Name)

By: _____
(Signature)

_____
(Print Name and Title of Authorized Person to Sign)

State of Incorporation: _____

Business Address: _____

_____

_____

Telephone Number: _____

Email Address: _____

_____
Attest By

_____
Print Name of Person

Business/Corporate Seal:

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SECTION 00 1250 - BIDDING SCHEDULE

1.1 BIDDING SCHEDULE

A. The Project's bidding schedule will be as follows:
1. 09/21/2026: Advertisement #1.
2. 09/29/2026: Advertisement #2.
3. 10/01/2026: Bid Documents available to Bidders.
4. 10/05/2026: Advertisement #3.
5. 10/07/2026: Mandatory Pre-Bid Conference.
6. 10/29/2026: Last day to submit Bid RFIs.
7. 11/05/2026: Final Addendum to be issued.
8. 11/10/2026: Sealed Bids due to the Township Building as outlined in Section 00 1113 - Advertisement for Bids.
9. 11/24/2026: Anticipated Letter of Intent to Award.
10. 12/14/2026: Anticipated Notice to Proceed.

END OF SECTION 00 1250

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SECTION 00 1300 - BID SECURITY FORM

The Bid Security Form utilized for this project shall be a “Bid Bond”, AIA Document A310-2010, included herein, or an approved equal. Reference Section 00 1100, “Instructions to Bidders” for the execution of the Bid Bond.

END OF SECTION 00 1300

DRAFT AIA® Document A310™ – 2010

Bid Bond

CONTRACTOR:
(Name, legal status and address)

« »« »
« »

SURETY:
(Name, legal status and principal place of business)

« »« »
« »

OWNER:
(Name, legal status and address)

«Exeter Township»«»
«4975 DeMoss Road
Reading, PA 19606»

BOND AMOUNT: $ « »

PROJECT:
(Name, location or address, and Project number, if any)

«Exeter Township Emergency Services Facility»
«70 Gibraltar Road
Reading, PA 19606»

The Contractor and Surety are bound to the Owner in the amount set forth above, for the payment of which the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein. The conditions of this Bond are such that if the Owner accepts the bid of the Contractor within the time specified in the bid documents, or within such time period as may be agreed to by the Owner and Contractor, and the Contractor either (1) enters into a contract with the Owner in accordance with the terms of such bid, and gives such bond or bonds as may be specified in the bidding or Contract Documents, with a surety admitted in the jurisdiction of the Project and otherwise acceptable to the Owner, for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or (2) pays to the Owner the difference, not to exceed the amount of this Bond, between the amount specified in said bid and such larger amount for which the Owner may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect. The Surety hereby waives any notice of an agreement between the Owner and Contractor to extend the time in which the Owner may accept the bid. Waiver of notice by the Surety shall not apply to any extension exceeding sixty (60) days in the aggregate beyond the time for acceptance of bids specified in the bid documents, and the Owner and Contractor shall obtain the Surety's consent for an extension beyond sixty (60) days.

If this Bond is issued in connection with a subcontractor's bid to a Contractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Project, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

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User Notes: (1280005747)

Signed and sealed this « » day of « » , « »

	« »
	(Contractor as Principal) *(Seal)*
	« »
(Witness)	*(Title)*
	« »
	(Surety) *(Seal)*
	« »
(Witness)	*(Title)*

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User Notes: (1280005747)

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SECTION 00 1310 – PROPOSAL CHECKLIST

The following represents a list of those Documents and materials, which will be required in connection with the Project. **Certain items will be required at time of the Bid submission; failure to submit them may result in disqualification of the Bid in accordance with Pennsylvania law; other items will be required after bid date but no later than time set for the Contract execution**. Specific review should be made of Bidding Documents contained in the Project Manual to ascertain what those Documents are and when they are required to be submitted.

Submissions required with the Bid:

[ ] Bid Form fully executed and notarized.

[ ] Bid Bond or Certified Check or Cashier's Check in the amount of 10% of the Bid total and shall include Consent of Surety and Power of Attorney, Signed and Sealed.

[ ] Non-Collusion Affidavit, Signed and Sealed.

[ ] Non-Discrimination Clause, Signed and Sealed.

[ ] PA Public Works Employment Verification Form (E-Verify).

This checklist is submitted to the Bidders strictly as a courtesy and is not to be binding on the Owner. Responsibility for ascertaining and submitting the Documents needed for consideration of the Bid, and at appropriate time, falls upon each and every Bidder.

Submissions required after requested by the Construction Manager (within 48 hours of bid submission):

[ ] Bidder's Qualifications, AIA A305, completed.

[ ] A Schedule of Values.

[ ] List of Subcontractors.

[ ] Safety Questionnaire.

Submissions required after Letter of Intent issued:

[ ] Certificate of Insurance.

[ ] Performance and Payment Bond (100%).

[ ] No Lien Agreement.

[ ] Maintenance Bond.

END OF SECTION 00 1310

SECTION 00 1400 - AGREEMENT OF SURETY

(Note: This Agreement must be properly executed and must accompany the Certified Check, or Bid Bond, whichever is furnished as Bid Security.)

KNOW ALL MEN BY THESE PRESENTS, that we, _____, as Surety, a corporation existing under the laws of the State of _____, and authorized to transact business in the Commonwealth of Pennsylvania hereby agrees intending to be legally bound hereby, to execute and deliver to the Exeter Township, within the time limit specified in the Contract Documents, the Performance Bond and Payment Bond in the forms included in the Contract Documents each in an amount of 100% of the Contract Sum, in favor of the Exeter Township, as required for the faithful performance and proper fulfillment of the contract for Emergency Services Facility, 70 Gibraltar Road, Reading, PA 19606, Berks County, Exeter Township, Pennsylvania, on behalf of _____ (hereinafter called the Bidder) provided that the above contract be awarded to the Bidder within ninety (90) days after the date of opening of the bids or otherwise as set forth in the Instructions to Bidders.

Surety further agrees that should the Surety, after notification of intent to make such award, omit or refuse to execute the required bonds and agreement, then the Surety shall pay to the Exeter Township, hereinafter called the Obligee, any difference between the total amount specified in said Bidder's proposal for the required work and the amount of which said Obligee may procure the same work, if the latter amount be in excess of the former, plus any advertising, architectural, legal, and other expenses incurred by Obligee; provided, however, that the obligations of Surety hereunder shall not exceed the amount of bid security provided by the Bidder together with interest.

Dated: _____, 20__ _____
(CORPORATE SURETY)

WITNESS OR ATTEST:

_____ By: _____
Attorney-in-Fact*

NAME: _____
(Please type)

*Attach an appropriate Power of Attorney, dated as of the same date as this Agreement, evidencing the authority of the Attorney-in-Fact to act on behalf of the Corporation.

END OF SECTION 00 1400

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SECTION 00 1500 - NON-COLLUSION AFFIDAVIT OF CONTRACTOR

State of _____

County of _____

I state that I am _____ of _____
(Title) (Entity Name)

and that I am authorized to make this affidavit on behalf of said entity.

I state that:

1. The price(s) and amount of this Bid have been arrived at independently and without consultation, communication, or agreement with any other contractor, bidder, or potential bidder.

2. Neither the price(s) nor the amount of this Bid, and neither the approximate price(s) nor approximate amount of this Bid, have been disclosed to any other firm or person who is a bidder or potential bidder, and they will not be disclosed before Bid opening.

3. No attempt has been made or will be made to induce any firm or person to refrain from bidding on this contract, or to submit a bid higher than this Bid, or to submit any intentionally high or noncompetitive bid or other form of complementary bid.

4. The Bid of my firm is made in good faith and not pursuant to any agreement or discussion with, or inducement from, any firm or person to submit a complementary or other noncompetitive bid.

5. _____,its affiliates,
(Entity)
subsidiaries, officers, directors, and employees are not currently under investigation by any governmental agency and have not in the last three years been convicted or found liable for any act prohibited by State or Federal Law in any jurisdiction, involving conspiracy or collusion with respect to bidding on any public contract except as follows:

_____

I state that, _____,
(Name of My Firm)

understands and acknowledges that the above representations are material and important and will be relied on by the Exeter Township in awarding the contract(s) for which this Bid is submitted. I understand, and my firm understands, that any misstatement in this Affidavit is and shall be treated as fraudulent concealment from the Exeter Township of the true facts relating to the submission of bids for this contract.

_____
(Name)

_____
(Company, Firm Position)

SWORN TO AND SUBSCRIBED

BEFORE ME THIS _____ DAY

of_____, 20___.

_____ _____
Notary Public My Commission Expires

Notary Seal:

SECTION 00 1550 – NON-DISCRIMINATION CLAUSE

_____, hereinafter referred to as the CONTRACTOR, agrees as follows:

1. CONTRACTOR shall not discriminate against any employee, applicant for employment, independent contractor, or any other person because of race, color, religious creed, ancestry, national origin, age, or sex. CONTRACTOR shall take affirmative action to ensure that applicants are employed, and that employees or agents are treated, during employment, without regard to their race, color, religious creed, ancestry, national origin, age or sex. Such affirmative action shall include, but is not limited to, the following: Employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training. CONTRACTOR shall post in conspicuous places, available to all employees, agents, applicants for employment, and other persons a notice to be provided by the contracting agency setting forth the provisions of the non-discrimination clause.

2. CONTRACTOR shall, in advertisement or requests for employment placed by it or on its behalf, state that all qualified applicants will receive consideration for employment without regard to race, color, religious creed, ancestry, national origin, age or sex.

3. CONTRACTOR shall send each labor union or worker's representative with which it has a collective bargaining agreement or other contract or understanding, a notice advising said labor union or workers' representative of its commitment to this non-discrimination clause. Similar notice shall be sent to every other source of recruitment regularly utilized by the CONTRACTOR.

4. It shall be no defense to a finding of non-compliance with the Contract Compliance Regulation Commission or this non-discrimination clause that the CONTRACTOR had delegated some of its employment practices to any union, training program, or other source or recruitment which prevents it from meeting its obligations. However, if the evidence indicates that the CONTRACTOR was not on notice of the third-party discrimination or made a good faith effort to correct it, such factor shall be considered in mitigation in determining appropriate sanctions.

5. Where the practice of a union or any training program or other source of recruitment will result in the exclusion of minority group persons, so that the CONTRACTOR will be unable to meet its obligations under the Contract Compliance Regulations issued by the Pennsylvania Human Relations Commission or this non-discrimination clause, CONTRACTOR shall then employ and fill vacancies through other non-discriminatory employment procedures.

6. CONTRACTOR shall comply with the Contract Compliance Regulations of the Pennsylvania Human Relations Commission, 16 PA Code Chapter 49 and with all state and federal laws prohibiting discrimination in hiring or employment opportunities. In the event of the CONTRACTOR's noncompliance with the non-discrimination clause of this CONTRACT, or with any such laws, this CONTRACT may, after hearing and adjudication, be terminated or suspended, in whole or in part, and the CONTRACTOR may be declared temporarily ineligible for further contracts and other such sanctions may be imposed and remedies invoked as provided by the Contract Compliance Regulations.

7. CONTRACTOR shall furnish all necessary employment documents and records to, and permit access to its books, records, and accounts by the contracting agency, the Office of Administration, Bureau of Affirmative Action, and the Human Relations Commission for purposes of investigation to ascertain compliance with the

provisions of the Contract Compliance Regulations, pursuant to 49.35 of the regulations cited above (relating to information concerning compliance by contractors). If CONTRACTOR does not possess documents or records reflecting the necessary information requested, it shall furnish such information on reporting forms supplied by the contracting agency, the Bureau of Affirmative Action or the COMMISSION.

8. CONTRACTOR shall actively recruit minority subcontractor or subcontractors with substantial minority representation among their employees.

9. CONTRACTOR shall include the provisions of the non-discrimination clause in every subcontract, so that such provisions will be binding upon each subcontractor.

10. The terms used in this non-discrimination clause shall have the same meaning as in the Contract Compliance Regulations issued by the Pennsylvania Human Relations Commission, 16 PA Code Chapter 49.

11. CONTRACTOR obligations under this clause are limited to the CONTRACTOR's facilities within Pennsylvania, or, where the contract is for the purchase of goods manufactured outside of Pennsylvania, the facilities at which such goods are actually produced.

CONTRACTOR: WITNESS:

_____

By:

State of _____, County of _____

Subscribed and sworn to before me this _____ day of _____, 20__.

Notary Public:
My Commission Expires:

PUBLIC WORK EMPLOYMENT VERIFICATION ACT

General. In accordance with Act 127 of 2012, known as the Public Works Employment Verification Act ("the Act"), effective January 1, 2013, 43 P.S. §§167.1-167.11, use the Federal Government's E-Verify system to ensure that all employees performing work on the project, including subcontractor's employees, are authorized to work in the United States.

Verification Form. Verify the employment eligibility of each new employee hired after January 1, 2013 and submit the Commonwealth Public Works Employment Verification Form ("Form") included in the bid package attachments to the Department.

Contractor. Fax the Form, signed by authorized representative of the Contractor, possessing sufficient knowledge to make the representations and certifications in the Form to Contract Awards at 717-705-1504 within 7 days of the bid opening. Failure or refusal to provide the Form will be considered a refusal to comply with bidding requirements, will result in rejection of the bid, and will be subject to the enforcement activities, sanctions and civil penalties specified in the Act.

Subcontractor. Obtain a signed Form from every subcontractor performing work on the project, signed by authorized representative of the subcontractor, possessing sufficient knowledge to make the representations and certifications in the Form and submit it to the Representative when requesting subcontractor approval. Failure or refusal to provide the Form will be considered a refusal to comply with subcontractor approval requirements, will result in rejection of the subcontractor request, and will subject the subcontractor to the enforcement activities, sanctions and civil penalties specified in the Act.

Include information about the requirements of the Act in all the subcontracts.

The Department of General Services is the Commonwealth agency responsible for enforcement and administration of the Act. Please direct questions about the Act to:

Department of General Services Public Works
Employment Verification Compliance Office
Room 105 Tent Building
18th and Herr Streets
Harrisburg, PA 17125
Fax: 717-214-3669

COMMONWEALTH OF PENNSYLVANIA

PUBLIC WORKS EMPLOYMENT VERIFICATION FORM

Date _____

Business or Organization Name (Employer)_____

Address _____

City _____ **State**_____ **Zip Code** _____

☐ **Contractor** ☐ {dzōŏ2yúNI-ŏű2N óŏKŜŏ] 2yŜú

Contracting Public Body _____

Contract/Project No _____

Project Description _____

Project Location _____

As a contractor/subcontractor for the above referenced public works contract, I hereby affirm that as of the above date, our company is in compliance with the Public Works Employment Verification Act ('the Act') through utilization of the federal E-Verify Program (EVP) operated by the United States Department of Homeland Security. To the best of my/our knowledge, all employees hired post January 1, 2013 are authorized to work in the United States.

It is also agreed to that all public works contractors/subcontractors will utilize the federal EVP to verify the employment eligibility of each new hire within five (5) business days of the employee start date throughout the duration of the public works contract. Documentation confirming the use of the federal EVP upon each new hire shall be maintained in the event of an investigation or audit.

I, _____, authorized representative of the company above, attest that the information contained in this verification form is true and correct and understand that the submission of false or misleading information in connection with the above verification shall be subject to sanctions provided by law.

_____

Authorized Representative Signature

SECTION 00 1810 – CONSTRUCTION MILESTONE SCHEDULE

Task #	Activity	Start No Earlier Than	Finish No Later Than
Exeter Township Emergency Service Center Construction Milestone Schedule			
	Site Phase 1		
1	Notice to Proceed	12/14/2026	
2	Start Submittal Review Process	12/14/2026	
3	Install E&S Protection and Temporary Construction Fence		12/21/2026
4	Begin Procurement of Long Lead Items	1/8/2027	
5	Complete Underground Storm Sewer & Basins		3/17/2027
6	Install U/G Water Meter Pit & Service Line to Building		3/22/2027
7	Install U/G Gas Service Lateral Sleeves		3/24/2027
8	Install U/G Sanitary Sewer & Oil/Sand Separator		3/29/2027
9	Install U/G Electrical Pathways		3/31/2027
10	Complete Rough Grading for Site and Building Pad		3/31/2027
	Building Phase		
11	Place Building Footings & CMU Foundation Walls		4/28/2027
12	Complete under slab rough-ins		6/4/2027
13	Complete Slab-On Grade		6/22/2027
14	Complete building Structural framing		7/20/2027
15	Complete Roof Deck, Insulation, and Membrane for watertight condition		7/27/2027
16	Complete Exterior Framing & Exterior CMU		8/24/2027
17	Complete Exterior -In-Wall Mechanical, Electrical, and Plumbing Rough-Ins		8/31/2027
18	Construct Interior wall framing		9/7/2027
19	Complete Exterior Window and Door Temporary enclosures		10/15/2027
20	Complete Overhead MEPF Rough-ins		11/16/2027
21	Complete Interior Gypsum Wall Board Installation		12/7/2027
22	Energize Permanent Power		12/28/2027
23	Install Ceiling Grid & set ceiling mounted devices		1/11/2028
24	Complete All Above Ceiling Inspections		1/14/2028
25	Complete MEP Startup		2/23/2028
26	Complete All Finishes		3/1/2028
27	Complete All Other Building Inspections		3/6/2028
28	Punchlist Preparation and Contractor Correction Period		4/10/2028
29	Building Substantial Completion		4/10/2028
30	Owner Training of All Building Systems		4/17/2028
31	Owner Furniture, Fixtures, & Equipment Move-In		5/1/2028
	Site Phase 2		
32	Complete Gas, Water, and Sanitary Connections to Public Utilities		11/23/2027
33	Set Generator & Commission		12/17/2027
34	Complete concrete Curbs, Sidewalks, & Concrete Paved Areas		3/14/2028
35	Complete all Asphalt Paving, Line Striping, Signage, Landscaping, & Site Lighting		4/13/2028
36	Site Substantial Completion		4/13/2028
37	Complete All Punch List for Site & Building		5/11/2028
38	Project Final Completion		5/11/2028

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SECTION 00 1910 – PERFORMANCE AND PAYMENT BOND

The Performance and Payment Bond to be executed on behalf of the Owner is the American Institute of Architects Document A312 "Performance and Payment Bond ", 2010 Edition, bound herein, is hereby made part of the Contract Documents. Other general industry accepted Performance and Payment Bond forms may also be accepted.

Document A312 is enclosed (2 page) following for each Prime Contractor's review.

END OF SECTION 00 1910

DRAFT AIA® Document A312® – 2010

Performance Bond

CONTRACTOR:
(Name, legal status and address)

« »« »
« »

SURETY:
(Name, legal status and principal place of business)

« »« »
« »

OWNER:
(Name, legal status and address)

«Exeter Township»« »
«4975 DeMoss Road
Reading, PA 19606»

CONSTRUCTION CONTRACT
Date: « »
Amount: $ « »
Description:
(Name and location)

«Exeter Township Emergency Services Facility»
«70 Gibraltar Road
Reading, PA 19606»

BOND
Date:
(Not earlier than Construction Contract Date)
« »
Amount: $ « »
Modifications to this Bond: **« »** None **« »** See Section 16

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:	« »« »	Name and Title:	« »« »

(Any additional signatures appear on the last page of this Performance Bond.)

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or **BROKER:**

« »
« »
« »

OWNER'S REPRESENTATIVE:
(Architect, Engineer or other party:)

«Mr. Larry Piersol»
«Exeter Township»
«4975 DeMoss Road»
«Reading, PA 19606»
«610-779-5560»
« »

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

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User Notes: (1112959090)

§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

§ 2 If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Section 3.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after

- **.1** the Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Section 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;
- **.2** the Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and
- **.3** the Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

§ 4 Failure on the part of the Owner to comply with the notice requirement in Section 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

§ 5 When the Owner has satisfied the conditions of Section 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

§ 5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

§ 5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

§ 5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Section 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

§ 5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:

- **.1** After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or
- **.2** Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

§ 6 If the Surety does not proceed as provided in Section 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Section 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

§ 7 If the Surety elects to act under Section 5.1, 5.2 or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the

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User Notes: (1112959090)

Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication, for

.1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

.2 additional legal, design professional and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Section 5; and

.3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

§ 8 If the Surety elects to act under Section 5.1, 5.3 or 5.4, the Surety's liability is limited to the amount of this Bond.

§ 9 The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors and assigns.

§ 10 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 11 Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 12 Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

§ 13 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 14 Definitions

§ 14.1 Balance of the Contract Price. The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made, including allowance to the Contractor of any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

§ 14.2 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

§ 14.3 Contractor Default. Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

§ 14.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 14.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

§ 15 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

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§ 16 Modifications to this bond are as follows:

« »

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:	« »« »	Name and Title:	« »« »
Address:	« »	Address:	« »

DRAFT

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User Notes: (1112959090)

DRAFT AIA® Document A312® – 2010

Payment Bond

CONTRACTOR:
(Name, legal status and address)

« »« »
« »

SURETY:
(Name, legal status and principal place of business)

« »« »
« »

OWNER:
(Name, legal status and address)

«Exeter Township»« »
«4975 DeMoss Road
Reading, PA 19606»

CONSTRUCTION CONTRACT
Date: « »
Amount: $ « »
Description:
(Name and location)

«Exeter Township Emergency Services Facility
«70 Gibraltar Road
Reading, PA 19606»

BOND
Date:
(Not earlier than Construction Contract Date)
« »
Amount: $ « »
Modifications to this Bond: « » None « » See Section 18

CONTRACTOR AS PRINCIPAL
Company: *(Corporate Seal)*

Signature: _____
Name and Title: « »« »

SURETY
Company: *(Corporate Seal)*

Signature: _____
Name and Title: « »« »

(Any additional signatures appear on the last page of this Payment Bond.)

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or **BROKER:**

« »
« »
« »

OWNER'S REPRESENTATIVE:
(Architect, Engineer or other party:)

«Mr. Larry Piersol»
«Exeter Township»
4975 DeMoss Road« »
«Reading, PA 19606»
«610-779-5560»
« »

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

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User Notes: (1835755338)

§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner to pay for labor, materials and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

§ 2 If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies and holds harmless the Owner from claims, demands, liens or suits by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Section 13) of claims, demands, liens or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety.

§ 4 When the Owner has satisfied the conditions in Section 3, the Surety shall promptly and at the Surety's expense defend, indemnify and hold harmless the Owner against a duly tendered claim, demand, lien or suit.

§ 5 The Surety's obligations to a Claimant under this Bond shall arise after the following:

§ 5.1 Claimants, who do not have a direct contract with the Contractor,

- **.1** have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
- **.2** have sent a Claim to the Surety (at the address described in Section 13).

§ 5.2 Claimants, who are employed by or have a direct contract with the Contractor, have sent a Claim to the Surety (at the address described in Section 13).

§ 6 If a notice of non-payment required by Section 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Section 5.1.1.

§ 7 When a Claimant has satisfied the conditions of Sections 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

§ 7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

§ 7.2 Pay or arrange for payment of any undisputed amounts.

§ 7.3 The Surety's failure to discharge its obligations under Section 7.1 or Section 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Section 7.1 or Section 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

§ 8 The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Section 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

§ 9 Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

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§ 10 The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to, or give notice on behalf of, Claimants or otherwise have any obligations to Claimants under this Bond.

§ 11 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 12 No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Section 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 13 Notice and Claims to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

§ 14 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 15 Upon request by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

§ 16 Definitions

§ 16.1 Claim. A written statement by the Claimant including at a minimum:

- **.1** the name of the Claimant;
- **.2** the name of the person for whom the labor was done, or materials or equipment furnished;
- **.3** a copy of the agreement or purchase order pursuant to which labor, materials or equipment was furnished for use in the performance of the Construction Contract;
- **.4** a brief description of the labor, materials or equipment furnished;
- **.5** the date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
- **.6** the total amount earned by the Claimant for labor, materials or equipment furnished as of the date of the Claim;
- **.7** the total amount of previous payments received by the Claimant; and
- **.8** the total amount due and unpaid to the Claimant for labor, materials or equipment furnished as of the date of the Claim.

§ 16.2 Claimant. An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

§ 16.3 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

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User Notes: (1835755338)

§ 16.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 16.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

§ 17 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 18 Modifications to this bond are as follows:

« »

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:	« »« »	Name and Title:	« »« »
Address:	« »	Address:	« »

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SECTION 00 1930 – MAINTENANCE BOND

Exeter Township Emergency Services Facility

18 MONTH MAINTENANCE BOND

(Please type or print clearly)

BOND # _____

(Renew each term with Maintenance Contract)

Know all men by these presents, that we, the undersigned_____as principal and as sureties, are hereby held and firmly bound unto the Exeter Township, as Obligee,_in the penal sum of__ _____dollars, (15% of Contract Amount) for the payment of which well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

Signed this_____day of_____, 20___.

The condition of the above obligation is such that whereas, the above named principal did on the day of___, 20___, enter into a contract with, which said contract is made a part of this the bond the same as though set forth herein:

Now, if said_____shall well and faithfully do and perform the things agreed by_____to be done and performed according to the terms of said contract, and shall pay all lawful claims for subcontractors, materialmen, laborers, persons, firms or corporations for labor performed or materials, provisions, provender or other supplies or teams, fuels, oils, implements or machinery furnished, used or consumed in the carrying forward, performing or completing said contract, we agreeing and assenting that this undertaking shall be for the benefit of any subcontractor, materialmen, laborer, person, firm or corporation having a just claim, as well as for the Obligee herein; and shall continue said obligation for twelve months from the date of completion and acceptance of the work to be performed under the said contract to guarantee against defects in the work, which, in the judgment of the Obligee or its successors or assigns having jurisdiction in the premises, are caused by defective or inferior materials and/or workmanship, then this obligation shall be void; otherwise the same shall remain in liability of the surety for any and all claims hereunder shall in no event exceed the penal amount of this obligation as herein stated.

The said surety hereby stipulates and agrees that no modifications, omissions or additions in or to the terms of the said contract or in or to the plans or specifications therefore shall in anywise affect the obligation of said surety on its bond.

The Principal and the Surety agree that in case of default in and/or any action arising out of this Bond, the Obligee or any person, association, partnership and/or corporation who shall be entitled to institute and maintain an action upon this Bond, as above provided, may use, for the purpose of the establishment of the claim, a copy of this Bond, duly certified by the Obligee to be true and correct, and the Principal and the Surety agree that any action instituted upon any part of this Bond shall not be a bar to any subsequent action upon the same part or any other part of

this Bond.

Each reference in this Bond to the Obligee shall also include the officers, employees and representatives of said Obligee.

It is the intention of the parties hereto to be legally bound by this instrument.

IN WITNESS WHEREOF, THE said Principal and Surety have duly executed this Bond in triplicate under seal and day and year first above written.

SIGNED, SEALED AND DATED THIS_____DAY OF_____, 20_ .

_____
PRINCIPAL

Attest: BY_____(L.S.)

_____
Title of Officer

_____
SECRETARY (SEAL)

_____
Surety

Attest: BY_____(L.S.)

_____
Title of Officer

_____
SECRETARY (SEAL)

SECTION 00 1940 - CONTRACTOR QUALIFICATION STATEMENT

The Contractor Qualification Statement is the American Institute of Architect's Document A305 “Contractor Qualification Statement”, 2020 Edition, and is bound herewith.

Document A305 is enclosed with Exhibits for each Prime Contractor’s review.

END OF SECTION 00 1940

DRAFT

AIA® Document A305® – 2020

Contractor's Qualification Statement

THE PARTIES SHOULD EXECUTE A SEPARATE CONFIDENTIALITY AGREEMENT IF THEY INTEND FOR ANY OF THE INFORMATION IN THIS A305-2020 TO BE HELD CONFIDENTIAL.

SUBMITTED BY:
(Organization name and address.)
« »

SUBMITTED TO:
(Organization name and address.)
«Exeter Township«»
«4975 DeMoss Road
Reading, PA 19606»

TYPE OF WORK TYPICALLY PERFORMED
(Indicate the type of work your organization typically performs, such as general contracting, construction manager as constructor services, HVAC contracting, electrical contracting, plumbing contracting, or other.)
« »

THIS CONTRACTOR'S QUALIFICATION STATEMENT INCLUDES THE FOLLOWING:
(Check all that apply.)

[«X»] Exhibit A – General Information
[«X»] Exhibit B – Financial and Performance Information
[«X»] Exhibit C – Project-Specific Information
[«X»] Exhibit D – Past Project Experience
[« »] Exhibit E – Past Project Experience (Continued)

CONTRACTOR CERTIFICATION
The undersigned certifies under oath that the information provided in this Contractor's Qualification Statement is true and sufficiently complete so as not to be misleading.

« »
Organization's Authorized Representative Signature **Date**

« »
Printed Name and Title

NOTARY
State of: « »
County of: « »
Signed and sworn to before me this « » day of « » « »

Notary Signature

My commission expires: « »

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DRAFT AIA® Document A305™ – 2020 Exhibit A

General Information

This Exhibit is part of the Contractor's Qualification Statement, submitted by « » and dated the « » day of « » in the year « »
(In words, indicate day, month and year.)

§ A.1 ORGANIZATION
§ A.1.1 Name and Location
§ A.1.1.1 Identify the full legal name of your organization.

« »

§ A.1.1.2 List all other names under which your organization currently does business and, for each name, identify jurisdictions in which it is registered to do business under that trade name.

« »

§ A.1.1.3 List all prior names under which your organization has operated and, for each name, indicate the date range and jurisdiction in which it was used.

« »

§ A.1.1.4 Identify the address of your organization's principal place of business and list all office locations out of which your organization conducts business. If your organization has multiple offices, you may attach an exhibit or refer to a website.

« »

§ A.1.2 Legal Status
§ A.1.2.1 Identify the legal status under which your organization does business, such as sole proprietorship, partnership, corporation, limited liability corporation, joint venture, or other.

« »

.1 If your organization is a corporation, identify the state in which it is incorporated, the date of incorporation, and its four highest-ranking corporate officers and their titles, as applicable.

« »

.2 If your organization is a partnership, identify its partners and its date of organization.

« »

.3 If your organization is individually owned, identify its owner and date of organization.

« »

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User Notes: (1463371110)

.4 If the form of your organization is other than those listed above, describe it and identify its individual leaders:

« »

§ A.1.2.2 Does your organization own, in whole or in part, any other construction-related businesses? If so, identify and describe those businesses and specify percentage of ownership.

« »

§ A.1.3 Other Information

§ A.1.3.1 How many years has your organization been in business?

« »

§ A.1.3.2 How many full-time employees work for your organization?

« »

§ A.1.3.3 List your North American Industry Classification System (NAICS) codes and titles. Specify which is your primary NAICS code.

« »

§ A.1.3.4 Indicate whether your organization is certified as a governmentally recognized special business class, such as a minority business enterprise, woman business enterprise, service disabled veteran owned small business, woman owned small business, small business in a HUBZone, or a small disadvantaged business in the 8(a) Business Development Program. For each, identify the certifying authority and indicate jurisdictions to which such certification applies.

« »

§ A.2 EXPERIENCE

§ A.2.1 Complete Exhibit D to describe up to four projects, either completed or in progress, that are representative of your organization's experience and capabilities.

§ A.2.2 State your organization's total dollar value of work currently under contract.

« »

§ A.2.3 Of the amount stated in Section A.2.2, state the dollar value of work that remains to be completed:

« »

§ A.2.4 State your organization's average annual dollar value of construction work performed during the last five years.

« »

§ A.3 CAPABILITIES

§ A.3.1 List the categories of work that your organization typically self-performs.

« »

§ A.3.2 Identify qualities, accreditations, services, skills, or personnel that you believe differentiate your organization from others.

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« »

§ A.3.3 Does your organization provide design collaboration or pre-construction services? If so, describe those services.

« »

§ A.3.4 Does your organization use building information modeling (BIM)? If so, describe how your organization uses BIM and identify BIM software that your organization regularly uses.

« »

§ A.3.5 Does your organization use a project management information system? If so, identify that system.

« »

§ A.4 REFERENCES

§ A.4.1 Identify three client references:
(Insert name, organization, and contact information)

« »

§ A.4.2 Identify three architect references:
(Insert name, organization, and contact information)

« »

§ A.4.3 Identify one bank reference:
(Insert name, organization, and contact information)

« »

§ A.4.4 Identify three subcontractor or other trade references:
(Insert name, organization, and contact information)

« »

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DRAFT AIA® Document A305™ – 2020 Exhibit B

Financial and Performance Information

This Exhibit is part of the Contractor's Qualification Statement, submitted by « » and dated the « » day of « » in the year « »
(In words, indicate day, month and year.)

§ B.1 FINANCIAL

§ B.1.1 Federal tax identification number:

« »

§ B.1.2 Attach financial statements for the last three years prepared in accordance with Generally Accepted Accounting Principles, including your organization's latest balance sheet and income statement. Also, indicate the name and contact information of the firm that prepared each financial statement.

« »

§ B.1.3 Has your organization, its parent, or a subsidiary, affiliate, or other entity having common ownership or management, been the subject of any bankruptcy proceeding within the last ten years?

« »

§ B.1.4 Identify your organization's preferred credit rating agency and identification information.
(Identify rating agency, such as Dun and Bradstreet or Equifax, and insert your organization's identification number or other method of searching your organization's credit rating with such agency.)

« »

§ B.2 DISPUTES AND DISCIPLINARY ACTIONS

§ B.2.1 Are there any pending or outstanding judgments, arbitration proceedings, bond claims, or lawsuits against your organization, its parent, or a subsidiary, affiliate, or other entity having common ownership or management, or any of the individuals listed in Exhibit A, Section 1.2, in which the amount in dispute is more than $75,000?
(If the answer is yes, provide an explanation.)

« »

§ B.2.2 In the last five years has your organization, its parent, or a subsidiary, affiliate, or other entity having common ownership or management:
(If the answer to any of the questions below is yes, provide an explanation.)

.1 failed to complete work awarded to it?

« »

.2 been terminated for any reason except for an owners' convenience?

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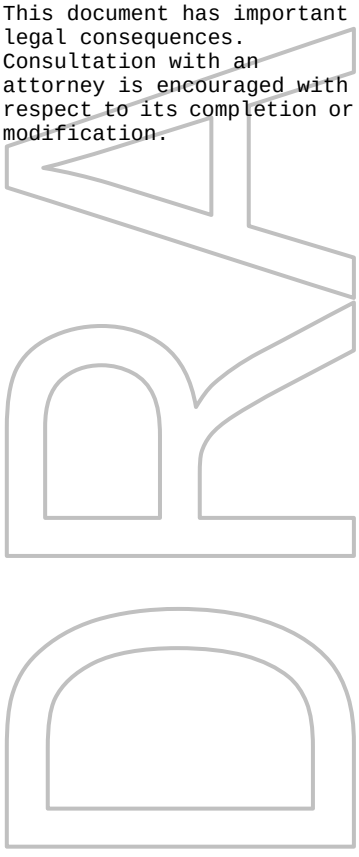

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« »

.3 had any judgments, settlements, or awards pertaining to a construction project in which your organization was responsible for more than $75,000?

« »

.4 filed any lawsuits or requested arbitration regarding a construction project?

« »

§ B.2.3 In the last five years, has your organization, its parent, or a subsidiary, affiliate, or other entity having common ownership or management; or any of the individuals listed in Exhibit A Section 1.2:
(If the answer to any of the questions below is yes, provide an explanation.)

.1 been convicted of, or indicted for, a business-related crime?

« »

.2 had any business or professional license subjected to disciplinary action?

« »

.3 been penalized or fined by a state or federal environmental agency?

« »

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DRAFT AIA® Document A305™ – 2020 Exhibit C

Project Specific Information

This Exhibit is part of the Contractor's Qualification Statement, submitted by « » and dated the « » day of « » in the year « »
(In words, indicate day, month and year.)

PROJECT:
(Name and location or address.)

«Exeter Township Services Facility
70 Gibraltar Road
Reading, PA 19606»

CONTRACTOR'S PROJECT OFFICE:
(Identify the office out of which the contractor proposes to perform the work for the Project.)

« »

TYPE OF WORK SOUGHT
(Indicate the type of work you are seeking for this Project, such as general contracting, construction manager as constructor, design-build, HVAC subcontracting, electrical subcontracting, plumbing subcontracting, etc.)

« »

CONFLICT OF INTEREST
Describe any conflict of interest your organization, its parent, or a subsidiary, affiliate, or other entity having common ownership or management, or any of the individuals listed in Exhibit A Section 1.2, may have regarding this Project.

« »

§ C.1 PERFORMANCE OF THE WORK
§ C.1.1 When was the Contractor's Project Office established?

« »

§ C.1.2 How many full-time field and office staff are respectively employed at the Contractor's Project Office?

« »

§ C.1.3 List the business license and contractor license or registration numbers for the Contractor's Project Office that pertain to the Project.

« »

§ C.1.4 Identify key personnel from your organization who will be meaningfully involved with work on this Project and indicate (1) their position on the Project team, (2) their office

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location, (3) their expertise and experience, and (4) projects similar to the Project on which they have worked.

« »

§ C.1.5 Identify portions of work that you intend to self-perform on this Project.

« »

§ C.1.6 To the extent known, list the subcontractors you intend to use for major portions of work on the Project.

« »

§ C.2 EXPERIENCE RELATED TO THE PROJECT

§ C.2.1 Complete Exhibit D to describe up to four projects performed by the Contractor's Project Office, either completed or in progress, that are relevant to this Project, such as projects in a similar geographic area or of similar project type. If you have already completed Exhibit D, but want to provide further examples of projects that are relevant to this Project, you may complete Exhibit E.

§ C.2.2 State the total dollar value of work currently under contract at the Contractor's Project Office:

« »

§ C.2.3 Of the amount stated in Section C.2.2, state the dollar value of work that remains to be completed:

« »

§ C.2.4 State the average annual dollar value of construction work performed by the Contractor's Project Office during the last five years.

« »

§ C.2.5 List the total number of projects the Contractor's Project Office has completed in the last five years and state the dollar value of the largest contract the Contractor's Project Office has completed during that time.

« »

§ C.3 SAFETY PROGRAM AND RECORD

§ C.3.1 Does the Contractor's Project Office have a written safety program?

« »

§ C.3.2 List all safety-related citations and penalties the Contractor's Project Office has received in the last three years.

« »

§ C.3.3 Attach the Contractor's Project Office's OSHA 300a Summary of Work-Related Injuries and Illnesses form for the last three years.

§ C.3.4 Attach a copy of your insurance agent's verification letter for your organization's current workers' compensation experience modification rate and rates for the last three years.

§ C.4 INSURANCE

§ C.4.1 Attach current certificates of insurance for your commercial general liability policy, umbrella insurance policy, and professional liability insurance policy, if any. Identify deductibles or self-insured retentions for your commercial general liability policy.

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§ C.4.2 If requested, will your organization be able to provide property insurance for the Project written on a builder's risk "all-risks" completed value or equivalent policy form and sufficient to cover the total value of the entire Project on a replacement cost basis?

« »

§ C.4.3 Does your commercial general liability policy contain any exclusions or restrictions of coverage that are prohibited in AIA Document A101-2017, Exhibit A, Insurance A.3.2.2.2? If so, identify.

« »

§ C.5 SURETY

§ C.5.1 If requested, will your organization be able to provide a performance and payment bond for this Project?

« »

§ C.5.2 Surety company name:

« »

§ C.5.3 Surety agent name and contact information:

« »

§ C.5.4 Total bonding capacity:

« »

§ C.5.5 Available bonding capacity as of the date of this qualification statement:

« »

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AIA® Document A305™ – 2020
Exhibit D

Contractor's Past Project Experience

	1	2	3	4
PROJECT NAME				
PROJECT LOCATION				
PROJECT TYPE				
OWNER				
ARCHITECT				
CONTRACTOR'S PROJECT EXECUTIVE				
KEY PERSONNEL (include titles)				
PROJECT DETAILS	Contract Amount Completion Date % Self-Performed Work	Contract Amount Completion Date % Self-Performed Work	Contract Amount Completion Date % Self-Performed Work	Contract Amount Completion Date % Self-Performed Work
PROJECT DELIVERY METHOD	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:
SUSTAINABILITY CERTIFICATIONS				

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AIA® Document A305™ – 2020
Exhibit E

Contractor's Past Project Experience, Continued

	1	2	3	4
PROJECT NAME				
PROJECT LOCATION				
PROJECT TYPE				
OWNER				
ARCHITECT				
CONTRACTOR'S PROJECT EXECUTIVE				
KEY PERSONNEL (include titles)				
PROJECT DETAILS	Contract Amount Completion Date % Self-Performed Work	Contract Amount Completion Date % Self-Performed Work	Contract Amount Completion Date % Self-Performed Work	Contract Amount Completion Date % Self-Performed Work
PROJECT DELIVERY METHOD	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☑ CM advisor ☐ Other:
SUSTAINABILITY CERTIFICATIONS				

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SECTION 00 1950 – SAFETY PRE-QUALIFICATION QUESTIONNAIRE

The Safety Pre-Qualification Questionnaire, bound herewith, is to be completed by each Bidder. Safety Pre-Qualification Questionnaire is enclosed following for each Prime Contractor's review.

CONTRACTOR SAFETY PRE-QUALIFICATION AND MINIMUM SAFETY STANDARDS

PURPOSE AND AUTHORITY

A. The Owner will award each prime contract for the Project to the lowest responsible bidder after due public notice, in accordance with the Second-Class Township Code, 53 P.S. Section 68102. A bidder's record of and commitment to safe work practices bear directly on its responsibility, that is, its ability to perform and complete the Work in a proper, safe, and satisfactory manner. The Owner has therefore established the objective safety criteria and will apply them uniformly to every bidder as one component of its determination of bidder responsibility.

B. These criteria are part of the Contract Documents adopted and approved by the Board of Supervisors of Exeter Township. They are in addition to, and not a substitute for, all other requirements of responsibility stated in the Contract Documents, including bonding, insurance, and financial and technical qualification requirements.

REQUIRED SUBMISSION

A. Each bidder shall complete, sign, and submit the Safety Pre-Qualification Questionnaire bound in Section 001950 (the "Safety Questionnaire"), fully answered, within 48 hours of bid submission. The identical Safety Questionnaire and the identical standards apply to every bidder in each bid category. The Owner may also require each major subcontractor identified in a bidder's bid to complete and submit the Safety Questionnaire on the same terms.

B. Each bidder shall submit with the Safety Questionnaire the supporting documentation it requires, including verification from the bidder's insurance carrier, agent, or broker of the bidder's Experience Modification Rate (EMR) for the current and three most recent rating periods.

MINIMUM SAFETY STANDARDS

A. Experience Modification Rate. The maximum acceptable EMR is 1.0. A bidder whose current EMR, or whose average EMR over the three most recent rating periods, exceeds 1.0 does not for that reason alone become ineligible, but shall provide the written explanation and supporting information described in Section A.

B. Safety Culture Score. The minimum acceptable score on the Safety Culture questions (Section D of the Safety Questionnaire) is 80 out of 100. A bidder scoring below 80 does not for that reason alone become ineligible, but shall provide the written explanation and supporting information described in Section D.

C. OSHA History. Each bidder shall disclose its Serious, Repeat, and Willful OSHA citations for the preceding five years, and its OSHA recordable and lost-time incidence data, as the Safety Questionnaire requires. A bidder's failure to disclose citations or data that are later verified may be treated as a material misrepresentation bearing on its responsibility.

OPPORTUNITY TO EXPLAIN; DETERMINATION OF RESPONSIBILITY

A. Equal opportunity to explain. Any bidder whose submission does not meet a minimum standard in all Sections shall be afforded, on the same terms as every other such bidder, a reasonable opportunity to submit a written explanation

with supporting documentation, addressing the reasons the standard was not met and the corrective actions the bidder has undertaken.

B. Good-faith determination. The Owner will review each Safety Questionnaire, each explanation, and the supporting documentation, and will determine in good faith whether the bidder is a responsible bidder. The Owner may accept or reject a bidder's explanation and will apply the same criteria and the same process to all bidders.

C. Timing. The Owner will evaluate responsibility after bids are received and publicly opened. Nothing authorizes the rejection or return of any bid before it has been received and opened.

RESERVATIONS

A. The Owner reserves the right to reject any or all bids, to waive technical defects and informalities in any bid, and to investigate the responsibility of any bidder, including independent verification of the information in the Safety Questionnaire.

B. Financial information and Workers' Compensation loss-run data submitted with the Safety Questionnaire will be treated as confidential to the extent permitted by law.

C. No determination limits the Owner's rights, or a bidder's obligations, under any other provision of the Contract Documents.

END OF SECTION 00 1950

Subcontractor Pre-Qualification Safety Questionnaire

Job#: _____

Date: _____

Subcontractor Name: _____

Information required in this document will be provided to the above-named client. Client will Review and make all determinations regarding acceptability based on initial and any follow up Information requested.

Company Information

Address _____ Phone Number _____

City _____ Fax Number _____

State _____ Zip Code _____ e-mail _____

SIC Code _____ Yrs. In Business _____

Corp. Safety Director _____

Phone Number _____

E-mail _____

Company Background (Explain the type of work your company performs)

Section A: Experience Modification Rate

Please obtain from your insurance agent/broker/carrier, Company's EMR for the last four (4) rating periods. Contractor may be considered ineligible if current year or most recent three-year average EMR is above the identified threshold:

Experience Modification Rate Threshold (EMR)	1.0		
Current Year EMR		Policy Year	
Previous Year 1		Policy Year	
Previous Year 2		Policy Year	
Previous Year 3		Policy Year	

If Contractor's current EMR, or average EMR over the most recent three (3) year period is above the identified threshold, the following information must be provided:

1. Written explanation of why contractor's EMR is above identified threshold;
2. Written outline of corrective actions currently being undertaken to reduce injuries, illnesses and Worker's Compensation losses by the contractor;
3. Copy of Contractor's Corporate Safety and Health Program
4. Name and qualification of individual(s) responsible for managing and overseeing this initiative;
5. Copy of Contractor's Worker's Compensation Loss Runs for the past 3 years.

Determinations made are based on the above information provided, as long as contractor has satisfied the requirements of Section A, even if its current or three-year average EMR is above the identified threshold.

Section B: OSHA Incident Rates

Evaluation of the Contractor's OSHA Recordable and Loss Time Incidence Rate compared to the most current data provided by the Annual Survey of Occupational Injuries and Illness conducted by the Bureau of Labor Statistics, U.S. Department of Labor (BLS). The Contractors must recent three-year (3) period will be evaluated.

Contractor may be considered ineligible if Total Recordable or Loss Time Incidence Rate average for the most recent three-year (3) period exceeds the applicable statistical standards for its business category.

Please provide your North American Industry Classification System (NAICS) Code _____

Contractor's company-wide OSHA Recordable Incidence Rate for past 3 years:

Year _____ # of Cases _____ Total Co. Hrs. Worked _____ T.R.I.R _____

Year _____ # of Cases _____ Total Co. Hrs. Worked _____ T.R.I.R _____

Year _____ # of Cases _____ Total Co. Hrs. Worked _____ T.R.I.R _____

Contractor's Company-wide OSHA Loss Time Incidence Rate for past 3 years:

Year _____ # of Cases _____ Total Co. Hrs. Worked _____ L.T.I.R _____

Year _____ # of Cases _____ Total Co. Hrs. Worked _____ L.T.I.R _____

Year _____ # of Cases _____ Total Co. Hrs. Worked _____ L.T.I.R _____

Information to assist in completing Section B, #2 and #3:

OSHA Recordable Incidence Rate = $\frac{\textit{Total \# of Recordable Cases x 200,000}}{\textit{Divided by Company Man Hours}}$

OSHA Loss Time Incidence Rate = $\frac{\textit{Total \# of Loss Time Cases x 200,000}}{\textit{Divided by Company Man Hours}}$

If Contractor's average total recordable or loss time incident rate compared to the most recent three-year (3) period exceeds the applicable statistical standards for its business category, the contractor must submit the following:

1. Written explanation why Contractor's Incidence Rate exceeds the BLS Incidence Rate;
2. Written outline of corrective actions currently being undertaken to reduce employee injuries and illnesses;
3. Copy of Contractor's Corporate Safety and Health Program;
4. Copy of Contractor's OSHA 300 log for each of the past three (3) years.

Determinations made are based on the above information provided, if the Contractor has satisfied the requirements of Section B even though it has an Incidence Rate that exceeds the BLS Incidence Rate.

Section C: OSHA History

Contractor's OSHA inspection history with respect to Serious, Repeat and Willful citations during the past five (5) year period will be evaluated.

Has Contractor received any Serious, Repeat or Willful Citations within the past five years, beginning immediately prior to the submittal of this questionnaire? This includes contested citations that have not yet been resolved.

☐ YES ☐ NO

If yes, list total number of citations by type and per year in the chart below. Submit copies of all citations and explanation of abatement actions taken to the client.

Year		Serious		Repeat		Willful		Fatality		Total	
Year		Serious		Repeat		Willful		Fatality		Total	
Year		Serious		Repeat		Willful		Fatality		Total	
Year		Serious		Repeat		Willful		Fatality		Total	
Year		Serious		Repeat		Willful		Fatality		Total	

If Contactor answered NO to having received any citations classified as Serious, Repeat, or Willful and such violations are found during the verification process, the Contractor may be considered ineligible by the client.

Section D: Safety Culture

Contractor must answer **ALL** questions in section below with either a YES or NO response. Each YES answer is worth "5" points and each NO answer is worth "0" points. Maximum possible score is 100. (For example, 20 questions with 20 answered YES equals 100; 15 answered YES equals 75.)

Minimum Required Score 80

Safety Policy and Procedure Questions:

1. Does Contractor have a written corporate safety and health program? ☐ YES ☐ NO
2. Does Contractor develop a project specific safety and health plan for each project? ☐ YES ☐ NO
3. Does Contractor clearly outline Names, Roles and Responsibility regarding safety for all management personnel assigned to a project? ☐ YES ☐ NO
4. Does Contractor implement and enforce a Substance Abuse Testing Program? ☐ YES ☐ NO

Safety Policy and Procedure Questions Cont.

5. Does Contractor perform pre-construction safety planning prior to the start of the project as well as major operations (i.e. foundation, steel erection, façade, excavation) addressing scope of work, exposures associated with work, controls necessary to eliminate or mitigate exposure? ☐ YES ☐ NO

6. Does Contractor complete Job Hazard Analysis (JHA) prior to the start of a new task identify And reviewed with crews performing the task? ☐ YES ☐ NO

7. Does Contractor assign an onsite safety representative to the project who has the authority and has been allocated sufficient time to audit and enforce safety compliance? ☐ YES ☐ NO

8. Does the Contractor implement and enforce a Fall Management program at heights in excess of six (6) feet for all trades? ☐ YES ☐ NO

9. Does Contractor conduct and document employee orientation for all workers assigned to the project? ☐ YES ☐ NO

10. Does Contractor implement an employee disciplinary action program regarding failure to comply with safety requirements and procedures? ☐ YES ☐ NO

11. Does Contractor hold its project management personnel accountable for safety performance of the project they are assigned to? ☐ YES ☐ NO

12. Does Contractor conduct ongoing job site safety audits with corrective action taken for deficiency? ☐ YES ☐ NO

13. Accident investigation performed to determine cause and corrective action to prevent reoccurrence? ☐ YES ☐ NO

14. Does Contactor provide ongoing safety training to its office and field management personnel? ☐ YES ☐ NO

15. Does Contractor provide ongoing safety training to its field labor forces? ☐ YES ☐ NO

16. Does Contractor hold and document weekly or more frequent safety meetings onsite? ☐ YES ☐ NO

17. Does Contractor hold subcontractors accountable for adhering to safety requirements and procedures set forth on the project? ☐ YES ☐ NO

18. Does Contractor employ full-time Safety Director? ☐ YES ☐ NO

19. Does Contractor identify by name and qualification competent persons assigned to project? ☐ YES ☐ NO

20. Does Contractor develop a project specific emergency response plan that is reviewed with All workers? ☐ YES ☐ NO

Contractor Score

Completed by

Name _____

Signature _____

Title _____

Date _____

SECTION 00 3100 - AVAILABLE PROJECT INFORMATION

PART 1 GENERAL

1.1 INFORMATION AVAILABLE TO BIDDERS

A. Certain information relating to existing surface and subsurface conditions and structures is available to Bidders for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. The information available shall not be a warranty or guarantee of existing conditions. The information available will not be part of the Contract Documents.

1.2 EXISTING CONDITIONS

A. Existing drawings and/or reports that include information on existing conditions are as follows:

B. Geotechnical Report: Entitled Report of Geotechnical Exploration, New Exeter Emergency Service Center, Demoss Road and Gibraltar Road, Exeter Township, Berks County, Pennsylvania, dated 01/27/2026.
1. A copy of the original report is available for viewing as appended to this document.
2. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. Owner is not responsible for interpretations or conclusions drawn from the data.
3. Any party using information described in the geotechnical report shall make additional test borings and conduct other exploratory operations that may be required to determine the character of subsurface materials that may be encountered.
4. The recommendations described shall not be construed as a requirement of this Contract, unless specifically referenced in Contract Documents.
5. Because subsurface conditions indicated by the soil borings are a sampling in relation to the entire construction area, and for other reasons, the Owner, the Architect, the Architect's consultants, and the firm reporting the subsurface conditions do not warranty the conditions below the depths of the borings or that the strata logged from the borings are necessarily typical of the entire site. Any party using the information described in the soil borings and geotechnical report shall accept full responsibility for its use.

1.3 PERMITS

A. Each Prime Contractor shall be responsible for tracking the expiration of all permits related to their Scope of Work during the course of construction up to project closeout unless otherwise indicated. Each Prime Contractor shall notify in writing the Architect, Construction Manager (CMa), and the Owner a minimum of 60 calendar days prior to the expiration of any permit. Each Prime Contractor shall be responsible for any/all costs related to their Scope of Work incurred as a result of failing to notify the Architect and the Owner prior to the 60 calendar day deadline for notification.

B. The Architect/Owner has applied for the following permits:
1. Zoning Board of Appeals approvals.
    a. Status: Under review

2. Planning commission approvals.
    a. Status: Under review
3. Site work and Grading Permit.
    a. Status: Under review

C. The General Contractor shall be responsible for obtaining and paying for all other required permits including but not limited to all trade permits. Obtainment of permits includes but is not limited to gathering, producing, and submitting all documentation and information required by the AHJ for any/all permits.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 OBTAINMENT OF PERMITS

A. Each Prime Contractor will secure and pay for all permits required to complete their Scope of Work with the exception of the General Building Permit and Grading Permit. The Owner will be responsible for the submission and cost of the General Building Permit and the Grading Permit.
    1. Each Prime Contractor is responsible to complete and submit all necessary forms, produce and submit all necessary drawings, and provide all other necessary items and payments to Plymouth Township or other AHJ as required to secure permits to complete their Scope of Work.

END OF SECTION 00 3100

DAVID BLACKMORE & ASSOCIATES, INC.
GEOTECHNICAL & ENVIRONMENTAL ENGINEERS

Project 5779G1L2
September 17, 2026

EXETER TOWNSHIP
c/o Boyle Construction, Inc..
Suite 400, 3850 Sierra Circle
Center Valley, PA 18034

ATTN: Mr. Christopher Haller, Senior Project Manager

RE: Supplemental Geotechnical Exploration and Report
Exeter Emergency Services Center
DeMoss Road and Gibraltar Road
Exeter Township, Berks County, PA

Dear Mr. Haller:

David Blackmore and Associates, Inc. (DBA) has completed the supplemental geotechnical exploration of the subject site in accordance with our Proposal 5779G1P2, dated August 5, 2026. DBA has previously completed geotechnical exploration and report on January 27, 2026, to assist the design team with the building and site design, report number 5779G1R1. The presence of fill material, shallow rock, and karst features were identified in the initial investigation. This exploration was completed to evaluate the existing subsurface conditions at improvement areas to identify the potential presence of fill materials and/or bedrock conflicts for the proposed two-story, 25,000 to 30,000 square foot, emergency services center and related underground utilities.

GEOTECHNICAL EXPLORATION

A total of sixteen (16) test pits were completed at the subject site to evaluate the potential presence of fill materials and/or bedrock conflicts along proposed improvement areas. All of the test pits were excavated to a maximum depth of ten feet below grade, to bucket refusal on dense weathered rock, or to a sufficient depth for the required development. One (1) test pit, TP-1, was omitted due to the proximity of an existing outlet structure residing at the same elevation as the proposed outlet structure. Four (4) test pits, TP-1, TP-2, TP-12, and TP-13, were completed at proposed stormwater outlet structures to the west and east of the proposed structure. Two (2) of the test pits completed, TP-7 and TP-8 were conducted in the northmost proposed infiltration bed. One

(1) test pit, TP-3, was conducted within the westmost infiltration bed. Seven (7) test pits, TP-4, TP-5, TP-10, TP-11, and TP-14 to TP-16, were completed at proposed underground utilities across the site. The remaining one (1) test pit, TP-9, was completed at the west end of the building pad. The test pits were located in the field by DBA personnel using a Grading and PCSM Plan Prepared by Herbert, Rowland & Grubic, Inc., dated 2/18/2026. The test pits were excavated by Exeter Township Personal under the direction of DBA.

A copy of an excerpt of this plan which has been annotated with our test pit locations is included in the appendix of this report.

GEOTECHNICAL ANALYSIS AND RECOMMENDATIONS

The results of our exploration revealed a somewhat variable profile beneath 6" to 18" of topsoil, 6" of topsoil and 2" of asphalt millings or 6" to 7" of asphalt millings mixed with 2A modified stone. Beneath the top-soil or subbase layer resides a somewhat localized fill deposits consisting of orange-brown, reddish-brown, and brown fine sand and silt with occasional rock fragments (Stratum IF). Portions of this fill material contain asphalt, concrete, bricks, and other construction debris, see test pits TP-10 and TP-15. This stratum transitions into two intermittent soil strata consisting of either 2.0' to 8.25' thick layer of orange-brown fine sand and silt with rock fragments, silty clay, and clayey silt layers (Stratum I), or a 1.0' to 3.25' thick layer of reddish-brown fine sand and silt with some medium sand, silty clay, and clayey silt layers (Stratum II). These strata transition into weathered reddish-brown limestone (Stratum III) at a variable depth.

Based on the conditions encountered, the majority of the site contains sufficient depth to dense weathered rock to complete the proposed site development however, the proposed infiltration bed located to the west of the structure will encounter limestone bedrock throughout the excavation to proposed bed bottom. Bedrock was encountered in test pit TP-3, where bucket refusal was encountered at a depth of 5' below the existing surface elevation, corresponding to an elevation of 246.78 feet. This test pit was shifted 5.0' to the north and encountered bucket refusal on the edge of a limestone at 7.0' below existing surface elevation, corresponding to an elevation of 244.78 feet.

Localized deposits of fill material were encountered within five (5) of the test pits completed. It is anticipated that the material encountered within test pits TP-3, TP-4, and TP-16 are associated with prior grading, whereas the deleterious fill materials encountered in test pits TP-10 and TP-15 are associated with fill pits from prior construction. Extensive depths of topsoil were encountered in

two (2) test pits. Test pit TP-4 encountered 11" of topsoil overlying 2'5" of fill containing significant root mass and TP-11 encountered 18" of topsoil.

The site conditions are suitable for the support of the proposed structure and associated utilities however; it is expected that the west most infiltration bed will require the removal of hard bedrock through the use of hydraulic hammers or blasting. See 5579G1R1 report Section 7.3 ROCK REMOVAL for more information. Site clearing may require additional removal to fully separate out the topsoil and root mass. It is recommended that a Geotechnical Engineer inspects the site once the initial clearing has taken place to confirm the removal of organic material from the development areas.

LIMITATIONS

Services performed by DBA, including this Geotechnical Exploration report, any subsequent supplemental site exploration, and construction monitoring have been or will be conducted in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions. No other warranty or guarantee is indicated or intended in this report or any opinion, document or otherwise stated.

If you have any questions regarding this letter, please contact our office.

Sincerely,
DAVID BLACKMORE & ASSOCIATES, INC.

Marc Utti Hodge, EIT
Geotechnical Engineer

Brian D. McCree, PE
President

APPENDIX

TEST PIT LOGS
TEST PIT LOCATION PLAN

APPENDIX

TEST PIT LOGS

DAVID BLACKMORE & ASSOCIATIES, INC.
Geotechnical & Environmental Engineers
Phone: 610-495-6255 Fax: 610-495-7353
www.dbaengineering.com

Test Pit Number: TP-2

Project: New Exeter Emergency Services Center
Location: DeMoss Road and Gilbraltar Road
Twp/City/State: Exeter Township/Berks County/PA
Excavation Contractor: Exeter Township
Excavation Equipment: Backhoe
Operator:
X Coordinate (ft): Y Coordinate (ft):

Project Number: 5779G1
Date Excavated: 09/02/2026
Logged By: M. Utti-Hodge
Test Pit Depth: 9'
Ground Surface Elevation (ft msl): 250.30
Water Level - Immediate (ft bgs): Dry (5 Min)
Water Level - Static (ft bgs): Dry (1 Hr)

DEPTH BELOW	WATER LEVEL	LITHOLOGY: LITHOLOGIC SYMBOL	LITHOLOGY: GEOLOGIC DESCRIPTION OF SOIL AND ROCK STRATA	LITHOLOGY: ELEVATION (FT)	SAMPLING DATA: NUMBER	SAMPLING DATA: Water Content (10 20 30 40)	SAMPLING DATA: Comments/Notes
0			Topsoil (9")	249.55			
1.5			Stratum I Orange-brown fine sand and clayey silt *Moist from 9" to 2'3"*	248.05			
3			Orange-brown fine sand and silt with some clay and rock fragments *Very moist from 2'3" to 9'*				
4.5							
6							
7.5							
9			Test Pit Terminated	241.30			
10.5			Notes: Easy excavation to 9'				



The test pit results represent subsurface conditions at the boring locations only and are not necessarily representative of conditions at other locations. Water levels are taken at the time of excavation and are not indicative of seasonal variations in the ground water lovel. NR = No Recovery, S = Split Spoon sample (2" O.D.), C = Rock Coring Run.

DAVID BLACKMORE & ASSOCIATIES, INC.
Geotechnical & Environmental Engineers
Phone: 610-495-6255 Fax: 610-495-7353
www.dbaengineering.com

Test Pit Number: TP-3

Project: New Exeter Emergency Services Center
Location: DeMoss Road and Gilbraltar Road
Twp/City/State: Exeter Township/Berks County/PA
Excavation Contractor: Exeter Township
Excavation Equipment: Backhoe
Operator:
X Coordinate (ft): Y Coordinate (ft):

Project Number: 5779G1
Date Excavated: 09/02/2026
Logged By: M. Utti-Hodge
Test Pit Depth: 5'
Ground Surface Elevation (ft msl): 251.78
Water Level - Immediate (ft bgs): Dry (5 Min)
Water Level - Static (ft bgs): Dry (1 Hr)

DEPTH BELOW	WATER LEVEL	LITHOLOGY: LITHOLOGIC SYMBOL	LITHOLOGY: GEOLOGIC DESCRIPTION OF SOIL AND ROCK STRATA	LITHOLOGY: ELEVATION (FT)	SAMPLING DATA: NUMBER	SAMPLING DATA: Water Content (10 20 30 40)	SAMPLING DATA: Comments/Notes
0			**Topsoil (6")**	251.28			
			Stratum IF Fill consisting of orange-brown fine sand and silt with some rock fragments	250.70			
1.5			**Stratum I** Orange-brown fine sand and silt with some clay *Moist from 1'1" to 3'7"*				
3				248.20			
			Stratum III Weathered reddish-brown limestone				
4.5				246.78			
			Bucket Refusal on Dense Weathered Limestone				
6			Notes: Easy to medium excavation to refusal at 5' Test pit shifted 5 feet north: Medium excavation to refusal at 7'				
7.5							
9							
10.5							

The test pit results represent subsurface conditions at the boring locations only and are not necessarily representative of conditions at other locations. Water levels are taken at the time of excavation and are not indicative of seasonal variations in the ground water lovel. NR = No Recovery, S = Split Spoon sample (2" O.D.), C = Rock Coring Run.

DAVID BLACKMORE & ASSOCIATIES, INC.
Geotechnical & Environmental Engineers
Phone: 610-495-6255 Fax: 610-495-7353
www.dbaengineering.com

Test Pit Number: TP-4

Project: New Exeter Emergency Services Center
Location: DeMoss Road and Gilbraltar Road
Twp/City/State: Exeter Township/Berks County/PA
Excavation Contractor: Exeter Township
Excavation Equipment: Backhoe
Operator:
X Coordinate (ft): Y Coordinate (ft):

Project Number: 5779G1
Date Excavated: 09/02/2026
Logged By: M. Utti-Hodge
Test Pit Depth: 6'
Ground Surface Elevation (ft msl): 254.92
Water Level - Immediate (ft bgs): Dry (5 Min)
Water Level - Static (ft bgs): Dry (1 Hr)

DEPTH BELOW	WATER LEVEL	LITHOLOGY: LITHOLOGIC SYMBOL	LITHOLOGY: GEOLOGIC DESCRIPTION OF SOIL AND ROCK STRATA	LITHOLOGY: ELEVATION (FT)	SAMPLING DATA: NUMBER	SAMPLING DATA: Water Content (10 20 30 40)	SAMPLING DATA: Comments/Notes
0			Topsoil (11")	254.00			
1.5			Stratum IF Orange-brown fine sand and silt with some rock fragments and root mass	251.59			
3			Stratum I Orange-brown fine sand and silt with occasional rock fragments	248.92			
4.5							
6			Test Pit Terminated				
7.5			Notes: Medium excavation to refusal to 3'4"				
9							
10.5							

The test pit results represent subsurface conditions at the boring locations only and are not necessarily representative of conditions at other locations. Water levels are taken at the time of excavation and are not indicative of seasonal variations in the ground water lovel. NR = No Recovery, S = Split Spoon sample (2" O.D.), C = Rock Coring Run.

DAVID BLACKMORE & ASSOCIATIES, INC.
Geotechnical & Environmental Engineers
Phone: 610-495-6255 Fax: 610-495-7353
www.dbaengineering.com

Test Pit Number: TP-5

Project: New Exeter Emergency Services Center
Location: DeMoss Road and Gilbraltar Road
Twp/City/State: Exeter Township/Berks County/PA
Excavation Contractor: Exeter Township
Excavation Equipment: Backhoe
Operator:
X Coordinate (ft): Y Coordinate (ft):

Project Number: 5779G1
Date Excavated: 09/03/2026
Logged By: M. Utti-Hodge
Test Pit Depth: 6'
Ground Surface Elevation (ft msl): 257.07
Water Level - Immediate (ft bgs): Dry (5 Min)
Water Level - Static (ft bgs): Dry (1 Hr)

DEPTH BELOW	WATER LEVEL	LITHOLOGY: LITHOLOGIC SYMBOL	LITHOLOGY: GEOLOGIC DESCRIPTION OF SOIL AND ROCK STRATA	LITHOLOGY: ELEVATION (FT)	SAMPLING DATA: NUMBER	SAMPLING DATA: Water Content (10 20 30 40)	SAMPLING DATA: Comments/Notes
0			**Stratum IF** FILL consisting of 2A modified stone and asphalt millings	256.49			
			Stratum I Orange-brown fine sand and silty clay *Moist from 7" to 4'8"*				
4.5				252.40			
			Stratum II Reddish-brown fine sand and silt with some clay and occasional rock fragments	251.07			
6			Test Pit Terminated				
7.5							
9							
10.5							

The test pit results represent subsurface conditions at the boring locations only and are not necessarily representative of conditions at other locations. Water levels are taken at the time of excavation and are not indicative of seasonal variations in the ground water lovel. NR = No Recovery, S = Split Spoon sample (2" O.D.), C = Rock Coring Run.

DAVID BLACKMORE & ASSOCIATIES, INC.
Geotechnical & Environmental Engineers
Phone: 610-495-6255 Fax: 610-495-7353
www.dbaengineering.com

Test Pit Number: TP-6

Project: New Exeter Emergency Services Center
Location: DeMoss Road and Gilbraltar Road
Twp/City/State: Exeter Township/Berks County/PA
Excavation Contractor: Exeter Township
Excavation Equipment: Backhoe
Operator:
X Coordinate (ft): Y Coordinate (ft):

Project Number: 5779G1
Date Excavated: 09/03/2026
Logged By: M. Utti-Hodge
Test Pit Depth: 7'
Ground Surface Elevation (ft msl): 258.11
Water Level - Immediate (ft bgs): Dry (5 Min)
Water Level - Static (ft bgs): Dry (1 Hr)

DEPTH BELOW	WATER LEVEL	LITHOLOGY: LITHOLOGIC SYMBOL	LITHOLOGY: GEOLOGIC DESCRIPTION OF SOIL AND ROCK STRATA	LITHOLOGY: ELEVATION (FT)	SAMPLING DATA: NUMBER	SAMPLING DATA: Water Content (10 20 30 40)	SAMPLING DATA: Comments/Notes
0			**Stratum IF** FILL consisting of asphalt millings and modified stone	257.61			
			Stratum I Reddish-brown fine sand and silty clay *Moist to very moist from 6" to 5'4"*				
4.5				252.78			
			Stratum II Orange-brown fine sand and silt				
6				251.11			
			Test Pit Terminated				
10.5							

The test pit results represent subsurface conditions at the boring locations only and are not necessarily representative of conditions at other locations. Water levels are taken at the time of excavation and are not indicative of seasonal variations in the ground water lovel. NR = No Recovery, S = Split Spoon sample (2" O.D.), C = Rock Coring Run.

DAVID BLACKMORE & ASSOCIATIES, INC.
Geotechnical & Environmental Engineers
Phone: 610-495-6255 Fax: 610-495-7353
www.dbaengineering.com

Test Pit Number: TP-7

Project: New Exeter Emergency Services Center
Location: DeMoss Road and Gilbraltar Road
Twp/City/State: Exeter Township/Berks County/PA
Excavation Contractor: Exeter Township
Excavation Equipment: Backhoe
Operator:
X Coordinate (ft): Y Coordinate (ft):

Project Number: 5779G1
Date Excavated: 09/03/2026
Logged By: M. Utti-Hodge
Test Pit Depth: 7'
Ground Surface Elevation (ft msl): 258.24
Water Level - Immediate (ft bgs): Dry (5 Min)
Water Level - Static (ft bgs): Dry (1 Hr)

DEPTH BELOW	WATER LEVEL	LITHOLOGY: LITHOLOGIC SYMBOL	LITHOLOGY: GEOLOGIC DESCRIPTION OF SOIL AND ROCK STRATA	LITHOLOGY: ELEVATION (FT)	SAMPLING DATA: NUMBER	SAMPLING DATA: Water Content (10 20 30 40)	SAMPLING DATA: Comments/Notes
0			**Stratum IF** FILL consisting of asphalt millings and modified stone	257.74			
			Stratum I Orange-brown fine sand and silty clay with some rock fragments *Moist to very moist from 6" to 5'9"*				
1.5							
3							
				253.82			
4.5			**Stratum II** Orange-brown fine to medium sand and silt	253.24			
			Reddish-brown fine to medium sand and silt				
6							
				251.24			
			Test Pit Terminated				
7.5			Notes: Medium excavation from 5'9"				
9							
10.5							

The test pit results represent subsurface conditions at the boring locations only and are not necessarily representative of conditions at other locations. Water levels are taken at the time of excavation and are not indicative of seasonal variations in the ground water lovel. NR = No Recovery, S = Split Spoon sample (2" O.D.), C = Rock Coring Run.

DAVID BLACKMORE & ASSOCIATIES, INC.
Geotechnical & Environmental Engineers
Phone: 610-495-6255 Fax: 610-495-7353
www.dbaengineering.com

Test Pit Number: TP-8

Project: New Exeter Emergency Services Center
Location: DeMoss Road and Gilbraltar Road
Twp/City/State: Exeter Township/Berks County/PA
Excavation Contractor: Exeter Township
Excavation Equipment: Backhoe
Operator:
X Coordinate (ft): Y Coordinate (ft):

Project Number: 5779G1
Date Excavated: 09/03/2026
Logged By: M. Utti-Hodge
Test Pit Depth: 7'
Ground Surface Elevation (ft msl): 257.26
Water Level - Immediate (ft bgs): Dry (5 Min)
Water Level - Static (ft bgs): Dry (1 Hr)

DEPTH BELOW	WATER LEVEL	LITHOLOGY: LITHOLOGIC SYMBOL	LITHOLOGY: GEOLOGIC DESCRIPTION OF SOIL AND ROCK STRATA	LITHOLOGY: ELEVATION (FT)	SAMPLING DATA: NUMBER	SAMPLING DATA: Water Content (10 20 30 40)	SAMPLING DATA: Comments/Notes
0			Topsoil (7")	256.68			
			Stratum I Orange-brown and reddish-brown fine sand and clayey silt				
3				253.51			
			Stratum II Reddish-brown fine sand and silt with limestone fragments, cobbles, and boulders				
6				250.26			
			Test Pit Terminated				
10.5							



The test pit results represent subsurface conditions at the boring locations only and are not necessarily representative of conditions at other locations. Water levels are taken at the time of excavation and are not indicative of seasonal variations in the ground water lovel. NR = No Recovery, S = Split Spoon sample (2" O.D.), C = Rock Coring Run.

DAVID BLACKMORE & ASSOCIATIES, INC.
Geotechnical & Environmental Engineers
Phone: 610-495-6255 Fax: 610-495-7353
www.dbaengineering.com

Test Pit Number: TP-9

Project: New Exeter Emergency Services Center
Location: DeMoss Road and Gilbraltar Road
Twp/City/State: Exeter Township/Berks County/PA
Excavation Contractor: Exeter Township
Excavation Equipment: Backhoe
Operator:
X Coordinate (ft): Y Coordinate (ft):

Project Number: 5779G1
Date Excavated: 09/02/2026
Logged By: M. Utti-Hodge
Test Pit Depth: 4'
Ground Surface Elevation (ft msl): 253.78
Water Level - Immediate (ft bgs): Dry (5 Min)
Water Level - Static (ft bgs): Dry (1 Hr)

DEPTH BELOW	WATER LEVEL	LITHOLOGY: LITHOLOGIC SYMBOL	LITHOLOGY: GEOLOGIC DESCRIPTION OF SOIL AND ROCK STRATA	LITHOLOGY: ELEVATION (FT)	SAMPLING DATA: NUMBER	SAMPLING DATA: Water Content (10 20 30 40)	SAMPLING DATA: Comments/Notes
0			Topsoil (6")	253.28			
			Asphalt millings (2")	253.11			
			Stratum I Orange-brown fine sand and clayey silt				
1.5							
3				249.78			
			Test Pit Terminated				
4.5			Notes: Easy excavation to 4'				
6							
7.5							
9							
10.5							

The test pit results represent subsurface conditions at the boring locations only and are not necessarily representative of conditions at other locations. Water levels are taken at the time of excavation and are not indicative of seasonal variations in the ground water lovel. NR = No Recovery, S = Split Spoon sample (2" O.D.), C = Rock Coring Run.

DAVID BLACKMORE & ASSOCIATIES, INC.
Geotechnical & Environmental Engineers
Phone: 610-495-6255 Fax: 610-495-7353
www.dbaengineering.com

Test Pit Number: TP-10

Project: New Exeter Emergency Services Center
Location: DeMoss Road and Gilbraltar Road
Twp/City/State: Exeter Township/Berks County/PA
Excavation Contractor: Exeter Township
Excavation Equipment: Backhoe
Operator:
X Coordinate (ft): Y Coordinate (ft):

Project Number: 5779G1
Date Excavated: 09/03/2026
Logged By: M. Utti-Hodge
Test Pit Depth: 5'
Ground Surface Elevation (ft msl): 253.91
Water Level - Immediate (ft bgs): Dry (5 Min)
Water Level - Static (ft bgs): Dry (1 Hr)

DEPTH BELOW	WATER LEVEL	LITHOLOGY: LITHOLOGIC SYMBOL	LITHOLOGY: GEOLOGIC DESCRIPTION OF SOIL AND ROCK STRATA	LITHOLOGY: ELEVATION (FT)	SAMPLING DATA: NUMBER	SAMPLING DATA: Water Content (10 20 30 40)	SAMPLING DATA: Comments/Notes
0			Asphalt millings (2")	253.74			
			Stratum IF FILL consisting of reddish-brown fine sand and silt with asphalt and construction debris *Moist from 2" to 4'*				
1.5							
3							
				249.91			
			Stratum II Orange-brown fine to medium sand with some silt				
4.5				248.91			
			Test Pit Terminated				
			Notes: Easy excavation to 5'				
6							
7.5							
9							
10.5							

The test pit results represent subsurface conditions at the boring locations only and are not necessarily representative of conditions at other locations. Water levels are taken at the time of excavation and are not indicative of seasonal variations in the ground water lovel. NR = No Recovery, S = Split Spoon sample (2" O.D.), C = Rock Coring Run.

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Geotechnical & Environmental Engineers
Phone: 610-495-6255 Fax: 610-495-7353
www.dbaengineering.com

Test Pit Number: TP-11

Project: New Exeter Emergency Services Center
Location: DeMoss Road and Gilbraltar Road
Twp/City/State: Exeter Township/Berks County/PA
Excavation Contractor: Exeter Township
Excavation Equipment: Backhoe
Operator:
X Coordinate (ft): Y Coordinate (ft):

Project Number: 5779G1
Date Excavated: 09/03/2026
Logged By: M. Utti-Hodge
Test Pit Depth: 5'
Ground Surface Elevation (ft msl): 254.55
Water Level - Immediate (ft bgs): Dry (5 Min)
Water Level - Static (ft bgs): Dry (1 Hr)

DEPTH BELOW	WATER LEVEL	LITHOLOGY: LITHOLOGIC SYMBOL	LITHOLOGY: GEOLOGIC DESCRIPTION OF SOIL AND ROCK STRATA	LITHOLOGY: ELEVATION (FT)	SAMPLING DATA: NUMBER	SAMPLING DATA: Water Content (10 20 30 40)	SAMPLING DATA: Comments/Notes
0			Topsoil with root mass (18")	253.05			
1.5			Stratum I Orange-brown fine sand and silt with occasional rock fragments	250.55			
3			Stratum II Reddish-brown fine sand and silt with some clay	249.55			
4.5			Test Pit Terminated Notes: Easy excavation to 5'				
6							
7.5							
9							
10.5							

The test pit results represent subsurface conditions at the boring locations only and are not necessarily representative of conditions at other locations. Water levels are taken at the time of excavation and are not indicative of seasonal variations in the ground water lovel. NR = No Recovery, S = Split Spoon sample (2" O.D.), C = Rock Coring Run.

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Test Pit Number: TP-12

Project: New Exeter Emergency Services Center
Location: DeMoss Road and Gilbraltar Road
Twp/City/State: Exeter Township/Berks County/PA
Excavation Contractor: Exeter Township
Excavation Equipment: Backhoe
Operator:
X Coordinate (ft): Y Coordinate (ft):

Project Number: 5779G1
Date Excavated: 09/03/2026
Logged By: M. Utti-Hodge
Test Pit Depth: 3.25'
Ground Surface Elevation (ft msl): 254.71
Water Level - Immediate (ft bgs): Dry (5 Min)
Water Level - Static (ft bgs): Dry (1 Hr)

DEPTH BELOW	WATER LEVEL	LITHOLOGY: LITHOLOGIC SYMBOL	LITHOLOGY: GEOLOGIC DESCRIPTION OF SOIL AND ROCK STRATA	LITHOLOGY: ELEVATION (FT)	SAMPLING DATA: NUMBER	SAMPLING DATA: Water Content (10 20 30 40)	SAMPLING DATA: Comments/Notes
0			Topsoil (8")	254.04			
			Stratum II Reddish-brown fine sand and silty clay with rock fragments				
1.5				252.79			
			Reddish-brown fine sand and clayey silt with limestone fragments				
3				251.46			
			Test Pit Terminated Notes: Medium excavation from 2'2"				
4.5							
6							
7.5							
9							
10.5							

The test pit results represent subsurface conditions at the boring locations only and are not necessarily representative of conditions at other locations. Water levels are taken at the time of excavation and are not indicative of seasonal variations in the ground water lovel. NR = No Recovery, S = Split Spoon sample (2" O.D.), C = Rock Coring Run.

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Phone: 610-495-6255 Fax: 610-495-7353
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Test Pit Number: TP-13

Project: New Exeter Emergency Services Center
Location: DeMoss Road and Gilbraltar Road
Twp/City/State: Exeter Township/Berks County/PA
Excavation Contractor: Exeter Township
Excavation Equipment: Backhoe
Operator:
X Coordinate (ft): Y Coordinate (ft):

Project Number: 5779G1
Date Excavated: 09/03/2026
Logged By: M. Utti-Hodge
Test Pit Depth: 3'
Ground Surface Elevation (ft msl): 254.89
Water Level - Immediate (ft bgs): Dry (5 Min)
Water Level - Static (ft bgs): Dry (1 Hr)

DEPTH BELOW	WATER LEVEL	LITHOLOGY: LITHOLOGIC SYMBOL	LITHOLOGY: GEOLOGIC DESCRIPTION OF SOIL AND ROCK STRATA	LITHOLOGY: ELEVATION (FT)	SAMPLING DATA: NUMBER	SAMPLING DATA: Water Content (10 20 30 40)	SAMPLING DATA: Comments/Notes
0			Topsoil (6")	254.22			
			Stratum II Reddish-brown and orange-brown fine sand and clayey silt				
1.5				252.97			
			Reddish-brown fine sand and silt with rock fragments				
3				251.89			
			Test Pit Terminated				
4.5			Notes: Test pit moved 5' nothwest due to irrigation line Easy excavation to 3'				
6							
7.5							
9							
10.5							

The test pit results represent subsurface conditions at the boring locations only and are not necessarily representative of conditions at other locations. Water levels are taken at the time of excavation and are not indicative of seasonal variations in the ground water lovel. NR = No Recovery, S = Split Spoon sample (2" O.D.), C = Rock Coring Run.

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Test Pit Number: TP-14

Project: New Exeter Emergency Services Center
Location: DeMoss Road and Gilbraltar Road
Twp/City/State: Exeter Township/Berks County/PA
Excavation Contractor: Exeter Township
Excavation Equipment: Backhoe
Operator:
X Coordinate (ft): Y Coordinate (ft):

Project Number: 5779G1
Date Excavated: 09/03/2026
Logged By: M. Utti-Hodge
Test Pit Depth: 2.5'
Ground Surface Elevation (ft msl): 252.30
Water Level - Immediate (ft bgs): Dry (5 Min)
Water Level - Static (ft bgs): Dry (1 Hr)

DEPTH BELOW	WATER LEVEL	LITHOLOGY: LITHOLOGIC SYMBOL	LITHOLOGY: GEOLOGIC DESCRIPTION OF SOIL AND ROCK STRATA	LITHOLOGY: ELEVATION (FT)	SAMPLING DATA: NUMBER	SAMPLING DATA: Water Content (10 20 30 40)	SAMPLING DATA: Comments/Notes
0			Topsoil (6")	251.80			
			Stratum II Reddish-brown fine sand and clayey silt with rock fragments *Very moist from 6" to 1'8"*				
1.5			Reddish-brown fine sand and silt	250.63			
			Test Pit Terminated	249.80			
3			Notes: Medium excavation from 1'8"				
4.5							
6							
7.5							
9							
10.5							

The test pit results represent subsurface conditions at the boring locations only and are not necessarily representative of conditions at other locations. Water levels are taken at the time of excavation and are not indicative of seasonal variations in the ground water lovel. NR = No Recovery, S = Split Spoon sample (2" O.D.), C = Rock Coring Run.

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Geotechnical & Environmental Engineers
Phone: 610-495-6255 Fax: 610-495-7353
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Test Pit Number: TP-15

Project: New Exeter Emergency Services Center
Location: DeMoss Road and Gilbraltar Road
Twp/City/State: Exeter Township/Berks County/PA
Excavation Contractor: Exeter Township
Excavation Equipment: Backhoe
Operator:
X Coordinate (ft): Y Coordinate (ft):

Project Number: 5779G1
Date Excavated: 09/02/2026
Logged By: M. Utti-Hodge
Test Pit Depth: 5.67'
Ground Surface Elevation (ft msl): 250.89
Water Level - Immediate (ft bgs): Dry (5 Min)
Water Level - Static (ft bgs): Dry (1 Hr)

DEPTH BELOW	WATER LEVEL	LITHOLOGY: LITHOLOGIC SYMBOL	LITHOLOGY: GEOLOGIC DESCRIPTION OF SOIL AND ROCK STRATA	LITHOLOGY: ELEVATION (FT)	SAMPLING DATA: NUMBER	SAMPLING DATA: Water Content (10 20 30 40)	SAMPLING DATA: Comments/Notes
0			Topsoil (6")	250.39			
			Stratum IF FILL consisting of brown fine sand and silt with asphalt, concrete, and rock fragments	248.39			
1.5			Asphalt (6")	247.89			
3			Stratum I Orange-brown fine sand and silt with some clay *Moist from 3' to 5'6"*	245.39			
4.5			Stratum III Weathered reddish-brown limestone	245.22			
6			Test Pit Terminated				
7.5							
9							
10.5							



Notes:
Easy excavation to 5'8"

The test pit results represent subsurface conditions at the boring locations only and are not necessarily representative of conditions at other locations. Water levels are taken at the time of excavation and are not indicative of seasonal variations in the ground water lovel. NR = No Recovery, S = Split Spoon sample (2" O.D.), C = Rock Coring Run.

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Test Pit Number: TP-16

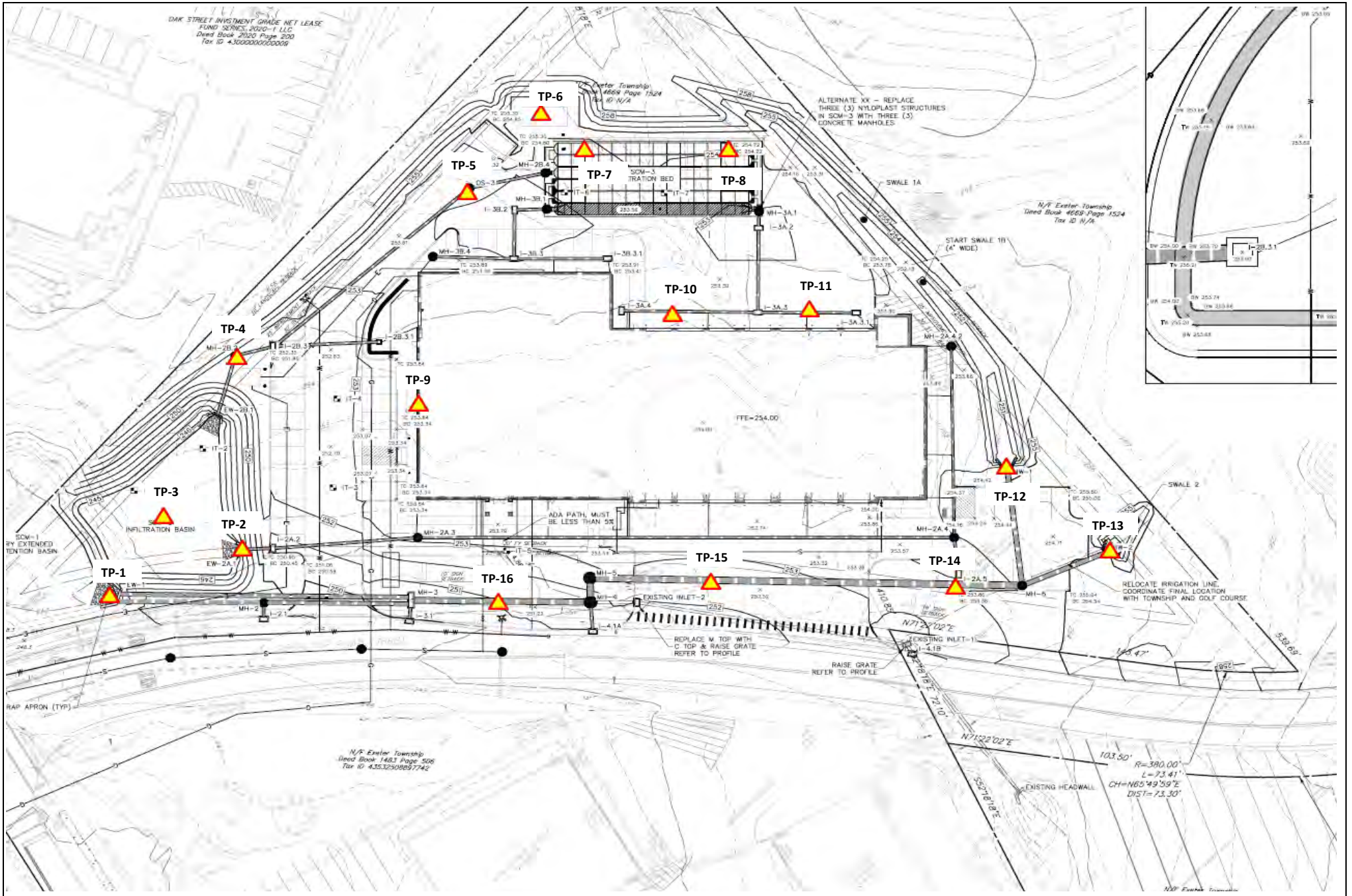
Project: New Exeter Emergency Services Center
Location: DeMoss Road and Gilbraltar Road
Twp/City/State: Exeter Township/Berks County/PA
Excavation Contractor: Exeter Township
Excavation Equipment: Backhoe
Operator:
X Coordinate (ft): Y Coordinate (ft):

Project Number: 5779G1
Date Excavated: 09/02/2026
Logged By: M. Utti-Hodge
Test Pit Depth: 5'
Ground Surface Elevation (ft msl): 249.74
Water Level - Immediate (ft bgs): Dry (5 Min)
Water Level - Static (ft bgs): Dry (1 Hr)

DEPTH BELOW	WATER LEVEL	LITHOLOGY: LITHOLOGIC SYMBOL	LITHOLOGY: GEOLOGIC DESCRIPTION OF SOIL AND ROCK STRATA	LITHOLOGY: ELEVATION (FT)	SAMPLING DATA: NUMBER	SAMPLING DATA: Water Content (10 20 30 40)	SAMPLING DATA: Comments/Notes
0			**Topsoil (9")**	248.99			
1.5			**Stratum IF** FILL consisting of orange-brown fine sand and silt with rock fragments	248.07			
3			**Stratum I** Orange-brown fine sand and silt with some clay	246.07			
4.5			**Stratum II** Reddish-brown fine sand and silty clay	244.74			
6			**Test Pit Terminated** <u>Notes:</u> Easy excavation to 5'				
7.5							
9							
10.5							

The test pit results represent subsurface conditions at the boring locations only and are not necessarily representative of conditions at other locations. Water levels are taken at the time of excavation and are not indicative of seasonal variations in the ground water lovel. NR = No Recovery, S = Split Spoon sample (2" O.D.), C = Rock Coring Run.

TEST PIT LOCATION PLAN



KEY

▲ Additional Test Pit Location

GEOTECHNICAL & ENVIRONMENTAL ENGINEERS

DAVID BLACKMORE & ASSOC., INC.

3335 West Ridge Pike

Pottstown, Pennsylvania 19464

Telephone: (610) 495-6255 FAX: (610) 495-7353

Project 5779G1L2

EXETER EMERGENCY CENTER

TEST LOCATION PLAN

Gibraltar Road/ DeMoss Road

Exeter Township/ Berks County/ PA

SECTION 00 4373 - PROPOSED SCHEDULE OF VALUES FORM

PART 1 - GENERAL

1.1 BID FORM SUPPLEMENT

A. A completed Proposed Schedule of Values form is required to be attached to the Bid Form.

1.2 PROPOSED SCHEDULE OF VALUES FORM

A. Proposed Schedule of Values Form: Provide a breakdown of the bid amount, including alternates, in enough detail to facilitate continued evaluation of bid. Coordinate with the Project Manual table of contents. Provide multiple line items for principal material and subcontract amounts in excess of five percent of the Contract Sum.

B. Arrange schedule of values using AIA Document G703-1992.
   1. Copies of AIA standard forms may be obtained from the American Institute of Architects; https://www.aiacontracts.org/ library; (800) 942-7732.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 00 4373

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IN THE COURT OF COMMON PLEAS
OF BERKS COUNTY, PENNSYLVANIA
CIVIL DIVISION

CONTRACTOR: _____

NO. _____

AND
Exeter Township

NO-LIEN AGREEMENT

WHEREAS, the parties hereto did on the ____ day of _____, 20__, enter into an agreement (hereinafter the "Contract"), therein and whereby said Contractor undertook and agreed to furnish all materials, labor and equipment, etc., to complete the work for the Exeter Township Emergency Services Facility, located at 70 Gibraltar Road, Reading, PA 19606.

NOW, THEREFORE, the Contractor for itself and any and all subcontractors, materialmen and parties acting for, through or under the Contractor or for, through or under any of them, does covenant and agree that it will not at any time suffer or permit any mechanics' lien or any other lien, attachment or other encumbrance, under any laws, regulations, or orders, Federal, State or local, or otherwise by any person or persons whomsoever, to be put or remain on the building or premises, into or upon which any work is done or labor or materials are furnished under this Contract, for such work, labor or material, or by reason of any other claim or demand against the Contractor, and the Contractor has not obtained absolute title; and the Contractor agrees, further, that any mechanics' lien, materialmen's lien or any other lien, attachment or other encumbrance or claim of a third party, however arising (whether through the Contractor's or Owner's or any other persons action or inaction, and whether valid or invalid), until it is removed shall preclude any and all claim or demand for any payment whatsoever under or by virtue of the Contract, and in the event that same is not removed, the Owner at its discretion may remove same at the expense (including legal fees) of the Contractor, and without regard to the validity or invalidity thereof.

The Contractor expressly agrees further, that no lien shall attach to the real estate, building, structures, or any other improvement to the Owner either on behalf of the Contractor herein or on behalf of any subcontractor, mechanic, journeyman, laborer, materialman or person performing improvement or premises of said Owner, or on behalf of any other person. Neither the Contractor nor any other person supplying any materials, equipment, machinery or other property, or performing work or labor in or upon the building or the work, included in this Contract shall have the right to file a mechanic's lien against the building or premises.

Contractor warrants and represents that at the time of execution hereof no work of any kind has been done and no materials of any kind have been furnished, delivered or ordered in connection with the performance of this Contract of any supplemental contract for extra work.

This stipulation and waiver is made and intended to be filed with the Berks County Prothonotary within ten (10) days after the date hereof, in accordance with the requirements of Act of Assembly of Pennsylvania, in such case provided.

In WITNESS WHEREOF, we have hereunto set our hands and seals, intending thereby to become legally bound this day of _____, 20____.

OWNER:
Exeter Township

_____

_____

_____

ATTEST: _____ CONTRACTOR: _____

By: _____

WITNESS: _____

SECTION 00 7000 - CONTRACT FOR CONSTRUCTION FORM OF AGREEMENT

The Standard Form of Agreement for this Contract is the American Institute of Architect's Document A132 "Standard Form of Agreement Between Owner and Contractor, Construction Manager as Advisor Edition", 2019 Edition, is bound herewith.

The Contract shall be in effect for the duration of this project for all Contractors.

Document A132 is enclosed for each Prime Contractor's review.

END OF SECTION 00 7000

DRAFT

AIA® Document A132™ – 2019

Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition

AGREEMENT made as of the « » day of « » in the year « »
(In words, indicate day, month, and year.)

BETWEEN the Owner:
(Name, legal status, address, and other information)

«Exeter Township »« »
«4975 DeMoss Road »
«Reading, PA 19606 »
«610-779-5560»

and the Contractor:
(Name, legal status, address, and other information)

« »« »
« »
« »
« »

for the following Project:
(Name, location, and detailed description)

«Exeter Township Emergency Services Facility»
«70 Gibraltar Road»
«Reading, PA 19606»

The Construction Manager:
(Name, legal status, address, and other information)

«Boyle Construction, Inc.»« »
«3850 Sierra Circle, Suite 400»
«Center Valley, PA 18034»
«484-223-0726»

The Architect:
(Name, legal status, address, and other information)

«Manns Woodward Studios, Inc.»« »
«8098 Sandpiper Circle, Suite H»
«Nottingham, MD 21236»
« 410-344-1460»

The Owner and Contractor agree as follows.

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This document is intended to be used in conjunction with AIA Documents A232™–2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition; B132™–2019, Standard Form of Agreement Between Owner and Architect, Construction Manager as Adviser Edition; and C132™–2019, Standard Form of Agreement Between Owner and Construction Manager as Adviser. AIA Document A232™–2019 is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

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2 THE WORK OF THIS CONTRACT

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EXHIBIT A INSURANCE AND BONDS
EXHIBIT B DETERMINATION OF THE COST OF THE WORK

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than Modifications, appears in Article 9. To the extent of any direct conflict or inconsistency between any of the Contract Documents, the Contractor shall immediately seek clarification from the Construction Manager. In the event that the Construction Manager fails to clarify such discrepancy, within a reasonable time under the circumstances, the Contractor shall proceed with the Work and give precedence to the Contract Documents in the following order of priority: (1) modifications issued after execution of the Agreement; (2) the Agreement; (3) Addenda issued prior to the execution of the Agreement, with the Addenda bearing the latest date taking precedence; (4) any supplementary conditions; (5) the General Conditions of the Contract for Construction; and (6) the Final Drawings and Specifications. The Contract Documents do not include soundings, dug test pits, and/or auger or test borings reports, or other information contained in geotechnical reports or similar documents.

ARTICLE 2 THE WORK OF THIS CONTRACT

§ 2.1 The Contractor shall fully execute the Work described in the Contract Documents as well as all attachments thereto and all work reasonably inferable by the Contract Documents as necessary to produce the results intended by the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others. A list of Contract Documents is attached hereto and incorporated herein as part of Exhibit "___."

§ 2.2 The Contractor shall furnish only skill and properly trained staff for the performance of the Work. The key members of the Contractor's staff shall be persons agreed upon by the Owner and identified in writing prior to the start of the Work. The Owner's authorized representative is set forth in section 14.3 below.

§ 2.2.1 Such key members of the Contractor's staff shall not be changed without the written consent of the Owner, unless such person becomes unable to perform any required duties due to death, disability, transfer, or termination of employment with the Contractor. If a key member is no longer capable of performing, the Owner and the Contractor shall agree on a mutually acceptable substitute.

§ 2.2.2 During the performance of the Work, the Contractor shall keep competent key personnel, including, but not limited to, Project Manager, Project Engineer, and Superintendent, at the Project site, fully authorized to act on behalf of

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the Contractor. Notice from the Owner and/or Construction Manager to such key personnel shall be considered notice to the Contractor.

ARTICLE 3 DATE OF COMMENCEMENT AND DATES OF SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:
(Check one of the following boxes.)

[« »] The date of this Agreement.

[« X »] A date set forth in a written notice to proceed issued by the Owner to the Contractor, or upon the receipt of the Building Permit, whichever is later.

[« »] Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

« »

If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

§ 3.2 The Contract Time shall be measured from the date of commencement of the Work.

§ 3.3 Substantial Completion of the Project or Portions Thereof

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the date of Substantial Completion of the Work of all of the Contractors for the Project will be:
(Insert the date of Substantial Completion of the Work of all Contractors for the Project.)

« »

§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work of all of the Contractors for the Project are to be completed prior to Substantial Completion of the entire Work of all of the Contractors for the Project, the Contractors shall achieve Substantial Completion of such portions by the following dates:

Portion of Work	Substantial Completion Date

§ 3.4 When the Work of this Contract, or any Portion Thereof, is Substantially Complete

§ 3.4.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall substantially complete the entire Work of this Contract:
(Check one of the following boxes and complete the necessary information.)

[« »] Not later than « » (« ») calendar days from the date of commencement of the Work.

[« »] By the following date: « »

§ 3.4.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work of this Contract are to be substantially complete prior to when the entire Work of this Contract shall be substantially complete, the Contractor shall substantially complete such portions by the following dates:

Portion of Work	Date to be substantially complete

§ 3.4.3 If the Contractor fails to substantially complete the Work of this Contract, or portions thereof, as provided in this Section 3.4, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

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ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be one of the following:
(Check the appropriate box.)

[« »] Stipulated Sum, in accordance with Section 4.2 below

[« »] Cost of the Work plus the Contractor's Fee, in accordance with Section 4.3 below

[« »] Cost of the Work plus the Contractor's Fee with a Guaranteed Maximum Price, in accordance with Section 4.4 below

(Based on the selection above, complete Section 4.2, 4.3 or 4.4 below.)

§ 4.2 Stipulated Sum

§ 4.2.1 The Contract Sum shall be « » ($ « »), subject to additions and deductions as provided in the Contract Documents.

§ 4.2.2 Alternates

§ 4.2.2.1 Alternates, if any, included in the Contract Sum:

Item	Price

§ 4.2.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.
(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance

§ 4.2.3 Allowances, if any, included in the Contract Sum:
(Identify each allowance.)

Item	Price

§ 4.2.4 Unit prices, if any:
(Identify the item and state the unit price, and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.3 Cost of the Work Plus Contractor's Fee without a Guaranteed Maximum Price

§ 4.3.1 The Cost of the Work is as defined in Exhibit B, Determination of the Cost of the Work.

§ 4.3.2 The Contractor's Fee:
(State a lump sum, percentage of Cost of the Work or other provision for determining the Contractor's Fee.)

« »

§ 4.3.3 The method of adjustment of the Contractor's Fee for changes in the Work:

« »

§ 4.3.4 Limitations, if any, on a Subcontractor's overhead and profit for increases in the cost of its portion of the Work:

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« »

§ 4.3.5 Rental rates for Contractor-owned equipment shall not exceed « » percent (« » %) of the standard rental rate paid at the place of the Project.

§ 4.3.6 Unit prices, if any:
(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.3.7 The Contractor shall prepare and submit to the Construction Manager, within 14 days of executing this Agreement, a written Control Estimate for the Owner's review and approval. The Control Estimate shall include the items in Section B.1 of Exhibit B, Determination of the Cost of the Work.

§ 4.4 Cost of the Work Plus Contractor's Fee with a Guaranteed Maximum Price
§ 4.4.1 The Cost of the Work is as defined in Exhibit B, Determination of the Cost of the Work.

§ 4.4.2 The Contractor's Fee:
(State a lump sum, percentage of Cost of the Work or other provision for determining the Contractor's Fee.)

« »

§ 4.4.3 The method of adjustment of the Contractor's Fee for changes in the Work:

« »

§ 4.4.4 Limitations, if any, on a Subcontractor's overhead and profit for increases in the cost of its portion of the Work:

« »

§ 4.4.5 Rental rates for Contractor-owned equipment shall not exceed « » percent (« » %) of the standard rental rate paid at the place of the Project.

§ 4.4.6 Unit Prices, if any: (Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.4.7 Guaranteed Maximum Price
§ 4.4.7.1 The Contract Sum is guaranteed by the Contractor not to exceed « » ($ « »), subject to additions and deductions by Change Order as provided in the Contract Documents. This maximum sum is referred to in the Contract Documents as the Guaranteed Maximum Price. Costs which would cause the Guaranteed Maximum Price to be exceeded shall be paid by the Contractor without reimbursement by the Owner.

§ 4.4.7.2 Alternates
§ 4.4.7.2.1 Alternates, if any, included in the Guaranteed Maximum Price:

Item	Price

§ 4.4.7.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.
(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

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Item	Price	Conditions for Acceptance

§ 4.4.7.3 Allowances, if any, included in the Guaranteed Maximum Price:
(Identify each allowance.)

Item	Price

§ 4.4.7.4 Assumptions, if any, upon which the Guaranteed Maximum Price is based:
(Identify each assumption.)

« »

§ 4.4.8 To the extent that the Contract Documents are anticipated to require further development, the Guaranteed Maximum Price includes the costs attributable to such further development consistent with the Contract Documents and reasonably inferable therefrom. Such further development does not include changes in scope, systems, kinds and quality of materials, finishes, or equipment, all of which, if required, shall be incorporated by Change Order.

§ 4.4.9 The Owner shall authorize preparation of revisions to the Contract Documents that incorporate the agreed-upon assumptions contained in Section 4.4.7.4. The Owner shall promptly furnish such revised Contract Documents to the Contractor. The Contractor shall notify the Owner and Architect of any inconsistencies between the agreed-upon assumptions contained in Section 4.4.7.4 and the revised Contract Documents.

§ 4.5 Liquidated damages, if any:
(Insert terms and conditions for liquidated damages, if any, to be assessed in accordance with Section 3.4.)

« The Contractor acknowledges and recognizes that the Owner is entitled to full and beneficial use of the completed work following expiration of the Contract Time. The Contractor further acknowledges and agrees that if the Contractor fails to achieve Substantial Completion of the entire Work within the Contract Time, the Owner will sustain extensive damages and serious loss as a result of such failure. The exact amount of such damages will be extremely difficult to ascertain. Therefore, the Owner and Contractor agree as set forth in this section.

« If the Contractor fails to achieve Substantial Completion as set forth in Section 3.3.1 of this Agreement, as may be adjusted pursuant to the Contract Documents, the Owner shall be entitled to assess liquidated damages against the Contractor in the amount of $_____ for each and every day thereafter until Substantial Completion is achieved.

The liquidated damages assessed by Owner against Contractor shall be Owner's sole monetary remedy against Contractor for Contractor's delay and failure to attain Substantial Completion of the Work by the date set forth in Section 3.3.1, as may be adjusted pursuant to the Contract Document; provided, however, that nothing herein shall limit Owner's rights to suspend or terminate the Work or Contractor, nor any of Owner's other non-monetary rights set forth herein. The Owner and Contractor agree that actual damages incurred by the Owner as a result of the delay are difficult to calculate with specificity and that the foregoing Liquidated Damages represent a mutual good faith estimate of what the parties believe to be the amount of actual damages to be incurred by the Owner on account of the delay. The parties jointly agree and stipulate that the contractually agreed to liquidated damages set forth above are not a penalty.
»

§ 4.6 Other:
(Insert provisions for bonus, cost savings or other incentives, if any, that might result in a change to the Contract Sum.)

« »

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment submitted to the Construction Manager by the Contractor, and Certificates for Payment issued by the Construction Manager and Architect, the Owner shall make progress payments on account of the

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Contract Sum, to the Contractor, as provided below and elsewhere in the Contract Documents. In addition to the other required items, each application for payment shall be accomplished by the following, all in form and substance satisfactory to the Owner and in compliance with applicable statutes of the jurisdiction in which the Project is located:

.1 A current sworn statement from the Contractor setting forth all Subcontractors and any material suppliers with whom Contractor has subcontracted, the amount requested for any Subcontractor or material supplier in the Application for Payment and the amount to be paid to the Contractor from such progress payment, as well as a sworn statement from the Contractor establishing receipt of payment or satisfaction of the payment requested by the Contractor in the previous Application for Payment, if any;
.2 Duly executed releases of mechanics' and material suppliers' liens and claims from the Contractor and also Subcontractors, sub-subcontractors and suppliers establishing payment or satisfaction of the payment requested by the Contractor in the previous Application for Payment (See Exhibit "___"); and
.3 Such other information, documentation, and materials, as the Owner, Owner's Lender, or the title insurer may reasonably require.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

« On or before the 20th day of the month immediately preceding a month in which the Contractor will submit an Application for Payment, the Owner, the Architect, the Construction Manager and the Contractor shall meet to review a preliminary draft of such Application for Payment (hereinafter referred to as a "Pencil Draw") prepared by the Contractor. The Contractor shall revise the Pencil Draw in accordance with any objection or recommendation of the Owner, Construction Manager or the Architect. Such revised Pencil Draw shall be resubmitted by the Contractor to the Construction Manager as the Application for Payment due on the fifth (5th) day of the month immediately following the month in which the Pencil Draw was first amended. The Contractor shall also submit with each Application for Payment a written narrative describing the basis for any items set forth in the Application for Payment that does not conform to the instructions of the Owner, Construction Manager or the Architect in connection with any applicable Pencil Draw. »

§ 5.1.3 Provided that a "Pencil Draw" Application for Payment pursuant to Section 5.1.2 is received by the Construction Manager not later than the «20th » day of a month and the Application for Payment submitted by the fifth (5th) day of the following month as stated above, , the Owner shall make payment of the amount certified to the Contractor not later than the «last » day of the «same » month in which the Application for Payment is submitted. If an Application for Payment is received by the Construction Manager after the application date fixed above, payment of the amount certified shall be made by the Owner not later than «thirty» («30 ») days after the Construction Manager receives the Application for Payment. Contractor is only permitted to submit one Application for Payment per calendar month.

(Federal, state or local laws may require payment within a certain period of time.)

§ 5.1.4 Progress Payments Where the Contract Sum is Based on a Stipulated Sum
§ 5.1.4.1 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Construction Manager and Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.4.2 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.4.3 In accordance with AIA Document A232™–2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.4.3.1 The amount of each progress payment shall first include:
.1 That portion of the Contract Sum properly allocable to completed Work;

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.2 That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner and Owner's Lender, if any, suitably stored off the site at a location agreed upon in writing; and

.3 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

§ 5.1.4.3.2 The amount of each progress payment shall then be reduced by:

.1 The aggregate of any amounts previously paid by the Owner;

.2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A232–2019;

.3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;

.4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A232–2019; and

.5 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.5 Progress Payments Where the Contract Sum is Based on the Cost of the Work without a Guaranteed Maximum Price

§ 5.1.5.1 With each Application for Payment, the Contractor shall submit the cost control information required in Exhibit B, Determination of the Cost of the Work, along with payrolls, petty cash accounts, receipted invoices, or invoices with check vouchers attached, and any other evidence required by the Owner, Construction Manager or Architect to demonstrate that payments already made by the Contractor on account of the Cost of the Work equal or exceed progress payments already received by the Contractor, plus payrolls for the period covered by the present Application for Payment, less that portion of the payments attributable to the Contractor's Fee.

§ 5.1.5.2 Applications for Payment shall show the Cost of the Work actually incurred by the Contractor through the end of the period covered by the Application for Payment and for which the Contractor has made or intends to make actual payment prior to the next Application for Payment.

§ 5.1.5.3 In accordance with AIA Document A232-2019 and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.5.3.1 The amount of each progress payment shall first include:

.1 The Cost of the Work as described in Exhibit B, Determination of the Cost of the Work;

.2 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified; and

.3 The Contractor's Fee computed upon the Cost of the Work described in the preceding Section 5.1.5.3.1.1 at the rate stated in Section 4.3.2; or if the Contractor's Fee is stated as a fixed sum in Section 4.3.2 an amount which bears the same ratio to that fixed-sum Fee as the Cost of the Work included in Section 5.1.5.3.1.1 bears to a reasonable estimate of the probable Cost of the Work upon its completion.

§ 5.1.5.3.2 The amount of each progress payment shall then be reduced by:

.1 The aggregate of any amounts previously paid by the Owner;

.2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A232–2019;

.3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;

.4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A232–2019;

.5 The shortfall, if any, indicated by the Contractor in the documentation required by Section 5.1.5.1 to substantiate prior Applications for Payment, or resulting from errors subsequently discovered by the Owner's auditors in such documentation; and

.6 Retainage withheld pursuant to Section 5.1.7.

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§ 5.1.5.4 The Owner, Construction Manager and Contractor shall agree upon a mutually acceptable procedure for review and approval of payments to Subcontractors and the percentage of retainage held on Subcontracts, and the Contractor shall execute subcontracts in accordance with those agreements.

§ 5.1.5.5 In taking action on the Contractor's Applications for Payment, the Construction Manager and Architect shall be entitled to rely on the accuracy and completeness of the information furnished by the Contractor, and such action shall not be deemed to be a representation that (1) the Construction Manager and Architect have made a detailed examination, audit or arithmetic verification of the documentation submitted in accordance with Article 5 or other supporting data; (2) that the Construction Manager and Architect have made exhaustive or continuous on-site inspections; or (3) that the Construction Manager and Architect have made examinations to ascertain how or for what purposes the Contractor has used amounts previously paid on account of the Contract. Such examinations, audits and verifications, if required by the Owner, will be performed by the Owner's auditors acting in the sole interest of the Owner.

§ 5.1.5.6 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.1.5.7 If final completion of the Work is materially delayed through no fault of the Contractor, then the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A232-2019.

§ 5.1.6 Progress Payments Where the Contract Sum is Based on the Cost of the Work with a Guaranteed Maximum Price

§ 5.1.6.1 With each Application for Payment, the Contractor shall submit payrolls, petty cash accounts, receipted invoices or invoices with check vouchers attached, and any other evidence required by the Owner, Construction Manager or Architect to demonstrate that payments already made by the Contractor on account of the Cost of the Work equal or exceed progress payments already received by the Contractor plus payrolls for the period covered by the present Application for Payment, less that portion of the progress payments attributable to the Contractor's Fee.

§ 5.1.6.2 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Guaranteed Maximum Price among: (1) the various portions of the Work; (2) any contingency for costs that are included in the Guaranteed Maximum Price but not otherwise allocated to another line item or included in a Change Order; and (3) the Contractor's Fee.

§ 5.1.6.2.1 The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Construction Manager and Architect may require. This schedule of values, unless objected to by the Owner, Architect, or Construction Manager shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.6.2.2 The allocation of the Guaranteed Maximum Price under this Section 5.1.6.2 shall not constitute a separate guaranteed maximum price for the Cost of the Work of each individual line item in the schedule of values.

§ 5.1.6.2.3 When the Contractor allocates costs from a contingency to another line item in the schedule of values, the Contractor shall submit supporting documentation to the Architect and Construction Manager.

§ 5.1.6.3 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment. The percentage of completion shall be the lesser of (1) the percentage of that portion of the Work which has actually been completed; or (2) the percentage obtained by dividing (a) the expense that has actually been incurred by the Contractor on account of that portion of the Work and for which the Contractor has made payment or intends to make payment prior to the next Application for Payment by (b) the share of the Guaranteed Maximum Price allocated to that portion of the Work in the schedule of values.

§ 5.1.6.4 In accordance with AIA Document A232-2019, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.4.1 The amount of each progress payment shall first include:

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.1 That portion of the Guaranteed Maximum Price properly allocable to completed Work as determined by multiplying the percentage of completion of each portion of the Work by the share of the Guaranteed Maximum Price allocated to that portion of the Work in the most recent schedule of values;

.2 That portion of the Guaranteed Maximum Price properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction or, if approved in writing in advance by the Owner and Owner's Lender, if any, suitably stored off the site at a location agreed upon in writing;

.3 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified; and

.4 The Contractor's Fee, computed upon the Cost of the Work described in the preceding Sections 5.1.6.4.1.1 and 5.1.6.4.1.2 at the rate stated in Section 4.4.2 or, if the Contractor's Fee is stated as a fixed sum in that Section, an amount that bears the same ratio to that fixed-sum fee as the Cost of the Work included in Sections 5.1.6.4.1.1 and 5.1.6.4.1.2 bears to a reasonable estimate of the probable Cost of the Work upon its completion.

§ 5.1.6.4.2 The amount of each progress payment shall then be reduced by:

.1 The aggregate of any amounts previously paid by the Owner;

.2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A232–2019;

.3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;

.4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A232–2019;

.5 The shortfall, if any, indicated by the Contractor in the documentation required by Section 5.1.6.1 to substantiate prior Applications for Payment, or resulting from errors subsequently discovered by the Owner's auditors in such documentation; and

.6 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.6.5 The Owner and the Contractor shall agree upon a mutually acceptable procedure for review and approval of payments to Subcontractors and the percentage of retainage held on Subcontracts, and the Contractor shall execute subcontracts in accordance with those agreements.

§ 5.1.6.6 In taking action on the Contractor's Applications for Payment, the Construction Manager and Architect shall be entitled to rely on the accuracy and completeness of the information furnished by the Contractor and such action shall not be deemed to be a representation that (1) the Construction Manager or Architect have made a detailed examination, audit, or arithmetic verification of the documentation submitted in accordance with Section 5.1.6.1 or other supporting data; (2) that the Construction Manager or Architect have made exhaustive or continuous on-site inspections; or (3) that the Construction Manager or Architect have made examinations to ascertain how or for what purposes the Contractor has used amounts previously paid on account of the Contract. Such examinations, audits, and verifications, if required by the Owner, will be performed by the Owner's auditors acting in the sole interest of the Owner.

§ 5.1.6.7 Except with the Owner's prior approval and the prior written approval of Owner's Lender, if any, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.1.6.8 If final completion of the Work is materially delayed through no fault of the Contractor, then the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A232-2019.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to when the Work of this Contract is substantially complete, the Owner may withhold the following amount, as retainage, from the payment otherwise due:
(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

« »

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§ 5.1.7.1.1 The following items are not subject to retainage:
(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

« »

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:
(If the retainage established in Section 5.1.7.1 is to be modified prior to when the entire Work of this Contract is substantially complete, including modifications for completion of portions of the Work as provided in Section 3.4.2, insert provisions for such modifications.)

« If the Owner reduces the retainage requirements of this Agreement or releases any portion of retainage prior to the date specified in the Contract Documents, any such reduction or release of retainage, or portion thereof, shall not be a waiver of any of the Owner's rights to retainage in connection with other payments to the Contractor or any other right or remedy that the Owner has under the Contract Documents, at law or in equity. Furthermore, the Owner reserves the right to withhold retainage due to the existence of unresolved claims from the Contractor's Subcontractors, Suppliers or any lower tier sub-subcontractors or suppliers to the extent necessary to reasonably protect the Owner as determined in Owner's sole discretion. The retainage of trades that complete their work prior to Final Completion of the Project, such as, but not limited to, steel, concrete, caissons, curtain wall, earthwork, aluminum, glass, glazing, exterior panels, plank, etc. ("Early Trades") may be released in Owner's sole discretion upon final completion of all the Early Trade's work on the Project including any punch-list items.»

»

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, when the Work of this Contract is substantially complete, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted when the Work of this Contract is substantially complete shall not include retainage as follows:
(Insert any other conditions for release of retainage when the Work of this Contract is substantially complete, or upon Substantial Completion of the Work of all Contractors on the Project or portions thereof.)

« »

§ 5.2 Final Payment

§ 5.2.1 Final Payment Where the Contract Sum is Based on a Stipulated Sum

§ 5.2.1.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A232–2019, and to satisfy other requirements, if any, which extend beyond final payment;

.2 the Contractor has submitted all necessary documentation required by the Contract Documents, as well as any reasonable requests for additional documentation made by the Owner or the Construction Lender, if any;

.3 the Contractor has submitted duly executed releases of mechanics' and material suppliers' liens and claims from the Contractor and also Subcontractors, sub-subcontractors and suppliers; and

.4 a final Certificate for Payment or Project Certificate for Payment has been issued by the Architect.

§ 5.2.1.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the final Certificate for Payment or Project Certificate for Payment, or as follows:

« Furthermore, the Owner reserves the right to withhold Final Payment due to the existence of unresolved claims from the Contractor's Subcontractors, Suppliers or any lower tier sub-subcontractors or suppliers to the extent necessary to reasonably protect the Owner as determined in Owner's sole discretion. »

§ 5.2.2 Final Payment Where the Contract Sum is Based on the Cost of the Work with or without a Guaranteed Maximum Price

§ 5.2.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

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.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A232–2019, and to satisfy other requirements, if any, which extend beyond final payment;

.2 the Contractor has submitted a final accounting for the Cost of the Work, pursuant to Exhibit B, Determination of the Cost of the Work and a final Application for Payment;

.3 the Contractor has submitted all necessary documentation required by the Contract Documents, as well as any reasonable requests for additional documentation made by the Owner or the Construction Lender, if any;

.4 the Contractor has submitted duly executed releases of mechanics' and material suppliers' liens and claims from the Contractor and also Subcontractors, sub-subcontractors and suppliers

.5 a final Certificate for Payment or Project Certificate for Payment has been issued by the Architect in accordance with Exhibit B, Determination of the Cost of the Work.

§ 5.2.2.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the final Certificate for Payment or Project Certificate for Payment, or as follows:

« Furthermore, the Owner reserves the right to withhold Final Payment due to the existence of unresolved claims from the Contractor's Subcontractors, Suppliers or any lower tier sub-subcontractors or suppliers to the extent necessary to reasonably protect the Owner as determined in Owner's sole discretion. »

§ 5.3 Intentionally omitted.

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as Initial Decision Maker pursuant to Article 15 of AIA Document A232–2019, unless the parties appoint below another individual, not a party to this Agreement, to serve as Initial Decision Maker.
(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

« »
« »
« »
« »

§ 6.2 Binding Dispute Resolution

For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A232–2019, the method of binding dispute resolution shall be as follows:
(Check the appropriate box.)

[«X »] Arbitration pursuant to Article 15 of AIA Document A232–2019.

[« »] Litigation in a court of competent jurisdiction.

[« »] Other: *(Specify)*

« »

If the Owner and Contractor do not select a method of binding dispute resolution, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 Where the Contract Sum is a Stipulated Sum

§ 7.1.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A232–2019.

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§ 7.1.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A232–2019, then the Owner shall pay the Contractor a termination fee as follows:
(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

«None »

§ 7.1.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A232–2019.

§ 7.2 Where the Contract Sum is Based on the Cost of the Work with or without a Guaranteed Maximum Price
§ 7.2.1 Termination
§ 7.2.1.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A232–2019.

§ 7.2.1.2 Termination by the Owner for Cause
§ 7.2.1.2.1 If the Owner terminates the Contract for cause as provided in Article 14 of AIA Document A232–2019, the Owner shall then only pay the Contractor an amount as follows:

.1 Take the Cost of the Work incurred by the Contractor to the date of termination;
.2 Add the Contractor's Fee, computed upon the Cost of the Work to the date of termination at the rate stated in Section 4.3.2 or 4.4.2, as applicable, or, if the Contractor's Fee is stated as a fixed sum in that Section, an amount that bears the same ratio to that fixed-sum Fee as the Cost of the Work at the time of termination bears to a reasonable estimate of the probable Cost of the Work upon its completion;
.3 Subtract the aggregate of previous payments made by the Owner; and
.4 Subtract the costs and damages incurred, or to be incurred, by the Owner under Article 14 of AIA Document A232–2019.

§ 7.2.1.2.2 When the Contract Sum is based on the Cost of the Work with a Guaranteed Maximum Price, if the Owner terminates the Contract for cause as provided in Article 14 of AIA Document A232-2019, the amount, if any, to be paid to the Contractor under Article 14 of AIA Document A232-2019 shall not cause the Guaranteed Maximum Price to be exceeded, nor shall it exceed the amount calculated in Section 7.2.1.2.1.

§ 7.2.1.2.3 The Owner shall also pay the Contractor fair compensation, either by purchase or rental at the election of the Owner, for any equipment owned by the Contractor that the Owner elects to retain and that is not otherwise included in the Cost of the Work under Section 7.2.1.2.1.1. To the extent that the Owner elects to take legal assignment of subcontracts and purchase orders (including rental agreements), the Contractor shall, as a condition of receiving the payments referred to in this Article 7, execute and deliver all such papers and take all such steps, including the legal assignment of such subcontracts and other contractual rights of the Contractor, as the Owner may require for the purpose of fully vesting in the Owner the rights and benefits of the Contractor under such subcontracts or purchase orders. All Subcontracts, purchase orders and rental agreements entered into by the Contractor will contain provisions allowing for assignment to the Owner as described above.

§ 7.2.1.3 Termination by the Owner for Convenience
If the Owner terminates the Contract for convenience in accordance with Article 14 of AIA Document A232–2019, then the Owner shall pay the Contractor a termination fee as follows:
(Insert the amount of or method for determining the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

«None »

§ 7.3 Suspension
The Work may be suspended by the Owner as provided in Article 14 of AIA Document A232–2019; in such case, the Contract Sum and Contract Time shall be increased as provided in Article 14 of AIA Document A232–2019, except that the term "profit" shall be understood to mean the Contractor's Fee as described in Section 4.3.2 or 4.4.2, as applicable, of this Agreement.

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ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A232–2019 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner's representative:
(Name, address, email address, and other information)

«Mr. Larry Piersol»
«Exeter Township»
«4975 DeMoss Road »
«Reading, PA 19606 »
«610-779-5560»

§ 8.3 The Contractor's representative:
(Name, address, email address, and other information)

« »
« »
« »
« »
« »
« »

§ 8.4 Neither the Owner's nor the Contractor's representative shall be changed without ten days' prior notice to the other party.

§ 8.5 Insurance and Bonds

§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A132™–2019, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A132™–2019, Exhibit A, and elsewhere in the Contract Documents.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A232–2019, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:
(If other than in accordance with AIA Document E203–2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

« »

§ 8.7 Relationship of the Parties

Where the Contract is based on the Cost of the Work plus the Contractor's Fee, with or without a Guaranteed Maximum Price, the Contractor accepts the relationship of trust and confidence established by this Agreement and covenants with the Owner to cooperate with the Architect and exercise the Contractor's skill and judgment in furthering the interests of the Owner; to furnish efficient business administration and supervision; to furnish at all times an adequate supply of workers and materials; and to perform the Work in an expeditious and economical manner consistent with the Owner's interests. The Owner agrees to furnish and approve, in a timely manner, information required by the Contractor and to make payments to the Contractor in accordance with the requirements of the Contract Documents.

§ 8.8 Other provisions:

««**§ 8.8.1** The Contractor represents and warrants the following to the Owner (in addition to any other representations and warranties contained in the Contract Documents), as a material inducement to the Owner to execute this Agreement,

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which representations and warranties shall survive the execution and delivery of this Agreement, any termination of this Agreement, and the final completion of the Work:

.1 The Contractor is financially solvent, is able to pay all debts as they mature, and is possessed of sufficient working capital to complete the Work and perform all obligations hereunder;

.2 The Contractor is able to furnish the plant, tools, materials, supplies, equipment and the labor required to complete the Work and perform its obligations hereunder and has sufficient experience and competence to do so;

.3 The Contractor is authorized to do business in the state in which the Project is located and is properly licensed by all necessary governmental and public and qualified public authorities having jurisdiction over the Contractor and over the Work and the Project;

.4 The Contractor's execution of this Agreement and performance thereof is within the Contractor's duly authorized powers;

.5 The Contractor's duly authorized representative has visited the site of the Project, is familiar with the location conditions under which the Work is to be performed, and has correlated observations with the requirements of the Contract Documents; and

.6 The Contractor possesses a high level of experience and expertise in the business administration, construction, construction management, and superintendence on Projects of this size, complexity, and the nature of this particular Project and will perform the Work with the care, skill, and diligence of such a contractor.

§ 8.8.2 Employee Verification through E-Verify.
Contractor and its Subcontractors shall comply with the Construction Industry Employee Verification Act ("Act 75"). In accordance with Act 75, each "construction industry employer" who hires an employee on or after October 7, 2020 shall verify the employment eligibility of the employee through the E-Verify program operated by the Department of Homeland Security and shall keep a record of the verification for the duration of the employee's employment or three years, whichever is longer.

§ 8.8.3 The Contractor acknowledges that the Owner maybe financing the Work with a loan from the Lender. In order to perform under the Contract Documents, the Owner must comply with certain terms and conditions embodied in the Lender's construction loan agreement. The Contractor agrees to use its best efforts to comply with the requirements of the Lender that bear upon the performance of the Work. The Contractor shall also:

1. Make the site of the Work available at reasonable times for inspection by the Lender or the Lender's representatives;

2. Consent to execute all documents reasonably requested by the Owner in connection with the assignment of this Agreement and the Drawings and Specifications to the Lender for collateral purposes. Such assignment shall provide that the Contractor agrees that notwithstanding a default by the Owner under the provisions of this Agreement that would give the Contractor the right to terminate this Agreement, the Contractor will continue to perform its obligations hereunder (on the same terms and conditions as are set forth herein) for and on account of the Lender, if the Lender, in its sole discretion, decided to proceed with the Project; and

3. Promptly furnish the Owner with information, documents, and material that the Owner may reasonably request from time to time in order to comply with the requirements of the Lender.

§ 8.8.4 Notwithstanding anything to the contrary contained in this Agreement or in any of the other Contract Documents, neither the Owner, any partner of the Owner, nor any person or entity holding any interest in the Owner shall be personally liable, whether directly or indirectly, by reason of any default by the Owner in the performance of any of the obligations of the Owner under this Agreement, including, without limitation, the Owner's failure to pay the Contractor as required hereunder, and in the event of any such default, the Contractor hereby agrees to look solely to the Owner's interest in the property upon which the Project is situated to secure the performance in payment of all such obligations. From time to time, however, the Owner may elect to sell, lease, mortgage, or otherwise transfer any of the Owner's interest in any portion of the Project site, not including any part of the Project site covered by the Project itself ("Site Conveyance"). In connection with any Site Conveyance, the Contractor shall execute and deliver to the Owner and shall cause any Subcontractors to execute and deliver to the Owner such documents for the benefit of the Owner, any purchaser, and any title insurance company issuing title insurance a full and complete release of all mechanics' and materials suppliers' liens and rights, with respect to the property that is the subject of such Site Conveyance, together with such other documents as a title company may require to induce it to issue its policy of title insurance with respect to the Site Conveyance without requiring the Owner's indemnity against mechanics' and materials suppliers' liens. »

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ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

.1 AIA Document A132™–2019, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition, as modified

.2 AIA Document A132™–2019, Exhibit A, Insurance and Bonds Exhibit

.3 AIA Document A232™–2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition, as modified

.4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:
(Insert the date of the E203-2013 incorporated into this Agreement.)

« »

.5 Drawings

Number	Title	Date

.6 Specifications

Section	Title	Date	Pages

.7 Addenda, if any:

Number	Date	Pages

Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless the bidding or proposal requirements are also enumerated in this Article 9.

.8 Other Exhibits:
(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

[« »] AIA Document A132™–2019, Exhibit B, Determination of the Cost of the Work

[« »] AIA Document E235™–2019, Sustainable Projects Exhibit, Construction Manager as Adviser Edition, dated as indicated below:
(Insert the date of the E235-2019 incorporated into this Agreement.)

« »

[« »] The Sustainability Plan:

Title	Date	Pages

[« »] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A232–2019 provides that the advertisement or invitation to bid, Instructions to Bidders,

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sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

«»

This Agreement is entered into as of the day and year first written above.

OWNER *(Signature)*	**CONTRACTOR** *(Signature)*
« »« »	« »« »
(Printed name and title)	*(Printed name and title)*

DRAFT

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DRAFT AIA® Document A132® – 2019 Exhibit A

Insurance and Bonds

This Insurance and Bonds Exhibit is part of the Agreement, between the Owner and the Contractor, dated the « » day of « » in the year « »
(In words, indicate day, month, and year.)

for the following **PROJECT**:
(Name and location or address)

«Exeter Township Emergency Services Facility »
«70 Gibraltar Road
Reading, PA 19606»

THE OWNER:
(Name, legal status, and address)

«Exeter Township »« »
«4975 DeMoss Road
Reading, PA 19606 »

THE CONTRACTOR:
(Name, legal status, and address)

« »« »
« »

TABLE OF ARTICLES

A.1 GENERAL

A.2 OWNER'S INSURANCE

A.3 CONTRACTOR'S INSURANCE AND BONDS

A.4 SPECIAL TERMS AND CONDITIONS

ARTICLE A.1 GENERAL

The Owner and Contractor shall purchase and maintain insurance, and provide bonds, as set forth in this Exhibit. As used in this Exhibit, the term General Conditions refers to AIA Document A232™–2019, General Conditions of the Contract for Construction.

ARTICLE A.2 OWNER'S INSURANCE

§ A.2.1 General

Prior to commencement of the Work, the Owner shall secure the insurance, and provide evidence of the coverage, required under this Article A.2 and, upon the Contractor's request, provide a copy of the property insurance policy or policies required by Section A.2.3. The copy of the policy or policies provided shall contain all applicable conditions, definitions, exclusions, and endorsements.

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This document is intended to be used in conjunction with AIA Document A232™–2019, General Conditions of the Contract for Construction. Article 11 of A232™–2019 contains additional insurance provisions

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§ A.2.2 Liability Insurance
The Owner shall be responsible for purchasing and maintaining the Owner's usual general liability insurance.

§ A.2.3 Required Property Insurance
§ A.2.3.1 Unless this obligation is placed on the Contractor pursuant to Section A.3.3.2.1, the Owner shall purchase and maintain, from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located, property insurance written on a builder's risk "all-risks" completed value or equivalent policy form and sufficient to cover the total value of the entire Project on a replacement cost basis. The Owner's property insurance coverage shall be no less than the amount of the initial Contract Sum, plus the value of subsequent Modifications and labor performed and materials or equipment supplied by others. The property insurance shall be maintained until Substantial Completion and thereafter as provided in Section A.2.3.1.3, unless otherwise provided in the Contract Documents or otherwise agreed in writing by the parties to this Agreement. This insurance shall include the interests of the Owner, Contractor, Subcontractors, and Sub-subcontractors in the Project as insureds. This insurance shall include the interests of mortgagees as loss payees.

§ A.2.3.1.1 Causes of Loss. The insurance required by this Section A.2.3.1 shall provide coverage for direct physical loss or damage, and shall not exclude the risks of fire, explosion, theft, vandalism, malicious mischief, collapse, earthquake, flood, or windstorm. The insurance shall also provide coverage for ensuing loss or resulting damage from error, omission, or deficiency in construction methods, design, specifications, workmanship, or materials. Sub-limits, if any, are as follows:
(Indicate below the cause of loss and any applicable sub-limit.)

Causes of Loss	Sub-Limit

§ A.2.3.1.2 Specific Required Coverages. The insurance required by this Section A.2.3.1 shall provide coverage for loss or damage to false work and other temporary structures, and to building systems from testing and startup. The insurance shall also cover debris removal, including demolition occasioned by enforcement of any applicable legal requirements, and reasonable compensation for the Architect's, Construction Manager's, and Contractor's services and expenses required as a result of such insured loss, including claim preparation expenses. Sub-limits, if any, are as follows:
(Indicate below type of coverage and any applicable sub-limit for specific required coverages.)

Coverage	Sub-Limit

§ A.2.3.1.3 Unless the parties agree otherwise, upon Substantial Completion, the Owner shall continue the insurance required by Section A.2.3.1 or, if necessary, replace the insurance policy required under Section A.2.3.1 with property insurance written for the total value of the Project that shall remain in effect until expiration of the period for correction of the Work set forth in Section 12.2.2 of the General Conditions.

§ A.2.3.1.4 Deductibles and Self-Insured Retentions. If the insurance required by this Section A.2.3 is subject to deductibles or self-insured retentions, the Owner shall be responsible for all loss not covered because of such deductibles or retentions.

§ A.2.3.2 Occupancy or Use Prior to Substantial Completion. The Owner's occupancy or use of any completed or partially completed portion of the Work prior to Substantial Completion shall not commence until the insurance company or companies providing the insurance under Section A.2.3.1 have consented in writing to the continuance of coverage. The Owner and the Contractor shall take no action with respect to partial occupancy or use that would cause cancellation, lapse, or reduction of insurance, unless they agree otherwise in writing.

§ A.2.3.3 Insurance for Existing Structures
If the Work involves remodeling an existing structure or constructing an addition to an existing structure, the Owner shall purchase and maintain, until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, "all-risks" property insurance, on a replacement cost basis, protecting the existing structure against direct physical loss or damage from the causes of loss identified in Section A.2.3.1, notwithstanding the undertaking of the Work. The Owner shall be responsible for all co-insurance penalties.

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§ A.2.4 Optional Extended Property Insurance.
The Owner shall purchase and maintain the insurance selected and described below.
(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. For each type of insurance selected, indicate applicable limits of coverage or other conditions in the fill point below the selected item.)

[« »] **§ A.2.4.1 Loss of Use, Business Interruption, and Delay in Completion Insurance**, to reimburse the Owner for loss of use of the Owner's property, or the inability to conduct normal operations due to a covered cause of loss.

« »

[« »] **§ A.2.4.2 Ordinance or Law Insurance**, for the reasonable and necessary costs to satisfy the minimum requirements of the enforcement of any law or ordinance regulating the demolition, construction, repair, replacement or use of the Project.

« »

[« »] **§ A.2.4.3 Expediting Cost Insurance**, for the reasonable and necessary costs for the temporary repair of damage to insured property, and to expedite the permanent repair or replacement of the damaged property.

« »

[« »] **§ A.2.4.4 Extra Expense Insurance**, to provide reimbursement of the reasonable and necessary excess costs incurred during the period of restoration or repair of the damaged property that are over and above the total costs that would normally have been incurred during the same period of time had no loss or damage occurred.

« »

[« »] **§ A.2.4.5 Civil Authority Insurance**, for losses or costs arising from an order of a civil authority prohibiting access to the Project, provided such order is the direct result of physical damage covered under the required property insurance.

« »

[« »] **§ A.2.4.6 Ingress/Egress Insurance**, for loss due to the necessary interruption of the insured's business due to physical prevention of ingress to, or egress from, the Project as a direct result of physical damage.

« »

[« »] **§ A.2.4.7 Soft Costs Insurance**, to reimburse the Owner for costs due to the delay of completion of the Work, arising out of physical loss or damage covered by the required property insurance: including construction loan fees; leasing and marketing expenses; additional fees, including those of architects, engineers, consultants, attorneys and accountants, needed for the completion of the construction, repairs, or reconstruction; and carrying costs such as property taxes, building permits, additional interest on loans, realty taxes, and insurance premiums over and above normal expenses.

« »

§ A.2.5 Other Optional Insurance.
The Owner shall purchase and maintain the insurance selected below.

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(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance.)

[« »] **§ A.2.5.1 Cyber Security Insurance** for loss to the Owner due to data security and privacy breach, including costs of investigating a potential or actual breach of confidential or private information. *(Indicate applicable limits of coverage or other conditions in the fill point below.)*

« »

[« »] **§ A.2.5.2 Other Insurance**
(List below any other insurance coverage to be provided by the Owner and any applicable limits.)

Coverage	Limits

ARTICLE A.3 CONTRACTOR'S INSURANCE AND BONDS

§ A.3.1 General

§ A.3.1.1 Certificates of Insurance. The Contractor shall provide certificates of insurance acceptable to the Owner evidencing compliance with the requirements in this Article A.3 at the following times: (1) prior to commencement of the Work; (2) upon renewal or replacement of each required policy of insurance; and (3) upon the Owner's written request. An additional certificate evidencing continuation of commercial liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment and thereafter upon renewal or replacement of such coverage until the expiration of the periods required by Section A.3.2.1 and Section A.3.3.1. The certificates will show the Owner as an additional insured on the Contractor's Commercial General Liability, auto and excess or umbrella liability policy or policies.

§ A.3.1.2 Deductibles and Self-Insured Retentions. The Contractor shall disclose to the Owner any deductible or self- insured retentions applicable to any insurance required to be provided by the Contractor.

§ A.3.1.3 Additional Insured Obligations. To the fullest extent permitted by law, the Contractor shall cause the commercial general liability, auto and umbrella policy coverage to include (1) the Owner, the Architect and the Architect's consultants, and the Construction Manager and the Construction Manager's consultants, as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions for which loss occurs during completed operations. The additional insured coverage shall be primary and non-contributory to any of the Owner's general liability, auto and umbrella insurance policies and shall apply to both ongoing and completed operations. To the extent commercially available, the additional insured coverage shall be no less than that provided by Insurance Services Office, Inc. (ISO) forms CG 20 10 07 04, CG 20 37 07 04, and, with respect to the Architect and the Architect's consultants, and the Construction Manager and the Construction Manager's consultants, CG 20 32 07 04.

§ A.3.2 Contractor's Required Insurance Coverage

§ A.3.2.1 The Contractor shall purchase and maintain the following types and limits of insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:
(If the Contractor is required to maintain insurance for a duration other than the expiration of the period for correction of Work, state the duration.)

« »

§ A.3.2.2 Commercial General Liability

§ A.3.2.2.1 Commercial General Liability insurance for the Project written on an occurrence form with policy limits of not less than «One Million Dollars » ($ «1,000,000 ») each occurrence, «Two Million Dollars » ($ «2,000,000 ») general aggregate, and «Two Million Dollars » ($ «2,000,000 ») aggregate for products-completed operations hazard, providing coverage for claims including

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.1 damages because of bodily injury, sickness or disease, including occupational sickness or disease, and death of any person;
.2 personal injury and advertising injury;
.3 damages because of physical damage to or destruction of tangible property, including the loss of use of such property;
.4 bodily injury or property damage arising out of completed operations; and
.5 the Contractor's indemnity obligations under Section 3.18 of the General Conditions.

§ A.3.2.2.2 The Contractor's Commercial General Liability policy under this Section A.3.2.2 shall not contain an exclusion or restriction of coverage for the following:

.1 Claims by one insured against another insured, if the exclusion or restriction is based solely on the fact that the claimant is an insured, and there would otherwise be coverage for the claim.
.2 Claims for property damage to the Contractor's Work arising out of the products-completed operations hazard where the damaged Work or the Work out of which the damage arises was performed by a Subcontractor.
.3 Claims for bodily injury other than to employees of the insured.
.4 Claims for indemnity under Section 3.18 of the General Conditions arising out of injury to employees of the insured.
.5 Claims or loss excluded under a prior work endorsement or other similar exclusionary language.
.6 Claims or loss due to physical damage under a prior injury endorsement or similar exclusionary language.
.7 Claims related to residential, multi-family, or other habitational projects, if the Work is to be performed on such a project.
.8 Claims related to roofing, if the Work involves roofing.
.9 Claims related to exterior insulation finish systems (EIFS), synthetic stucco or similar exterior coatings or surfaces, if the Work involves such coatings or surfaces.
.10 Claims related to earth subsidence or movement, where the Work involves such hazards.
.11 Claims related to explosion, collapse and underground hazards, where the Work involves such hazards.

§ A.3.2.3 Automobile Liability covering vehicles owned, and non-owned vehicles used, by the Contractor, with policy limits of not less than «One Million Dollars » ($ «1,000,000 ») per accident, for bodily injury, death of any person, and property damage arising out of the ownership, maintenance and use of those motor vehicles along with any other statutorily required automobile coverage.

§ A.3.2.4 The Contractor may achieve the required limits and coverage for Commercial General Liability and Automobile Liability through a combination of primary and excess or umbrella liability insurance, provided such primary and excess or umbrella insurance policies result in the same or greater coverage as the coverages required under Section A.3.2.2 and A.3.2.3, and in no event shall any excess or umbrella liability insurance provide narrower coverage than the primary policy. The excess policy shall not require the exhaustion of the underlying limits only through the actual payment by the underlying insurers.

§ A.3.2.5 Workers' Compensation at statutory limits.

§ A.3.2.6 Employers' Liability with policy limits not less than «Five Hundred Thousand Dollars » ($ «500,000 ») each accident, «Five Hundred Thousand Dollars » ($ «500,000 ») each employee, and «Five Hundred Thousand Dollars » ($ «500,000 ») policy limit.

§ A.3.2.7 Jones Act, and the Longshore & Harbor Workers' Compensation Act, as required, if the Work involves hazards arising from work on or near navigable waterways, including vessels and docks

§ A.3.2.8 If the Contractor is required to furnish professional services as part of the Work, the Contractor shall procure Professional Liability insurance covering performance of the professional services, with policy limits of not less than «One Million Dollars » ($ «1,000,000 ») per claim and «Two Million Dollars » ($ «2,000,000 ») in the aggregate.

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§ A.3.2.9 If the Work involves the transport, dissemination, use, or release of pollutants, the Contractor shall procure Pollution Liability insurance, with policy limits of not less than « One Million Dollars » ($ « 1,000,000 ») per claim and « Two Million Dollars » ($ «2,000,000 ») in the aggregate.

§ A.3.2.10 Coverage under Sections A.3.2.8 and A.3.2.9 may be procured through a Combined Professional Liability and Pollution Liability insurance policy, with combined policy limits of not less than « » ($ « ») per claim and « » ($ « ») in the aggregate.

§ A.3.2.11 Insurance for maritime liability risks associated with the operation of a vessel, if the Work requires such activities, with policy limits of not less than « » ($ « ») per claim and « » ($ « ») in the aggregate.

§ A.3.2.12 Insurance for the use or operation of manned or unmanned aircraft, if the Work requires such activities, with policy limits of not less than « » ($ « ») per claim and « » ($ « ») in the aggregate.

§ A.3.3 Contractor's Other Insurance Coverage

§ A.3.3.1 Insurance selected and described in this Section A.3.3 shall be purchased from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:
(If the Contractor is required to maintain any of the types of insurance selected below for a duration other than the expiration of the period for correction of Work, state the duration.)

«Umbrella Liability or Excess Liability – Five Million Dollars ($5,000,000.00) each occurrence. Five Million Dollars ($5,000,000.00) general aggregate. Two Million Dollars ($2,000,000.00) Products and Completed Operations Aggregate. Two Million Dollars ($2,000,000.00) - Personal and Advertising Injury »

§ A.3.3.2 The Contractor shall purchase and maintain the following types and limits of insurance in accordance with Section A.3.3.1.
(Select the types of insurance the Contractor is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. Where policy limits are provided, include the policy limit in the appropriate fill point.)

[« »] **§ A.3.3.2.1** If there is only one Contractor performing the Work on the Project, property insurance of the same type and scope satisfying the requirements identified in Section A.2.3, which, if selected in this section A.3.3.2.1, relieves the Owner of the responsibility to purchase and maintain such insurance except insurance required by Section A.2.3.1.3 and Section A.2.3.3. The Contractor shall comply with all obligations of the Owner under Section A.2.3 except to the extent provided below. The Contractor shall disclose to the Owner the amount of any deductible, and the Owner shall be responsible for losses within the deductible. Upon request, the Contractor shall provide the Owner with a copy of the property insurance policy or policies required. The Owner shall adjust and settle the loss with the insurer and be the trustee of the proceeds of the property insurance in accordance with Article 11 of the General Conditions unless otherwise set forth below:
(Where the Contractor's obligation to provide property insurance differs from the Owner's obligations as described under Section A.2.3, indicate such differences in the space below. Additionally, if a party other than the Owner will be responsible for adjusting and settling a loss with the insurer and acting as the trustee of the proceeds of property insurance in accordance with Article 11 of the General Conditions, indicate the responsible party below.)

« »

[« »] **§ A.3.3.2.2 Railroad Protective Liability Insurance**, with policy limits of not less than « » ($ « ») per claim and « » ($ « ») in the aggregate, for Work within fifty (50) feet of railroad property.

[« »] **§ A.3.3.2.3 Asbestos Abatement Liability Insurance**, with policy limits of not less than « » ($ « ») per claim and « » ($ « ») in the aggregate, for liability arising from the encapsulation, removal, handling, storage, transportation, and disposal of asbestos-containing materials.

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[« »] **§ A.3.3.2.4** Insurance for physical damage to property while it is in storage and in transit to the construction site on an "all-risks" completed value form.

[« »] **§ A.3.3.2.5** Property insurance on an "all-risks" completed value form, covering property owned by the Contractor and used on the Project, including scaffolding and other equipment.

[« »] **§ A.3.3.2.6 Other Insurance**
(List below any other insurance coverage to be provided by the Contractor and any applicable limits.)

Coverage	Limits

§ A.3.4 Performance Bond and Payment Bond
The Contractor shall provide surety bonds, from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located, as follows:
(Specify type and penal sum of bonds.)

Type	Penal Sum ($0.00)
Payment Bond	«100% »
Performance Bond	«100% »

Payment and Performance Bonds shall be AIA Document A312™, Payment Bond and Performance Bond, or contain provisions identical to AIA Document A312™, current as of the date of this Agreement.

ARTICLE A.4 SPECIAL TERMS AND CONDITIONS
Special terms and conditions that modify this Insurance and Bonds Exhibit, if any, are as follows:

«Maintenance Bond in the amount of 15% for 18 Months »

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SECTION 00 7226 - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

The General Conditions of this Contract is the American Institute of Architect's Document A232 "General Conditions of the Contract for Construction, Construction Manager as Advisor Edition", 2019 Edition, is bound herewith.

The General Conditions shall be in effect for the duration of this project for all Contractors. Document

A232 is enclosed for each Prime Contractor's review.

END OF SECTION 00 7226

DRAFT

AIA® Document A232™ – 2019

General Conditions of the Contract for Construction, *Construction Manager as Adviser Edition*

for the following PROJECT:
(Name, and location or address)

«Exeter Township Emergency Services Facility
70 Gibraltar Road
Reading, PA 19606»

THE CONSTRUCTION MANAGER:
(Name, legal status, and address)

«Boyle Construction, Inc.
3850 Sierra Circle, Suite 400
Center Valley, PA 18034»« »
«484-223-0726 »

THE OWNER:
(Name, legal status, and address)

«Exeter Township
4975 DeMoss Road
Reading, PA 19606»« »
«610-779-5560»

THE ARCHITECT:
(Name, legal status, and address)

«Manns Woodward Studios, Inc
8098 Sandpiper Circle, Suite H»« »
«Nottingham, MD 21236
410-344-1460»

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This document is intended to be used in conjunction with AIA Documents A132™–2019, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition; B132™–2019, Standard Form of Agreement Between Owner and Architect, Construction Manager as Adviser Edition; and C132™–2019, Standard Form of Agreement Between Owner and Construction Manager as Adviser.

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents. The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of addenda relating to bidding or proposal requirements.

§ 1.1.2 The Contract. The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and the Construction Manager or the Construction Manager's consultants, (3) between the Owner and the Architect or the Architect's consultants, (4) between the Contractor and the Construction Manager or the Construction Manager's consultants, (5) between the Owner and a Subcontractor or Sub-subcontractor (6) between the Construction Manager and the Architect, or (7) between any persons or entities other than the Owner and Contractor. The Construction Manager and Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of their duties.

§ 1.1.3 The Work. The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 The Project. The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by other Contractors, and by the Owner's own forces and Separate Contractors.

§ 1.1.5 Contractors. Contractors are persons or entities, other than the Contractor or Separate Contractors, who perform Work under contracts with the Owner that are administered by the Architect and Construction Manager.

§ 1.1.6 Separate Contractors. Separate Contractors are persons or entities who perform construction under separate contracts with the Owner not administered by the Architect and Construction Manager.

§ 1.1.7 The Drawings. The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.8 The Specifications. The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.9 Instruments of Service. Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.10 Initial Decision Maker. The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

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§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results. In the event of inconsistencies within or between parts of the Contract Documents, or between the Contract Documents and applicable standards, codes, and ordinances, the Contractor shall (i) provide the better quality or greater quantity of Work or (ii) comply with the more stringent requirement; either or both in accordance with the Architect's interpretation. The terms and conditions of this Sub-section 1.2.1, however, shall not relieve the Contractor of any of the obligations set forth in Sub-sections 3.2 and 3.7. Moreover, Work not expressly required in the Contract Documents will be required if it is consistent with the Contract Documents, is reasonably inferable from them as being necessary to produce the indicated results, is required by Article 2 of the Agreement, and to the extent it is necessary to produce complete and functioning Work.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade. Instructions and other information furnished in the Specifications, including, without limitation, items in connection with prefabricated or pre-finished items, are not intended to supersede work agreements between employers and employees. Should the Specifications conflict with such work agreements, the work agreements shall be followed, provided such items are provided and finished as specified. If necessary, such Work shall be performed on the Project site, instead of at the shop, by appropriate labor and in accordance with the requirements of the Drawings and Specifications.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.2.4 Whenever a product is specified or shown by describing propriety items, model numbers, catalog numbers, manufacturer, trade names, or similar reference, no substitutions may be made unless accepted prior to execution of the Contract or if accepted as a Change in the Work. Where two or more products are shown or specified, the Contractor has the option to use either of those shown or specified.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice,

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if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Construction Manager and the Architect do not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 {Intentionally Omitted}

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work, and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract.

§ 2.2.2 {Intentionally omitted} Intentionally omitted.

§ 2.2.3 {Intentionally omitted} {Intentionally omitted}

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, or as otherwise indicated in the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities. Unless otherwise provided under the Contract Documents, the Owner, assisted by the Construction Manager, shall secure and pay for the building permit.

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

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§ 2.3.3 The Owner shall retain a construction manager adviser lawfully practicing construction management in the jurisdiction where the Project is located. That person or entity is identified as the Construction Manager in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.4 If the employment of the Construction Manager or Architect terminates, the Owner shall employ a successor construction manager or architect to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Construction Manager or Architect, respectively.

§ 2.3.5 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.3.6 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.3.7 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.3.8 The Owner shall forward all communications to the Contractor through the Construction Manager. Other communication shall be made as set forth in Section 4.2.6.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a five-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to review by the Construction Manager and prior approval of the Architect, and the Construction Manager or Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Construction Manager's and Architect's and their respective consultants' additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15. The rights granted to the Owner pursuant to this Section 2.5 shall not give rise to any duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

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§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Construction Manager or Architect in their administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents. Prior to execution of the Agreement, the Contractor and each Subcontractor valued and satisfied themselves as to the conditions and limitations under which the Work is to be performed, including, without limitation, (i) the location, condition, layout, and nature of the Project site and surrounding areas, (ii) generally prevailing climatic conditions, (iii) anticipated labor supply and costs, (iv) availability and cost of materials, tools, and equipment and (v) other similar issues. The Owner assumes no responsibility or liability for the physical conditions or safety of the Project site of any improvements located on the Project site. The Owner shall not be required to make any adjustment in either the Contract Sum or the Contract Time in connection with any failure by the Contractor or any Subcontractor to have complied with the requirements of this Section 3.2.1.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.5, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Construction Manager and Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information submitted to the Construction Manager in such form as the Construction Manager and Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.2.1 The exactness of grades, elevations, dimensions, or locations given on any Contract Documents or the work installed by other contractors is not guaranteed by the Architect, the Construction Manager or the Owner. The Contractor shall, therefore, satisfy itself as to the accuracy of all grades, elevations, dimensions, and locations. In all cases of interconnection of its Work with existing or other work, it shall verify at the site all dimensions relating to such existing or other work. Any errors due to the Contractor's failure to so verify all such grades, elevations, dimensions, or locations shall be promptly rectified by the Contractor without any additional cost to the Owner.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Construction Manager and Architect any nonconformity discovered by or made known to the Contractor as a request for information submitted to Construction Manager in such form as the Construction Manager and Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or

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procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner, the Construction Manager, and the Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. The Construction Manager shall review the proposed alternative for sequencing, constructability, and coordination impacts on the other Contractors. The Contractor shall not perform the Work using its alternative means, methods, techniques, sequences, or procedures and shall not proceed with that portion of the Work without further written instructions from the Architect, Construction Manager and Owner. If the Contractor fails to give the requisite written notice and proposed changes to the Owner, Construction Manager and Architect before proceeding with the applicable portion of the Work or if the Contractor gives the requisite notice and proposed changes and then proceeds with that portion of the Work prior to receiving further written instructions from the Architect, Construction Manager and Owner, then the Contractor shall be solely responsible for any resulting loss or damage. If the Contractor gives the requisite written notice and proposed changes and then is instructed by the Owner to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Owner shall be solely responsible for any loss or damage arising solely from those Owner-required means, methods, techniques, sequences or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of the Project already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.
If the Contractor desires to submit an alternate product or method in lieu of what has been specified or shown in the Contract Documents, the following provisions apply:

.1 The Contractor must submit to the Construction Manager (i) a full explanation of the proposed substitution and submittal of all supporting data, including technical information, catalog cuts, warranties, tests results, installation instructions, operating procedures and other like information necessary for a complete evaluation of the substitution; (ii) a written explanation of the reasons the substitution is advantageous and necessary, including the benefits to the Owner and the Work in the event the substitution is acceptable; (iii) the adjustment, if any, in the Contract Sum, in the event the substitution is acceptable; (iv) the adjustment, if any, in the time of completion of the Contract and the construction schedule in the event the substitution is acceptable; and (v) an affidavit stating that (a) the proposed substitution shown on the Drawings, and (b) the Contractor accepts the warranty and correction obligations in connection with the proposed substitution as if originally specified by the Architect. Proposals for substitution shall be submitted in triplicate to the Architect in sufficient time to allow the Architect no less than ten (10) working days for review. No substitutions will be considered or allowed without the Contractor's submittal of complete substantiating data and information as stated hereinbefore.

.2 Substitutions and alternates may be rejected without explanation and will be considered only under one or more of the following conditions: (i) the proposal is required for compliance with interpretation of code requirements or insurance regulations then existing; (ii) specified products are unavailable through no fault of the Contractor; (iii) subsequent information discloses the inability of specified products to perform properly or to fit in the designated space; (iv) the manufacturer/fabricator refuses to certify or guarantee the performance of the specified product as required; and (v) when in the judgment of the Owner, the Construction Manager or the Architect, a substitution would be substantially in the Owner's best interests, in terms of cost, time or other considerations.

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.3 Whether or not any proposed substitution is accepted by the Owner, the Construction Manager or the Architect, the Contractor shall reimburse the Owner for any fees charged by the Construction Manager, the Architect or other consultants for evaluating each proposed substitute.

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect, in consultation with the Construction Manager, and in accordance with a Change Order or Construction Change Directive.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.4.4.1 The Contractor shall only employ or use labor in connection with the Work, capable of working harmoniously with all trades, crafts, and any other individuals associated with the Project. The Contractor shall also use best efforts to minimize the likelihood of any strike, work stoppage, or other labor disturbance.

§ 3.4.4.2 If the Work is to be performed by trade unions, the Contractor shall make all necessary arrangements to reconcile, without delay, damage or cost to the Owner and without recourse to the Architect or the Owner, any conflict between the Contract Documents and any agreements or regulations of any kind at any time in force among members or councils that regulate or distinguish the activities that shall not be included in the work of any particular trade.

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner, Construction Manager, and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Construction Manager or Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. The Contractor agrees to assign to the Owner at the time of final completion of the Work any and all manufacturer's warranties relating to materials and labor used in the Work and further agrees to perform the Work in such manner so as to preserve any and all such manufacturer's warranties.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.6 Taxes

The Contractor shall pay sales, consumer, use and similar taxes for the Work or portions thereof provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 Permits, Fees, Notices, and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Owner, assisted by the Construction Manager, shall secure and pay for the building permit. The Contractor shall secure and pay for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded and shall provide proof by way of copies or certificates to the Construction Manager as soon as practicable. All connection charges, assessments, or inspection fees as may be imposed by any municipal agency or utility company are included in the Contract Sum and shall be the Contractor's responsibility. The Contractor shall also obtain and pay all charges for all approvals for street closings, parking meter removal, and other similar matters as may be necessary or appropriate from time to time for the performance of the Work.

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§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions. If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner, Construction Manager, and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect and Construction Manager will promptly investigate such conditions and, if the Architect, in consultation with the Construction Manager, determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect, in consultation with the Construction Manager, determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner, Construction Manager, and Contractor, stating the reasons. If the Owner or Contractor disputes the Architect's determination or recommendation, either party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner, Construction Manager, and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents:

- **.1** allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- **.2** Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances;
- **.3** whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2;
- **.4** Upon execution of a Change Order addressing an item covered by an allowance, the allowance will be reduced by the value of the change order and the Contract Sum shall be adjusted accordingly to reflect the pricing in the Change Order; and
- **.5** The Contractor cannot bill for any Work associated with an allowance unless there is a signed executed Change Order for the Work.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

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§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor. If, during the course of the project, it is evident that the superintendent is not competent, is not managing the progress of the Work, or is not coordinating the supervision of the various trades under the Contract, the Owner or Construction Manager may require the replacement of the superintendent with an acceptable superintendent.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect, through the Construction Manager, of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Construction Manager may notify the Contractor, stating whether the Owner, the Construction Manager, or the Architect (1) has reasonable objection to the proposed superintendent or (2) require additional time for review. Failure of the Construction Manager to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ key personnel to whom the Owner, Construction Manager, or Architect has made reasonable and timely objection. The Contractor shall not change the key personnel without the Owner's consent, which shall not unreasonably be withheld or delayed. If, during the course of the Project, it is evident that any of the key personnel is not competent or is not managing the progress of the Work or is not coordinating the supervision of the various trades under the Contract, the Owner or Construction Manager may require the replacement of the personnel with acceptable personnel.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information, and the Construction Manager's use in developing the Project schedule, a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project. The Contractor shall cooperate with the Construction Manager in scheduling and performing the Contractor's Work to avoid conflict with, and as to cause no delay in, the work or activities of other Contractors, or the construction or operations of the Owner's own forces or Separate Contractors.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Construction Manager's and Architect's approval. The Architect and Construction Manager's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Construction Manager and Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall participate with other Contractors, the Construction Manager, and the Owner in reviewing and coordinating all schedules for incorporation into the Project schedule that is prepared by the Construction Manager. The Contractor shall make revisions to the construction schedule and submittal schedule as deemed necessary by the Construction Manager to conform to the Project schedule.

§ 3.10.4 The Contractor shall perform the Work in accordance with the most recent schedules submitted to the Owner, Construction Manager, and Architect, and incorporated into the approved Project schedule.

§ 3.10.5 The construction schedule shall be in a detailed precedence-style critical path management ("CPM") or primavera-type format satisfactory to the Owner and Construction Manager that shall also (i) provide a graphic representation of all activities and events that will occur during performance of the Work; (ii) identify each phase of construction and occupancy; and (iii) set forth dates that are critical in ensuring the timely and orderly completion of the Work in accordance with the requirements of the Contract Documents (hereinafter referred to as "Milestone Dates"). Upon review and acceptance by the Owner and Construction Manager of the Milestone Dates, the

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construction schedule shall be deemed part of the Contract Documents and attached to the Agreement as an Exhibit. If not accepted, the construction schedule shall be promptly revised by the Contractor in accordance with the recommendations of the Owner and the Construction Manager and resubmitted for acceptance. The Contractor shall monitor the progress of the Work for conformance with the requirements of the construction schedule and shall promptly advise the Owner of any delays or potential delays.

The accepted construction schedule shall be updated to reflect actual conditions as set forth in Section 3.10.1 or if requested by either the Owner or the Construction Manager. In the event any progress report indicates any delays, the Contractor shall propose an affirmative plan to correct the delay, including overtime and/or additional labor, if necessary. In no event shall any progress report constitute an adjustment in the Contract Time, any Milestone Date, or the Contract Sum unless any such adjustment is agreed to by the Owner and authorized pursuant to Change Order.

§ 3.10.6 In the event the Owner determines that the performance of the Work, as of a Milestone Date, has not progressed or reached the level of completion required by the Contract Documents, the Owner shall have the right to order the Contractor to take corrective measures necessary to expedite the progress of construction, including, without limitation, (i) working additional shifts or overtime; (ii) supplying additional manpower, equipment and facilities , and (iii) other similar measures (hereinafter referred to collectively as "Extraordinary Measures"). Such Extraordinary Measures shall continue until the progress of the Work complies with the stage of completion required by the Contract Documents. The Owner's right to require Extraordinary Measures is solely for the purpose of ensuring the Contractor's compliance with the construction schedule.

.1 The Contractor shall not be entitled to an adjustment in the Contract Sum in connection with Extraordinary Measures required by the Owner under or pursuant to this Section 3.10.6.

.2 The Owner may exercise the rights furnished the Owner under or pursuant to this Section 3.10.6 as frequently as the Owner deems necessary to ensure that the Contractor's performance of the Work will comply with any Milestone Date or completion date set forth in the Contract Documents.

§ 3.10.7 The Owner shall have the right to direct a postponement or reschedule of any date or time for the performance of any part of the Work that may interfere with the operation of the Owner's premises or any tenants or invitees thereof. The Contractor shall, upon the Owner's or Construction Manager's request, reschedule any portion of the Work affecting operation of the premises during hours when the premises are not in operation. Any postponement, rescheduling or performance of the Work under this Section 3.10.7 may be grounds for an extension of the Contract Time, if permitted, under Section 8.3.1, and an equitable adjustment in the Contract Sum if (i) the performance of the Work was properly scheduled by the Contractor in compliance with the requirements of the Contract

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Construction Manager, Architect, and Owner, and delivered to the Construction Manager for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.11.1 Monthly Report

The Contractor shall record the progress of the Project. On a monthly basis (on the tenth (10th) day of each month), or otherwise as agreed to by the Owner or Construction manager, the Contractor shall submit written progress reports to the Owner, Construction Manager and Architect, showing percentages of completion and other information required by the Owner. Specifically, for the preceding thirty (30) days, Contractor shall submit to Owner and Construction Manger the current Project schedule, together with a monthly report, which shall include the following information:

1. a description of the work activity on the Project during the immediately preceding month;
2. a description of the work activity anticipated for the current month for each of the major trades;
3. a list of outstanding RFI's;
4. the status of change orders and anticipated change orders;

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5. Project photographs;
6. a cost report;
7. an updated Project Schedule;
8. submittal log;
9. current Project directory;
10. contract schedule log;
11. change event log; and
12. procurement schedule.

§ 3.11.2 Daily Logs

The Contractor shall keep, and make available to the Owner, Construction Manager and Architect, a daily log containing a record for each day of weather, portions of the Work in progress, number of workers on site, identification of equipment on site, problems that might affect progress of the work, accidents, injuries, and other information required by the Owner.

§ 3.12 Shop Drawings, Product Data, and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect and Construction Manager is subject to the limitations of Sections 4.2.10 through 4.2.12. Informational submittals upon which the Construction Manager and Architect are not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Construction Manager or Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Construction Manager, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the Project submittal schedule approved by the Construction Manager and Architect or, in the absence of an approved Project submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of other Contractors, Separate Contractors, or the Owner's own forces. The Contractor shall cooperate with the Construction Manager in the coordination of the Contractor's Shop Drawings, Product Data, Samples, and similar submittals with related documents submitted by other Contractors.

§ 3.12.6 By approving and submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner, Construction Manager, and Architect, that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been reviewed and approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Construction Manager and Architect of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been

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issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Construction Manager and Architect on previous submittals. In the absence of such notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional and who shall comply with reasonable requirements of the Owner regarding qualifications and insurance. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner, the Architect, and the Construction Manager shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Construction Manager shall review submittals for sequencing, constructability, and coordination impacts on other Contractors.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Construction Manager and Architect at the time and in the form specified by the Architect.

§ 3.13 Use of Site

§ 3.13.1 The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.13.2 The Contractor shall coordinate the Contractor's operations with, and secure the approval of, the Construction Manager before using any portion of the site.

§ 3.13.3 Only materials and equipment that are to be used directly in the Work shall be brought to and stored on the Project site by the Contractor. After equipment is no longer required for the Work, it shall be promptly removed from the Project site. Protection of construction material and equipment stored at the Project site from weather, theft, damage and all other adversity is solely the responsibility of the Contractor. The Contractor shall ensure that the Work, at all times, is performed in a manner that affords reasonable access, both vehicular and pedestrian, to the site of the Work and all adjacent areas. The Work shall be performed, to the fullest extent reasonably possible, in such a manner that public areas adjacent to the site of the Work shall be free from all debris, building materials, and equipment likely to cause hazardous conditions.

§ 3.13.4 The Contractor and any entity for whom the Contractor is responsible shall not erect any sign on the Project site without the prior written consent of the Construction Manager, which may be withheld in the sole discretion of the Construction Manager.

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§ 3.13.5 Without limitation of any other provision of the Contract Documents, the Contractor shall use best efforts to minimize any interference with the occupancy or beneficial use of (i) any areas of the buildings adjacent to the site of the Work and (ii) the project itself in the event of partial occupancy. Without prior approval of the Construction Manager, the Contractor shall not permit any workers to use any existing facilities at the Project site, including, without limitation, lavatories, toilets, entrances and parking areas other than those designated by the Construction Manager.

.1 Without limitation of any other provision of the Contract Documents, the Contractor shall use its best efforts to comply with all rules and regulations promulgated by the Owner or the Construction Manager in connection with the use and occupancy of the Project site and the building, as amended from time to time. The Contractor shall immediately notify the Construction Manager in writing if during the performance of the Work, the Contractor finds compliance of any portion of such rules and regulations to be impracticable, setting forth the problems of such compliance and suggesting alternatives through which the same results intended by such portions of the rules and regulations can be achieved. The Owner or Construction Manager may, in their sole discretion, adopt such suggestions, develop new alternatives or require compliance with the existing requirements of the rules and regulations.

.2 The Contractor shall also comply with all insurance requirements and collective bargaining agreements, if any, applicable to use and occupancy of the Project or any portion thereof.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner, Separate Contractors, or of other Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner, Separate Contractors, or by other Contractors except with written consent of the Construction Manager, Owner, and such other Contractors or Separate Contractors. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Separate Contractors, other Contractors, or the Owner, its consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project. In addition, the Contractor will be responsible for the proper disposal of such waste, in accordance with applicable law.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner, or Construction Manager with the Owner's approval, may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 Access to Work

The Contractor shall provide the Owner, Construction Manager, and Architect with access to the Work in preparation and progress wherever located.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner, Construction Manager, and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner, Architect, or Construction Manager. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect through the Construction Manager.

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§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Construction Manager, Architect, Construction Manager's and Architect's consultants, any other entities identified in the Contract Documents, and agents and employees of any of them (individually, an "Indemnified Party," collectively, "Indemnified Parties") from and against any and all liabilities (including but not limited to contractual liabilities), claims (even if such claims are groundless, false or fraudulent), losses, damages, penalties, fines, settlements, costs, and/or expenses (including but not limited to court costs and reasonable attorneys' fees), attributable to injury (including but not limited to sickness, disease, or death) to any person (including but not limited to the Contractor's employees) and/or damage to any property of whatsoever kind or nature, arising out of or relating to the execution of the Work, or preparation for the Work, or any extension, modification, or amendment to the Work by change order or otherwise, or other directives from the Owner, or the design, manufacture, delivery, installation, use, misuse, maintenance, erection, repair, operation, or failure of any part, of all of the goods, materials, machinery, and/or equipment (even if such was furnished, rented, or loaned by any of the Indemnified Parties), even for, and if caused in part by, any negligent act or omission, or strict liability of an Indemnified Party. . Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

§ 3.18.3 The Contractor's obligation to defend the Indemnified Parties under this Section 3.18 is in addition to the Contractor's obligation to indemnify and hold harmless the Indemnified Parties. The Contractor shall, at the Contractor's expense, defend an Indemnified Party against any claim, whether asserted in a proceeding, action at law, in equity, in arbitration, or otherwise, containing any allegation(s) that may potentially give rise to the Contractor's obligation to indemnify an Indemnified Party under Sections 3.18.1 and 3.18.2 above. The Contractor shall retain an attorney to represent such Indemnified Party, provided, however, that any attorney employed in such defense must be satisfactory to the Indemnified Party. The Contractor's obligation to defend an Indemnified Party shall continue until such time as it is determined by court or arbitrator(s), through all appeals and/or the expiration of applicable appeal periods, that the Contractor is not obligated to provide such defense. The Contractor shall pay for all attorneys' fees and related legal expenses incurred by an Indemnified Party to enforce the Indemnified Party's rights under this Section 3.18.

§ 3.18.4 The Contractor's indemnity obligations under this Section 3.18 shall also specifically include, without limitation, all fines, penalties, damages, liability costs, expenses (including, without limitation, reasonable attorneys' fees), and punitive damages (if any) arising out of, or in connection with, any: (i) violation of or failure to comply with any law, statute, ordinance, rule, regulation, code or requirement of a public authority that relates to or bears upon the performance of the Work by the Contractor, its Subcontractors, or any person or entity for whom either is responsible, including, but not limited to, any environmental conditions, hazardous materials, or safety-related violation; (ii) means, methods, procedures, techniques, or sequences of execution or performance of the Work, (iii) failure to secure and pay for permits, fees, approvals, licenses and inspections as required under the Agreement, or any violation of any permit or other approval of a public authority applicable to the Work by the Contractor, its Subcontractors, or any person or entity for whom they are responsible, and (iv) any patent or intellectual property infringement.

ARTICLE 4 ARCHITECT AND CONSTRUCTION MANAGER

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 4.1.2 The Construction Manager is the person or entity retained by the Owner pursuant to Section 2.3.3 and identified as such in the Agreement.

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§ 4.1.3 Duties, responsibilities, and limitations of authority of the Construction Manager and Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Construction Manager, Architect, and Contractor. Consent shall not be unreasonably withheld.

§ 4.2 Administration of the Contract

§ 4.2.1 The Construction Manager and Architect will provide administration of the Contract as described in the Contract Documents and will be the Owner's representatives during construction until the date the Architect issues the final Certificate for Payment. The Construction Manager and Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. On the basis of the site visits, the Architect will keep the Owner and the Construction Manager reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner and Construction Manager known deviations from the Contract Documents and defects and deficiencies observed in the Work.

§ 4.2.3 The Construction Manager shall provide one or more representatives who shall be in attendance at the Project site whenever the Work is being performed. The Construction Manager will determine in general if the Work observed is being performed in accordance with the Contract Documents, will keep the Owner and Architect reasonably informed of the progress of the Work, and will promptly report to the Owner and Architect known deviations from the Contract Documents and the most recent Project schedule, and defects and deficiencies observed in the Work.

§ 4.2.4 The Construction Manager will schedule and coordinate the activities of the Contractor and other Contractors in accordance with the latest approved Project schedule.

§ 4.2.5 The Construction Manager, except to the extent required by Section 4.2.4, and Architect will not have control over, charge of, or responsibility for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents, and neither will be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. Neither the Construction Manager nor the Architect will have control over or charge of, or be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or of any other persons or entities performing portions of the Work.

§ 4.2.6 Communications. The Owner shall communicate with the Contractor and the Construction Manager's consultants through the Construction Manager about matters arising out of or relating to the Contract Documents. The Owner and Construction Manager shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Construction Manager otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with other Contractors shall be through the Construction Manager. Communications by and with the Owner's own forces and Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.7 The Construction Manager and Architect will review and certify all Applications for Payment by the Contractor, in accordance with the provisions of Article 9.

§ 4.2.8 The Architect and Construction Manager have authority to reject Work that does not conform to the Contract Documents, and will notify each other about the rejection. Whenever the Construction Manager considers it necessary or advisable, the Construction Manager will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, upon written authorization of the Owner, whether or not the Work is fabricated, installed or completed. The foregoing authority of the Construction Manager will be subject to the provisions of Sections 4.2.18 through 4.2.20 inclusive, with respect to interpretations and decisions of the Architect. However, neither the Architect's nor the Construction Manager's authority to act under this Section 4.2.8 nor a decision made by either of them in good faith either to exercise or not to exercise such authority shall give rise to a

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duty or responsibility of the Architect or the Construction Manager to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons performing any of the Work.

§ 4.2.9 Utilizing the submittal schedule provided by the Contractor, the Construction Manager shall prepare, and revise as necessary, a Project submittal schedule incorporating information from other Contractors, the Owner, Owner's consultants, Owner's Separate Contractors and vendors, governmental agencies, and participants in the Project under the management of the Construction Manager. The Project submittal schedule and any revisions shall be submitted to the Architect for approval.

§ 4.2.10 The Construction Manager will receive and promptly review for conformance with the submittal requirements of the Contract Documents, all submittals from the Contractor such as Shop Drawings, Product Data, and Samples. Where there are other Contractors, the Construction Manager will also check and coordinate the information contained within each submittal received from the Contractor and other Contractors, and transmit to the Architect those recommended for approval. By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Construction Manager represents to the Owner and Architect that the Construction Manager has reviewed and recommended them for approval. The Construction Manager's actions will be taken in accordance with the Project submittal schedule approved by the Architect or, in the absence of an approved Project submittal schedule, with reasonable promptness while allowing sufficient time to permit adequate review by the Architect.

§ 4.2.11 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Upon the Architect's completed review, the Architect shall transmit its submittal review to the Construction Manager.

§ 4.2.12 Review of the Contractor's submittals by the Construction Manager and Architect is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Construction Manager and Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Construction Manager and Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.13 The Construction Manager will prepare Change Orders and Construction Change Directives.

§ 4.2.14 The Construction Manager and the Architect will take appropriate action on Change Orders or Construction Change Directives in accordance with Article 7, and the Architect will have authority to order minor changes in the Work as provided in Section 7.4. The Architect, in consultation with the Construction Manager, will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.15 Utilizing the documents provided by the Contractor, the Construction Manager will maintain at the site for the Owner one copy of all Contract Documents, approved Shop Drawings, Product Data, Samples, and similar required submittals, in good order and marked currently to record all changes and selections made during construction. These will be available to the Architect and the Contractor, and will be delivered to the Owner upon completion of the Project.

§ 4.2.16 The Construction Manager will assist the Architect in conducting inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion in conjunction with the Architect pursuant to Section 9.8; and receive and forward to the Owner written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10. The Construction Manager will forward to the Architect a final Application and Certificate for Payment or final Project Application and Project Certificate for Payment upon the Contractor's compliance with the requirements of the Contract Documents.

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§ 4.2.17 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Construction Manager of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.18 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of the Construction Manager, Owner, or Contractor through the Construction Manager. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.19 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 Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions so rendered in good faith.

§ 4.2.20 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.21 The Construction Manager will receive and review requests for information from the Contractor, and forward each request for information to the Architect, with the Construction Manager's recommendation. The Architect will review and respond in writing, through the Construction Manager, to requests for information about the Contract Documents. The Construction Manager's recommendation and the Architect's response to each request will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include other Contractors or Separate Contractors or the subcontractors of other Contractors or Separate Contractors.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 No later than 14 days subsequent to the full execution of this Agreement, the Contractor, shall notify the Construction Manager, for review by the Owner, Construction Manager and Architect, of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Construction Manager may notify the Contractor whether the Owner, the Construction Manager or the Architect (1) has reasonable objection to any such proposed person or entity or, (2) requires additional time for review. Failure of the Construction Manager to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner, Construction Manager or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner, Construction Manager or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner, Construction Manager or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's

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Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.3.1 No approval or disapproval by the Architect, Construction Manager or Owner of any particular Subcontractor shall relieve Contractor of its responsibility for performance of the Work. Furthermore, Contractor is not relieved of its responsibility for Contractor's selection of particular processes or materials for the performance of the Work by any Owner, Construction Manager or Architect approval of a particular Subcontractor.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner, Construction Manager or Architect makes reasonable objection to such substitution.

§ 5.2.5 The Contractor shall also require each Subcontractor to submit a list of any proposed sub-subcontractors and suppliers for Construction Manager's review and approval pursuant to the same process detailed in section 5.2.1 above, and Contractor shall not permit Subcontractor to delegate, or further subcontract to others the performance of any of its obligations or work required or contemplated by their Subcontract without prior written consent of the Construction Manager, which shall not be unreasonably withheld.

§ 5.2.6 Promptly upon execution of a subcontract, Contractor shall provide the Owner true, accurate and complete copies of all subcontracts and material supply contracts.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work, that the Contractor, by these Contract Documents, assumes toward the Owner, Construction Manager and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner, Construction Manager and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract (but only those arising post assignment).

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor Contractor or other entity. If the Owner assigns the subcontract to a successor Contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor Contractor's obligations under the subcontract.

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§ 5.4.4 Each subcontract shall specifically provide that the Owner shall only be responsible to the Subcontractor for those obligations of the Contractor that accrue subsequent to the Owner's exercise of any rights under this conditional assignment.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction with Own Forces and to Award Other Contracts

§ 6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

§ 6.1.2 When the Owner performs construction or operations with the Owner's own forces or Separate Contractors, the Contractor shall provide for coordination of such forces and Separate Contractors with the Work of the Contractor, who shall cooperate with them.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner's own forces, Separate Contractors, Construction Manager and other Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner's own forces, Separate Contractors or other Contractors, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Construction Manager and Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor or other Contractors that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Construction Manager and the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's or other Contractors' completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractors or other Contractors that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs, including costs that are payable to a Separate Contractors or to other Contractors, because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of delays, improperly timed activities, damage to the Work or defective construction by the Owner's own forces, Separate Contractors, or other Contractors but, as to Separate Contractors or other Contractors, only to the extent Owner can recover such damages from the responsible Separate Contractors or other Contractors (such recovery being a condition precedent to the Owner's obligation to pay the Contractor for such costs).

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction, or to property of the Owner, Separate Contractors, or other Contractors as provided in Section 10.2.5.

§ 6.2.5 The Owner, Separate Contractors, and other Contractors shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, other Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Construction Manager, with notice to the Architect, will allocate the cost among those responsible.

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ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Construction Manager, Architect and Contractor. A Construction Change Directive requires agreement by the Owner, Construction Manager and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work. Except as permitted in Paragraph 7.3, a change in the Contract Sum or the Contract Time shall be accomplished only by Change Order. Accordingly, no course of conduct or dealings between the parties, nor express or implied, acceptance of alterations or additions to the Work, and no claim that Owner has been unjustly enriched by any alteration of or addition to the Work, whether or not there is, in fact, any unjust enrichment to the Work, shall be the basis of any claim to an increase in any amounts due under the Contract Documents or a change in any time period provided for in the Contract Documents.

§ 7.2 Change Orders

§ 7.2.1 A Change Order is a written instrument prepared by the Construction Manager and signed by the Owner, Construction Manager, Architect, and Contractor, stating their agreement upon all of the following:

.1 The change in the Work;
.2 The amount of the adjustment, if any, in the Contract Sum; and
.3 The extent of the adjustment, if any, in the Contract Time.

§ 7.2.2 All Change Orders shall be accompanied by detailed price breakdowns in the format as directed by the Construction Manager. Owner reserves the right to accept or reject Contractor's price. No charges by Contractor for extra Work or changes in the Work shall be valid unless duly authorized pursuant to the procedures described herein. Written authority from the Construction Manager and Owner to perform extra Work or changes in the Work must be in the possession of the Contractor before such Work commences if Contractor seeks payment on account of such Work. Contractor agrees that prices for changes in the Work and for extra Work will not include charges involving penalties or damages for assumed delays in the Work, charges for estimating, cancellation charges on prior rejected work or similar amounts which do not relate directly to costs of labor and material and equipment necessary for the Work involved in the Change Order. Agreement on any Change Order shall constitute a final settlement of all matters relating to the change in the Work that is the subject of the Change Order, including, but not limited to, all direct and indirect costs associated with such change and any and all adjustments to the Contract Sum and the construction schedule. Applications for Payment as if such Work were originally part of the Contract Documents.

7.2.3 The allowance for overhead and profit combined, included in the total cost to the Owner, shall be based on the following Clauses:

7.2.3.1 For the Contractor, for any Work performed by the Contractor's own forces, five (5%) percent of the cost.

7.2.3.2 For the Contractor, for Work performed by the Contractor's Subcontractor, five (5%) percent of the amount due to the Subcontractor.

7.2.3.3 For each Subcontractor or Sub-subcontractor involved, for any Work performed by that Subcontractor's own forces, five (5%) percent of the cost.

7.2.3.4 Overhead and Profit shall include the following;
a. Home office expenses
b. Field office expenses
c. Supervision

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d. Project management and estimation
e. Small tools and equipment
f. Labor & Material Payment and Performance Bond
g. Insurance
h. Shipping and delivery
i. Taxes.

7.2.4 In order to facilitate checking or quotations for credits, all proposals, except those so minor that their propriety can be seen by inspection, shall be accompanied by a complete itemization of costs including labor, materials and subcontracts. Labor and materials shall be itemized in the manner prescribed above. Where major cost items are subcontracts, they shall be itemized also. In no case will a change involving over one-thousand ($1,000.00) dollars be approved without such itemization.

7.2.5 When a change in the Work includes categories of work both added to and deleted from the Contract, the total quantities of added work and of deleted work shall be determined separately for each category and the appropriate unit price or net cost of the Work shall be applied to the difference between the two total quantities.

7.2.6 Unit Prices shall be inclusive of all costs (including overhead and profit) and shall be applied to units of measures as set forth in the form of proposal for each category of the Work.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Construction Manager and signed by the Owner, Construction Manager and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

.1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;

.2 Unit prices stated in the Contract Documents or subsequently agreed upon;

.3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or

.4 As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Construction Manager shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Construction Manager may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

.1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Construction Manager and Architect;

.2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;

.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;

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.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and

.5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Construction Manager of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Construction Manager and Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Construction Manager and Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Construction Manager and Architect determine to be reasonably justified. The interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Construction Manager and Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Construction Manager shall prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Construction Manager and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Construction Manager that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

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§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner, Architect, Construction Manager, or an employee of any of them, or of the Owner's own forces, Separate Contractors, or other Contractors; (2) by changes ordered in the Work; (3) by industry-wide labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts and the Architect, based on the recommendation of the Construction Manager, determines justify delay, then the Contract Time shall be extended to the extent such delay will prevent the Contractor from achieving Substantial Completion within the Contract Time and if the performance of the Work is not was not, or would not have been delayed by any other cause for which the Contractor is not entitled to an extension in the Contract Time under the Contract Documents. The Contractor further acknowledges and agrees that adjustment in the Contract Time will be permitted for a delay only to the extent such delay (i) is not caused, or could not have been anticipated, by the Contractor, (ii) could not be limited or avoided by the Contractor's timely notice to the Owner of the delay or reasonable likelihood that a delay will occur, and (iii) is of a duration of not less than one (1) day.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 Notwithstanding anything to the contrary in the Contract Documents, an extension in the Contract Time, to the extent permitted under Subparagraph 8.3.1 shall be the sole remedy of the Contractor for any (i) delay in the commencement, prosecution, or completion of the Work; (ii) hindrance or obstruction in the performance of the Work, (iii) loss of productivity or (iv) other similar claims (collectively referred to in this Subparagraph 8.3.3 as "Delays") whether or not such Delays are foreseeable, unless a Delay is caused by acts of the Owner constituting active interference with the Contractor's performance of the Work, and only to the extent such acts continue after the Contractor furnishes the Owner with notice of such interference. In no event shall the Contractor be entitled to any compensation or recovery of any damages, in connection with any Delay, including, without limitation, consequential damages, lost opportunity costs, impact damages, or other similar remuneration. The Owner's exercise of any of its rights or remedies under the Contract Documents (including, without limitation, ordering changes in the Work, or directing suspension, rescheduling or correction of the Work), regardless of the extent or frequency of the Owner's exercise of such rights or remedies, shall not be construed as active interference with the Contractor's performance of the Work.

§ 8.3.4 If the Contractor submits a progress report indicating or otherwise expresses an intention to achieve, completion of the Work prior to any completion date required by the Contract Documents, or expiration of the Contract Time, no liability of the Owner to the Contractor for any failure of the Contractor to so complete the Work shall be created or implied.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

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§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Construction Manager, earlier of fourteen (14) days of the execution of this Agreement or ten (10) days before the before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Construction Manager and the Architect. This schedule, unless objected to by the Construction Manager or Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. The Construction Manager shall forward to the Architect the Contractor's schedule of values. Any changes to the schedule of values shall be submitted to the Construction Manager and supported by such data to substantiate its accuracy as the Construction Manager and the Architect may require, and unless objected to by the Construction Manager or the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.3 Applications for Payment

§ 9.3.1 At least fifteen days before the date established for each progress payment, unless otherwise required by the Agreement, the Contractor shall submit to the Construction Manager an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner, Construction Manager or Architect require, such as copies of requisitions, and releases of waivers of lien from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Construction Manager and Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.1.3 Each Application for Payment shall be accompanied by the following, all in form and substance satisfactory to the Construction Manager; (i) a current Contractor's lien waiver and duly executed and acknowledged sworn statement showing all Subcontractors and material suppliers with whom the Contractor has entered into subcontracts, the amount of each such subcontract, the amount requested for any Subcontractor and material supplier in the requested progress payment, and the amount to be paid to the Contractor from such progress payment, together with similar sworn statements from all such Subcontractors and material suppliers; (ii) duly executed waivers of mechanics' and material suppliers' liens from all Subcontractors and, when appropriate, from material suppliers and lower tier Subcontractors establishing payment or satisfaction of payment of all amounts requested by the Contractor on behalf of such entities or persons in any previous Application for Payment; and (iii) all information and materials required to comply with the requirements of the Contract Documents or reasonably requested by the Construction Manager. A sample Lien Waiver and Release Form is attached hereto as an Exhibit to this Contract. Owner reserves the right to modify the form of this Lien Waiver and Release.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials and equipment relating to the Work.

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§ 9.4 Certificates for Payment

§ 9.4.1 Where there is only one Contractor, the Construction Manager will, within seven days after the Construction Manager's receipt of the Contractor's Application for Payment, review the Application, certify the amount the Construction Manager determines is due the Contractor, and forward the Contractor's Application and Certificate for Payment to the Architect. Within seven days after the Architect receives the Contractor's Application for Payment from the Construction Manager, the Architect will either (1) issue to the Owner a Certificate for Payment, in the full amount of the Application for Payment, with a copy to the Construction Manager; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Construction Manager and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Construction Manager and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1. The Construction Manager will promptly forward to the Contractor the Architect's notice of withholding certification.

§ 9.4.2 Where there is more than one Contractor performing portions of the Project, the Construction Manager will, within seven days after the Construction Manager receives all of the Contractors' Applications for Payment: (1) review the Applications and certify the amount the Construction Manager determines is due each of the Contractors; (2) prepare a Summary of Contractors' Applications for Payment by combining information from each Contractor's application with information from similar applications for progress payments from the other Contractors; (3) prepare a Project Application and Certificate for Payment; (4) certify the amount the Construction Manager determines is due all Contractors; and (5) forward the Summary of Contractors' Applications for Payment and Project Application and Certificate for Payment to the Architect.

§ 9.4.2.1 Within seven days after the Architect receives the Project Application and Project Certificate for Payment and the Summary of Contractors' Applications for Payment from the Construction Manager, the Architect will either (1) issue to the Owner a Project Certificate for Payment, with a copy to the Construction Manager; or (2) issue to the Owner a Project Certificate for Payment for such amount as the Architect determines is properly due, and notify the Construction Manager and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Project Application for Payment, and notify the Construction Manager and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1. The Construction Manager will promptly forward the Architect's notice of withholding certification to the Contractors.

§ 9.4.3 The Construction Manager's certification of an Application for Payment or, in the case of more than one Contractor, a Project Application and Certificate for Payment, shall be based upon the Construction Manager's evaluation of the Work and the data in the Application or Applications for Payment. The Construction Manager's certification will constitute a representation that, to the best of the Construction Manager's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is, or Contractors are, entitled to payment in the amount certified.

§ 9.4.4 The Architect's issuance of a Certificate for Payment or, in the case of more than one Contractor, Project Application and Certificate for Payment, shall be based upon the Architect's evaluation of the Work, the recommendation of the Construction Manager, and data in the Application for Payment or Project Application for Payment. The Architect's certification will constitute a representation that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is, or Contractors are, entitled to payment in the amount certified.

§ 9.4.5 The representations made pursuant to Sections 9.4.3 and 9.4.4 are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Construction Manager or Architect.

§ 9.4.6 The issuance of a Certificate for Payment or a Project Certificate for Payment will not be a representation that the Construction Manager or Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the

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Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Construction Manager or Architect may withhold a Certificate for Payment or Project Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Construction Manager's or Architect's opinion the representations to the Owner required by Section 9.4.3 and 9.4.4 cannot be made. If the Construction Manager or Architect is unable to certify payment in the amount of the Application, the Construction Manager will notify the Contractor and Owner as provided in Section 9.4.1 and 9.4.2. If the Contractor, Construction Manager and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment or a Project Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Construction Manager or Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment or Project Certificate for Payment previously issued, to such extent as may be necessary in the Construction Manager's or Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from the acts and omissions described in Section 3.3.2 because of

- **.1** defective Work not remedied;
- **.2** third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- **.3** failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;
- **.4** reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- **.5** damage to the Owner or a Separate Contractor or other Contractor;
- **.6** reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- **.7** repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 If the Architect or Construction Manager withholds certification for payment under Section 9.5.1, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Construction Manager, and both will reflect such payment on the next Certificate for Payment. The Contractor and such Subcontractor shall be responsible for the allocation and disbursement of funds included as part of any such joint payment. In no event shall any joint payment be construed to create any (i) contract between the Owner and a Subcontractor of any tier, (ii) obligations from the Owner to such Subcontractor or (iii) rights in such Subcontractor against the Owner.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment or Project Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Construction Manager and Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Construction Manager will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Owner, Construction Manager and Architect on account of portions of the Work done by such Subcontractor.

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§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner, Construction Manager nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 9.7 Failure of Payment

If the Construction Manager and Architect do not issue a Certificate for Payment or a Project Certificate for Payment, through no fault of the Contractor, within fourteen days after the Construction Manager's receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Construction Manager and Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner, Construction Manager and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so the Owner can occupy or utilize the Work for its intended use provided, however, that as a condition precedent to Substantial Completion, the Owner has received all certificates of occupancy and any other permits, approvals, licenses, and other documents from any government authority having jurisdiction thereof necessary for the beneficial occupancy of the Project.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall notify the Construction Manager, and the Contractor and Construction Manager shall jointly prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the list, the Architect, assisted by the Construction Manager, will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended

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use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect, assisted by the Construction Manager, to determine Substantial Completion.

§ 9.8.4 When the Architect, assisted by the Construction Manager, determines that the Work of all of the Contractors, or designated portion thereof, is substantially complete, the Construction Manager will prepare, and the Construction Manager and Architect shall execute, a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor and Construction Manager shall jointly prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect after consultation with the Construction Manager.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Construction Manager, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon completion of the Work, the Contractor shall forward to the Construction Manager a notice that the Work is ready for final inspection and acceptance, and shall also forward to the Construction Manager a final Contractor's Application for Payment. Upon receipt, the Construction Manager shall perform an inspection to confirm the completion of Work of the Contractor. The Construction Manager shall make recommendations to the Architect when the Work of all of the Contractors is ready for final inspection, and shall then forward the Contractors' notices and Application for Payment or Project Application for Payment, to the Architect, who will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Construction Manager and Architect will promptly issue a final Certificate for Payment or Project Certificate for Payment stating that to the best of their knowledge, information and belief, and on the basis of their on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Construction Manager's and Architect's final Certificate for Payment or Project Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled. All warranties and guarantees required under or pursuant to the Contract Documents shall be assembled and delivered by the Contractor to the Construction Manager as part of the final Application for Payment. The final Certificate for Payment will not be issued by the Architect until all warranties and guarantees have been received and accepted by the Owner.

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§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect through the Construction Manager (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Construction Manager and Architect so confirm, the Owner shall, upon application by the Contractor and certification by the Construction Manager and Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect through the Construction Manager prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- **.1** liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- **.2** failure of the Work to comply with the requirements of the Contract Documents;
- **.3** terms of special warranties required by the Contract Documents; or
- **.4** audits performed by the Owner, if permitted by the Contract Documents, after final payment.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract. The Contractor shall submit the Contractor's safety program to the Construction Manager for review and coordination with the safety programs of other Contractors. The Construction Manager's responsibilities for review and coordination of safety programs shall not extend to direct control over or charge of the acts or omissions of the Contractors, Subcontractors, agents or employees of the Contractors or Subcontractors, or any other persons performing portions of the Work and not directly employed by the Construction Manager.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

- **.1** employees on the Work and other persons who may be affected thereby;
- **.2** the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor;
- **.3** other property 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; and

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.4 construction or operations by the Owner, Separate Contractors, or other Contractors.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards. The Contractor shall also be responsible at the Contractor's sole cost and expenses, for all measures necessary to protect any property adjacent to the Project and improvements therein. Any damages to such property or improvements shall be promptly repaired by the Contractor.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel. When use or storage of explosives or other hazardous materials or equipment or unusual construction methods are necessary, the Contractor shall give the Owner and the Construction Manager reasonable advance notice.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2, 10.2.1.3 and 10.2.1.4 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2, 10.2.1.3 and 10.2.1.4. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner, Construction Manager or Architect or anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner, Construction Manager and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.2.9 When all or a portion of the Work is suspended for any reason, the Contractor shall securely fasten down all coverings and protect the work, as necessary, from injury by any cause.

§ 10.2.10 The Contractor shall promptly report in writing to the Construction Manager all accidents arising out of or in connection with the Work that cause death, personal injury or property damage, giving full details and statements of any witnesses. In addition, if death, serious personal injuries or serious damages are caused, the accident shall be reported immediately by telephone or messenger to the Construction Manager.

§ 10.3 Hazardous Materials

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing

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the condition, immediately stop Work in the affected area and notify the Owner, Construction Manager and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor, Construction Manager and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor, the Construction Manager and the Architect will promptly reply to the Owner in writing stating whether or not any of them has reasonable objection to the persons or entities proposed by the Owner. If the Contractor, Construction Manager or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor, the Construction Manager and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Construction Manager, Architect, their consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Construction Manager and Construction Manager's consultants, the Architect and Architect's consultants, and any other entities set forth in the Contract Documents, shall be named as additional insureds under the Contractor's commercial general liability, automobile, and umbrella policies or as otherwise described in the Contract Documents.

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§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.4 Certificates of insurance acceptable to the Owner shall be submitted to the Construction Manager for transmittal to the Owner with a copy to the Architect within fourteen (14) days of the date of the execution of the Contract but no later than ten (10) days prior to commencement of the Work and thereafter upon renewal or replacement of each required policy of insurance.

§ 11.1.5 Notice of Cancellation or Expiration of Contractor's Required Insurance. The insurance policies required by this Section 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. In addition, within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice directly to the Owner, and separately to the Construction Manager, of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform both the Contractor and the Construction Manager, separately and in writing, prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice directly to the Contractor, and separately to the Construction Manager, of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

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§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Construction Manager and Construction Manager's consultants; (3) the Architect and Architect's consultants; (4) other Contractors and any of their subcontractors, sub-subcontractors, agents, and employees; and (5) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Construction Manager, Construction Manager's consultants, Architect, Architect's consultants, other Contractors, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this Section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor, Architect, and Construction Manager for loss of use of the Owner's property, due to fire or other hazards however caused.

§ 11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Construction Manager, Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Construction Manager, Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Construction Manager's or Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by either, be uncovered for their examination and be replaced at the Contractor's expense without change in the Contract Time.

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§ 12.1.2 If a portion of the Work has been covered that the Construction Manager or Architect has not specifically requested to examine prior to its being covered, the Construction Manager or Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Construction Manager or Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion, and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Construction Manager's and Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof, or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner, Construction Manager or Architect, the Owner may correct it in accordance with Section 2.5.

§ 12.2.2.2 Upon completion of any Work under or pursuant to this Paragraph 12.2, the one (1) year correction period in connection with the Work requiring correction shall be renewed and recommence for the corrective work performed as well as any Work effected by the corrective work. The obligations under Paragraph 12.2 shall cover any repairs and replacement to any part of the Work or other property that is damaged by the defective Work

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner, Separate Contractors, or other Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

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ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender or other entity providing construction financing for the Project or credit enhancement, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Construction Manager, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Construction Manager and Architect timely notice of when and where tests and inspections are to be made so that the Construction Manager and Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Construction Manager, Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Construction Manager and Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Construction Manager and Architect of when and where tests and inspections are to be made so that the Construction Manager and Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Construction Manager's and Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 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 Construction Manager for transmittal to the Architect.

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§ 13.4.5 If the Construction Manager or Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Construction Manager or Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Right-To-Know Law

§ 13.5.1 General. The Owner is a local agency subject to the Pennsylvania Right-to-Know Law, 65 P.S. §§ 67.101 to 67.3104 (the "RTKL"). Records in the possession of the Owner are presumed to be public records under Section 305 of the RTKL and are subject to access unless exempt. The Contractor acknowledges that records it creates, submits, or maintains in connection with the Project may be subject to public access under the RTKL, whether those records are in the possession of the Owner or of the Contractor, and agrees to the following.

§13.5.2 Records in the Owner's possession. All bids, applications for payment, schedules of values, change order documentation, correspondence, submittals, certified payrolls, and other records that the Contractor provides to the Owner become records of the Owner and may be public records subject to access under the RTKL. The Contractor has no expectation that any record provided to the Owner will be withheld from public access except to the extent an exemption under the RTKL actually applies, as determined by the Owner's Open Records Officer or by the Office of Open Records or a court on appeal. Disclosure by the Owner of any record that the RTKL requires or permits to be disclosed, or that the Office of Open Records or a court directs to be disclosed, shall not constitute a breach of this Contract or a violation of any duty of confidentiality, and the Owner shall have no liability to the Contractor arising from such disclosure.

§13.5.3 Designation of confidential or proprietary records. If the Contractor contends that any record it provides to the Owner constitutes or reveals a trade secret or confidential proprietary information exempt under 65 P.S. § 67.708(b)(11), as those terms are defined in 65 P.S. § 67.102, the Contractor shall identify that record, with particularity, in a conspicuous written designation delivered to the Owner at the time the record is submitted. A blanket or boilerplate legend, a designation applied to an entire submission, or a designation asserted after submission shall not be honored. A designation under this Section does not bind the Owner, does not determine whether an exemption applies, and does not relieve the Contractor of the burden described in Section 13.5.4.

§13.5.4 Third-party notice and defense of designated records. If the Owner receives a request under the RTKL that implicates a record the Contractor has designated under Section 13.5.3, the Owner may, but is not required to, notify the Contractor under Section 707(b) of the RTKL. Within five (5) business days after such notice, the Contractor shall provide the Owner a written statement, with supporting evidence, establishing that the record is exempt; the Contractor bears the burden of proving the exemption by a preponderance of the evidence. If the Contractor wishes to prevent disclosure, the Contractor shall, at its sole cost and expense, take all steps necessary to do so, which may include participating as a person with a direct interest in any appeal before the Office of Open Records under Section 1101(c) of the RTKL and seeking any available stay, or seeking a protective order from a court of competent jurisdiction. If the Contractor fails to respond within the time provided, fails to carry its burden, or fails to obtain an order preventing disclosure, the Owner may release the record without liability to the Contractor. Nothing in this Section obligates the Owner to assert any exemption, to withhold any record, or to appeal any determination.

§13.5.5 Records in the Contractor's possession (Section 506(d)). The Contractor acknowledges that a record in the possession of the Contractor, a subcontractor, or a supplier that directly relates to a governmental function performed on behalf of the Owner may be a public record of the Owner under Section 506(d) of the RTKL, even though the Owner does not physically possess it. So that the Owner may satisfy its obligations under the RTKL, the Contractor shall, within three (3) business days after a written request from the Owner, provide to the Owner any record in the possession of the Contractor, a subcontractor, or a supplier that relates to the Project, in a form and medium reasonably specified by the Owner. This access obligation is a term of this Contract and applies regardless of whether any such record is ultimately determined to be a public record under Section 506(d); it does not, however, require the Contractor to provide any record of the Contractor that does not relate to the Project, consistent with Section 506(d)(2). The Contractor shall include a provision imposing this obligation in every subcontract and material supply contract for the Project.

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§13.5.6 Recordkeeping and retention. The Contractor shall maintain complete and organized Project records and shall retain them in accordance with the retention schedules applicable to municipal records, including the schedules issued for Pennsylvania local governments. The Contractor shall not destroy or dispose of any Project record during the term of this Contract or during any applicable retention period without the Owner's prior written consent. This Section survives final payment and the completion or termination of the Contract.

§13.5.7 Costs and indemnification. The Contractor shall bear its own costs of designating, substantiating, and defending the confidentiality of any record. To the fullest extent permitted by law, the Contractor shall indemnify, defend, and hold harmless the Owner from and against any claim, loss, penalty, sanction, cost, or expense, including reasonable attorneys' fees and any fees or civil penalties assessed under the RTKL, arising out of (i) the Contractor's designation or assertion of confidentiality, (ii) the Contractor's failure or delay in providing a record required under Section 13.5.5, or (iii) the Contractor's failure to create or maintain a record required by the Contract Documents or by law. The Owner retains sole discretion over the disclosure of records and the assertion of exemptions under the RTKL.

§13.5.8 Survival. The obligations of this Article survive final payment and the completion or termination of the Contract.

{Intentionally omitted}

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

- **.1** Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- **.2** An act of government, such as a declaration of national emergency, that requires all Work to be stopped;
- **.3** Because the Construction Manager has not certified or the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- **.4** The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon fifteen (15) days' notice to the Owner, Construction Manager and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination. In the event of such a notice of termination, Contractor agrees that Owner can assign this Contract to its Lender, if any. In the event that the Owner does not so assign the Contract, the Contractor can recover as its sole remedy payment for Work properly performed in connection with the terminated portion of the Work prior to the effective date of termination and for items properly and timely fabricated off the Project site, delivered and stored in accordance with the Owner's instructions. The Contractor hereby waives and forfeits all other claims for payment and damages, including, without limitation, anticipated profits. The Owner shall be credited for (i) payments previously made to the Contractor for the termination portion of the Work, (ii) claims that the Owner has against the Contractor for the terminated portion of the Work, (iii) claims that the Owner has against the Contractor under the Contract, and (iv) the value of the materials, supplies, equipment, or other items that are to be disposed of by the Contractor that are part of the Contract Sum.

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§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees, or any other persons performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner, Construction Manager and Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- **.1** repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- **.2** fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;
- **.3** repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- **.4** otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- **.1** Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- **.2** Accept assignment of subcontracts pursuant to Section 5.4; and
- **.3** Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Construction Manager's and Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall, upon application, be certified by the Initial Decision Maker after consultation with the Construction Manager, and this obligation for payment shall survive termination of the Contract.

§ 14.2.5 In the event that the Owner terminates the Contract for cause, and such cause is determined to be valid, in addition to and without prejudice all other rights, remedies and relief which the Owner may obtain under this Agreement, and pursuant to law, the Owner shall be entitled to payment by Contractor of all reasonable professional fees, including attorney fees, architectural fees, engineering fees and consulting fees (together with reasonable expenses and disbursements incurred in connection therewith), which the Owner may incur in connection with any legal proceedings or actions (including professional fees rendered in anticipation of such proceedings or action). This provision shall create no right to the Contractor or to any other person or entity for payment of such costs or expenses.

§ 14.2.6 If it is determined by a court of competent jurisdiction, the cause for termination under Article 14.2 did not exist, then such termination shall be treated as a termination for convenience under Article 14.4.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and the Contract Time shall be adjusted for increases in the cost and time caused by suspension under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent:

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.1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or

.2 that an equitable adjustment is made or denied under another provision of this Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

.1 cease operations as directed by the Owner in the notice;

.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 Upon such termination, the Contractor shall recover as its sole remedy payment for Work properly performed in connection with the terminated portion of the Work prior to the effective date of termination and for items properly and timely fabricated off the Project site, delivered and stored in accordance with the Owner's instructions. The Contractor hereby waives and forfeits all other claims for payment and damages, including without limitation, anticipated profits. The Owner shall be credited for (i) payments previously made to the Contractor for the terminated portion of the Work (ii) claims that the Owner has against the Contractor under the Contract and (iii) the value of the materials, supplies, equipment, or other items that are to be disposed of by the Contractor that are part of the Contract Sum.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition. A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Construction Manager and Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later provided, however, that the Contractor shall use its best efforts to furnish the Construction Manager, as expeditiously as possible, with notice of any Claim once such claim is recognized and shall cooperate with the Construction Manager, the Architect and the Owner in an effort to mitigate the alleged or potential damages, delay or other adverse consequences arising out of the condition that is the cause of such a Claim.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

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§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost. If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay only one Claim is necessary.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated and had an adverse effect on the scheduled construction.

§ 15.1.7 Waiver of Claims for Consequential Damages. The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial

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Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties, the Construction Manager, and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time.{Intentionally omitted}

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution. The decision to mediate, however, shall be at the Owner's sole discretion. Once the Owner decides not to mediate the dispute and rejects mediation in writing, mediation will no longer be a condition precedent to any action pursuant to Section15.4 below.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.3.5 In the event of mediation, the parties agree that they will attempt to agree to the identity of the mediator. If the parties are unable to agree within fifteen (15) business days from the date of the filing of a Demand for Mediation, the parties shall permit the selection process and the mediation to be administered by the American Arbitration Association.

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§ 15.4 Arbitration or Litigation

§ 15.4.1 The Owner may elect to subject Claims, disputes or other matters in question between the parties to this Agreement arising out of this Agreement to resolution by arbitration or litigation. This election can be made at any time by the Owner. The Contractor hereby waives the right to elect the method of dispute resolution and agrees that this waiver is supported by sufficient and appropriate consideration. Unless the parties mutually agree otherwise, in the event of arbitration such proceeding shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. Any arbitration or court proceeding shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. The arbitrator(s) or court shall apply the law of the Commonwealth of Pennsylvania without consideration of choice of law analysis.

{Intentionally omitted}

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 IN THE EVENT OF LITIGATION, THE PARTIES MUTUALLY AGREE TO WAIVE THEIR RIGHT TO A JURY.

§ 15.4.5 The prevailing party in any dispute resolution process shall be entitled to recover all costs incurred in any dispute resolution including but not limited to attorney's fees, expert fees, and court and arbitration costs.

§ 15.4.6 Consolidation or Joinder

§ 15.4.6.1 Notwithstanding anything to the contrary contained in this Agreement, Contractor waives all objections to joinder of the Contractor as a party to any mediation, arbitration, or litigation related to this Project in which the Owner is joined or is otherwise positioned as a party and in which the Contractor's conduct or his performance of professional services is in any way relevant to the subject of a dispute. {Intentionally omitted} {Intentionally omitted} .

DRAFT

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SECTION 00 7343 PREVAILING WAGE RATE REQUIREMENTS

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Prevailing Wage Act.
2. Pennsylvania Prevailing Wage Determination Schedule follows as Section 007346.13.
3. Pennsylvania Department of Labor and Industry "Weekly Payroll Certification for Public Works Projects" Form LLC-25 follows as Section 07346.16.

1.3 Prevailing Wage Rates

A. The provisions of the Pennsylvania Prevailing Wage Act, Act. No. 442, approved August 15, 1961 (P.L. 987) as amended are hereby incorporated herein and the Contractor and all Subcontractors shall comply with the requirements of the applicable portions thereof and the Regulations issued in connection therewith.

B. Pursuant to the requirements of the above Act, the Prevailing Minimum Wage Predetermination is attached hereto and hereby made part of the Contract Documents.

C. The general prevailing minimum wage rates including contributions for employee benefits as shall have been determined by the Secretary of Labor and Industry (hereinafter "Secretary"), which must be paid to the workmen, employed in the performance of the Contract.

D. All Prime Contractors shall submit (3) copies of weekly certification forms with their payment requisitions. The form to be used is the latest edition of the Department of Labor and Industry form "Contractor's or Subcontractor's Weekly Payroll Certification for Public Works Projects" (forms LIPW-123 and LIPW-124).

E. There shall be paid each laborer or mechanic of the Contractor or Subcontractor engaged in the Work on this Project, in the trade or occupation listed on the attached Prevailing Minimum Wage Predetermination, not less than the hourly wage rate set opposite the same, regardless of any contractual relationship which may be alleged to exist between the Contractor, or any Subcontractor, and such laborers and mechanics.

F. These Contract provisions shall apply to all work performed on the Contract by the Contractor and to all work performed on the Contract by all subcontractors.

G. The Contractor shall insert in each of his subcontracts all of the stipulations contained in these required provisions.

H. No workmen may be employed on the Work except in accordance with the classifications set forth in the decision of the Secretary. In the event that additional or different classifications are necessary, the procedure set forth in the Regulations shall be followed.

I. All workmen employed or working on the Work shall be paid unconditionally, regardless of whether any contractual relationship exists or the contractual relationship which may be alleged to exist between any contractor, subcontractor, and workmen, not less than once a week without deductions or rebate, on any account, either directly or indirectly, except authorized deductions, the full amount due at the time of payment, computed at the rates applicable to the time worked in the appropriate classification. Nothing in this Contract, the Act or the Regulations shall prohibit the payment of more than the general prevailing minimum wage rates as determined by the Secretary to the workmen on the Work.

J. Each Prime Contractor or Subcontractor shall post the general prevailing minimum wage rates for each craft and classification involved, as determined by the Secretary of the Department of Labor and Industry, including the effective date of any changes thereof, in prominent and easily accessible places at the site of the work, or at such place or places as are used by them to pay the workmen their wages. The posted notice of wage rates must contain the following information:

1. Name of project.
2. Name of public body of which it is constructed.
3. The crafts and classifications of workmen listed in the Secretary's general prevailing minimum wage rate determination for the particular project.
4. The general prevailing minimum wage rates determined for each craft and classification and the effective date of any changes.
5. A statement advising workmen that if they have been paid less than the general prevailing minimum wage rate for their job classification or that the Contractor and/or subcontractor are not complying with the Act or the Regulations in any manner whatsoever, they may file a protest with the Secretary within three (3) months of the date of the occurrence, objecting to the payment to the Contractor to the extent of the amount or amounts due or to become due to them as wages for work performed on the Project. Any workmen paid less than the rate specified in the Contract shall have a civil right of action for the difference between the wage paid and wages stipulated in the Contract, which right of action must be exercised within six (6) months from the occurrence of the event creating such right.

K. The Contractor and all subcontractors shall keep an accurate record **showing the name, craft and/or classification, number of hours worked per day, and the actual hourly rate of wage paid (including employee benefits) to each workman employed by him in connection with the Work and such record must include any deductions from each workman.** The record shall be preserved for two (2) years from the date of payment and shall open at all reasonable hours to the inspection of the Owner and to the Secretary or his duly authorized representative.

1. Apprentices shall be limited to such numbers as shall be in accordance with a bona fide apprenticeship program registered with and approved by the Pennsylvania Apprenticeship and Training Council and only apprentices whose training and employment are in full compliance with the provisions of the Apprenticeship and Training Act approved July 14, 1961 (Act No. 304) and the Rules and Regulation issued pursuant thereto shall be employed on the Work. Any workmen using the tools of a craft that does not qualify as an apprentice within the provisions of this submission shall be paid the rate predetermined for journeyman in that particular craft and/or classification.

L. Wages shall be paid without any deductions except authorized deductions. Employers not party to a contract requiring contributions for employee benefits which the Secretary has determined to be included in the general prevailing minimum wage rate shall pay the monetary equivalent thereof directly to the workman.

M. Payment of compensation to workmen for work performed on public work on a lump sum basis, or apiece work system, or a price certain for the completion of a certain amount of work, or the production of a certain result shall be deemed a violation of the Act and the Regulations, regardless of the average hourly earnings resulting therefrom.

N. Each Contractor and each subcontractor shall file a statement each week and a final statement at the conclusion of the Work on the Contract with Owner, under oath, and in form satisfactory to the Secretary, certifying that all workmen have been paid wages in strict conformity with the provisions of the Contract as prescribed by the Regulations, or if any wages remain unpaid, to the amount of wages due and owing to each workman respectively.

O. The provision of the Act and the Regulations are incorporated by reference in the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

A. Prevailing wage certification forms are to be produced weekly and are to be submitted monthly. Prevailing wage certificates are to be sent to Architect and CM with a pencil copy of the Application for Payment. No Applications for Payment will be processed without the proper prevailing wage certificates. Contractor may be requested to submit the prevailing wage certification forms in any of the following manners:

1. If hard paper copies are submitted, Contractor shall submit two (2) copies of each prevailing wage certification form.
2. If digital copies are submitted, Contractor shall submit to Architect and CM in PDF form.
3. Redacted certified payroll:

    a. Prevailing wage certification forms submitted to the Owner may not be redacted by law; however, if there is a Project Right-to-Know request, the Contractor will be required to submit redacted prevailing wage certification forms **in addition** to the required unredacted forms. The following information may be redacted:

        1) Employee Name
        2) Employee Address
        3) Employee Social Security Number

B. Contractor shall use the Commonwealth of Pennsylvania Department of Labor and Industry Form LLC-25 (form can be accessed at: http://www.dli.pa.gov/Individuals/Labor-Management-Relations/Documents/llc-25.pdf), as revised from time to time, and ensure proper classification of workmen are assigned to each person. Certificates must be filled out in their entirety. Form is included as Specification Section 007346.16. Certified Payroll submitted on U.S. Wage and Hour Division forms are NOT accepted and will be returned to the Contractor.

C. Regardless of the submission type, the first and the final certification forms must be notarized, signed, and dated.

BUREAU OF LABOR LAW COMPLIANCE
PREVAILING WAGES PROJECT RATES

Project Name:	Exeter Township Emergency Services Facility
General Description:	New Fire & Rescue Station
Project Locality	Exeter Township
Awarding Agency:	Exeter Township
Contract Award Date:	11/24/2026
Serial Number:	26-08377
Project Classification:	Building
Determination Date:	9/17/2026
Assigned Field Office:	Scranton
Field Office Phone Number:	(570)963-4577
Toll Free Phone Number:	(877)214-3962
Project County:	Berks County

BUREAU OF LABOR LAW COMPLIANCE
PREVAILING WAGES PROJECT RATES

Project: 26-08377 - Building	Effective Date	Expiration Date	Hourly Rate	Fringe Benefits	Total
Asbestos & Insulation Workers	6/30/2025		$41.50	$29.86	$71.36
Asbestos & Insulation Workers	6/29/2026		$43.50	$31.11	$74.61
Boilermaker (Commercial, Institutional, and Minor Repair Work)	3/1/2026		$41.34	$19.23	$60.57
Boilermakers	1/1/2026		$58.00	$36.57	$94.57
Bricklayers, Stone Masons, Pointers, Caulkers, Cleaners	5/3/2026		$43.53	$19.17	$62.70
Carpenters, Drywall Hangers, Framers, Instrument Men, Lathers, Soft Floor Layers	6/1/2026		$36.84	$22.69	$59.53
Carpenters, Drywall Hangers, Framers, Instrument Men, Lathers, Soft Floor Layers	6/1/2027		$36.84	$24.94	$61.78
Cement Finishers & Plasterers	5/3/2026		$34.23	$22.27	$56.50
Cement Finishers & Plasterers	5/3/2027		$33.49	$25.01	$58.50
Cement Masons	5/1/2025		$35.85	$20.90	$56.75
Dockbuilder, Pile Drivers	5/1/2026		$56.98	$37.99	$94.97
Dockbuilder/Pile Driver Diver	5/1/2026		$66.54	$41.74	$108.28
Dockbuilder/pile driver tender	5/1/2026		$56.98	$37.99	$94.97
Drywall Finisher	5/1/2026		$33.02	$24.00	$57.02
Electricians	9/1/2025		$46.02	$28.39	$74.41
Electricians	8/31/2026		$48.02	$29.46	$77.48
Elevator Constructor	1/1/2026		$64.06	$46.01	$110.07
Floor Coverer	5/1/2025		$37.78	$19.80	$57.58
Floor Coverer	5/1/2026		$38.59	$20.61	$59.20
Glazier	5/1/2024		$39.48	$23.81	$63.29
Iron Workers (Bridge, Structural Steel, Ornamental, Precast, Reinforcing)	7/1/2026		$40.51	$33.88	$74.39
Laborers (Class 01 - See notes)	5/1/2025		$29.27	$17.84	$47.11
Laborers (Class 01 - See notes)	5/1/2026		$30.12	$18.49	$48.61
Laborers (Class 02 - See notes)	5/1/2026		$32.12	$18.49	$50.61
Laborers (Class 02 - see notes)	5/1/2025		$31.27	$17.84	$49.11
Laborers (Class 03 - See notes)	4/27/2025		$31.82	$18.09	$49.91
Laborers (Class 03 - See notes)	5/1/2026		$32.82	$18.74	$51.56
Laborers (Class 04 - See notes)	4/27/2025		$33.82	$18.09	$51.91
Laborers (Class 04 - See notes)	5/1/2026		$34.32	$18.74	$53.06
Laborers (Class 05 - See notes)	5/1/2025		$31.27	$17.84	$49.11
Laborers (Class 05 - See notes)	5/1/2026		$32.12	$18.49	$50.61
Laborers (Class 06 - See notes)	5/1/2025		$30.62	$17.84	$48.46
Laborers (Class 06 - See notes)	5/1/2026		$31.47	$18.49	$49.96
Marble Mason	5/1/2025		$37.71	$18.73	$56.44
Marble Mason	5/3/2026		$37.72	$20.67	$58.39
Millwright	6/1/2025		$43.00	$22.95	$65.95
Millwright	6/1/2026		$44.97	$22.95	$67.92
Operators (Building, Class 01 - See Notes)	5/1/2025		$44.89	$30.92	$75.81
Operators (Building, Class 01 - See Notes)	5/1/2026		$46.05	$31.76	$77.81
Operators (Building, Class 01A - See Notes)	5/1/2025		$47.14	$31.58	$78.72
Operators (Building, Class 01A - See Notes)	5/1/2026		$48.30	$32.42	$80.72

BUREAU OF LABOR LAW COMPLIANCE
PREVAILING WAGES PROJECT RATES

Project: 26-08377 - Building	Effective Date	Expiration Date	Hourly Rate	Fringe Benefits	Total
Operators (Building, Class 02 - See Notes)	5/1/2025		$44.61	$30.83	$75.44
Operators (Building, Class 02 - See Notes)	5/1/2026		$45.77	$31.67	$77.44
Operators (Building, Class 02A - See Notes)	5/1/2025		$46.86	$31.50	$78.36
Operators (Building, Class 02A - See Notes)	5/1/2026		$48.02	$32.34	$80.36
Operators (Building, Class 03 - See Notes)	5/1/2025		$41.88	$30.03	$71.91
Operators (Building, Class 03 - See Notes)	5/1/2026		$43.04	$30.87	$73.91
Operators (Building, Class 04 - See Notes)	5/1/2025		$40.74	$29.70	$70.44
Operators (Building, Class 04 - See Notes)	5/1/2026		$41.90	$30.54	$72.44
Operators (Building, Class 05 - See Notes)	5/1/2025		$40.30	$29.56	$69.86
Operators (Building, Class 05 - See Notes)	5/1/2026		$41.45	$30.41	$71.86
Operators (Building, Class 06 - See Notes)	5/1/2025		$39.42	$29.30	$68.72
Operators (Building, Class 06 - See Notes)	5/1/2026		$40.58	$30.14	$70.72
Operators (Building, Class 07A- See Notes)	5/1/2025		$54.56	$35.21	$89.77
Operators (Building, Class 07A- See Notes)	5/1/2026		$56.03	$36.14	$92.17
Operators (Building, Class 07B- See Notes)	5/1/2025		$54.22	$35.10	$89.32
Operators (Building, Class 07B- See Notes)	5/1/2026		$55.69	$36.03	$91.72
Painters Class 1 (see notes)	5/1/2025		$32.71	$24.17	$56.88
Painters Class 1 (see notes)	5/1/2026		$33.89	$24.69	$58.58
Painters - Line Stripping	12/1/2024		$44.12	$27.91	$72.03
Painters - Line Stripping	12/1/2025		$45.12	$29.41	$74.53
Painters Class 2 (see notes)	5/1/2023		$30.09	$23.19	$53.28
Painters Class 2 (see notes)	5/1/2025		$35.61	$24.18	$59.79
Painters Class 3 (see notes)	5/1/2025		$41.71	$24.18	$65.89
Piledrivers	5/1/2021		$43.73	$37.99	$81.72
Plasterers	5/1/2024		$32.93	$21.08	$54.01
Plasterers	5/1/2025		$34.68	$21.23	$55.91
plumber	5/1/2025		$56.28	$36.01	$92.29
plumber	5/1/2026		$58.43	$36.61	$95.04
Roofers (Composition)	5/1/2025		$46.03	$34.77	$80.80
Roofers (Composition)	5/1/2026		$47.53	$35.22	$82.75
Roofers (Shingle)	5/1/2024		$34.35	$22.20	$56.55
Roofers (Slate & Tile)	5/1/2024		$37.35	$22.20	$59.55
Sheet Metal Workers	6/1/2025		$45.02	$44.71	$89.73
Sheet Metal Workers	6/1/2026		$46.62	$46.36	$92.98
Sign Makers and Hangars	7/15/2025		$33.48	$26.41	$59.89
Sign Makers and Hangars	7/15/2026		$36.38	$25.01	$61.39
Sprinklerfitters	4/1/2025		$49.75	$29.21	$78.96
Sprinklerfitters	4/1/2026		$52.82	$30.56	$83.38
Steamfitters	5/1/2024		$59.65	$43.09	$102.74
Steamfitters	5/1/2025		$61.47	$44.89	$106.36
Terrazzo Finisher	5/1/2025		$36.32	$21.68	$58.00
Terrazzo Finisher	5/1/2026		$37.12	$22.76	$59.88
Terrazzo Grinder	5/1/2025		$37.10	$21.68	$58.78
Terrazzo Grinder	5/1/2026		$37.93	$22.76	$60.69

BUREAU OF LABOR LAW COMPLIANCE
PREVAILING WAGES PROJECT RATES

Project: 26-08377 - Building	Effective Date	Expiration Date	Hourly Rate	Fringe Benefits	Total
Terrazzo Mechanics	5/1/2025		$37.17	$23.43	$60.60
Terrazzo Mechanics	5/1/2026		$38.06	$24.51	$62.57
Tile & Marble Finisher	5/1/2025		$35.31	$16.99	$52.30
Tile & Marble Finisher	5/1/2026		$37.26	$16.99	$54.25
Tile Setter	5/1/2025		$37.71	$18.73	$56.44
Tile Setter	5/3/2026		$37.72	$20.67	$58.39
Truckdriver class 1(see notes)	5/1/2025		$41.87	$0.00	$41.87
Truckdriver class 2 (see notes)	5/1/2025		$41.94	$0.00	$41.94
Truckdriver class 3 (see notes)	5/1/2025		$42.43	$0.00	$42.43
Window Film / Tint Installer	6/1/2025		$27.42	$15.13	$42.55
Window Film / Tint Installer	6/1/2026		$28.35	$15.60	$43.95

BUREAU OF LABOR LAW COMPLIANCE
PREVAILING WAGES PROJECT RATES

Project: 26-08377 - Heavy/Highway	Effective Date	Expiration Date	Hourly Rate	Fringe Benefits	Total
Carpenter	5/1/2026		$37.63	$21.18	$58.81
Carpenter Welder	5/1/2026		$38.38	$21.18	$59.56
Carpenters - Piledriver/Welder	1/1/2026		$38.38	$21.18	$59.56
Cement Finishers	1/1/2017		$27.70	$20.20	$47.90
Dockbuilder, Pile Drivers	5/1/2026		$56.98	$37.99	$94.97
Dockbuilder/Pile Driver Diver	5/1/2026		$61.88	$45.47	$107.35
Dockbuilder/pile driver tender	5/1/2026		$56.98	$37.99	$94.97
Electric Lineman	6/3/2024		$52.80	$30.61	$83.41
Electric Lineman	6/2/2025		$55.42	$31.04	$86.46
Iron Workers (Bridge, Structural Steel, Ornamental, Precast, Reinforcing)	7/1/2024		$37.26	$32.63	$69.89
Laborers (Class 01 - See notes)	5/1/2025		$26.61	$19.99	$46.60
Laborers (Class 01 - See notes)	5/1/2026		$27.61	$20.44	$48.05
Laborers (Class 02 - See notes)	5/1/2025		$33.23	$19.99	$53.22
Laborers (Class 02 - See notes)	5/1/2026		$34.23	$20.44	$54.67
Laborers (Class 03 - See notes)	5/1/2025		$30.22	$19.99	$50.21
Laborers (Class 03 - See notes)	5/1/2026		$31.22	$20.44	$51.66
Laborers (Class 04 - See notes)	5/1/2025		$30.57	$19.99	$50.56
Laborers (Class 04 - See notes)	5/1/2026		$31.57	$20.44	$52.01
Laborers (Class 05 - See notes)	5/1/2025		$31.24	$19.99	$51.23
Laborers (Class 05 - See notes)	5/1/2026		$32.24	$20.44	$52.68
Laborers (Class 06 - See notes)	5/1/2025		$30.66	$19.99	$50.65
Laborers (Class 06 - See notes)	5/1/2026		$31.66	$20.44	$52.10
Laborers (Class 07 - See notes)	5/1/2025		$30.95	$19.99	$50.94
Laborers (Class 07 - See notes)	5/1/2026		$31.95	$20.44	$52.39
Laborers (Class 08 - See notes)	5/1/2025		$31.43	$19.99	$51.42
Laborers (Class 08 - See notes)	5/1/2026		$32.43	$20.44	$52.87
Millwright	6/1/2026		$47.52	$23.33	$70.85
Operators (Heavy, Class 01 - See Notes)	5/1/2025		$43.46	$30.50	$73.96
Operators (Heavy, Class 01 - See Notes)	5/1/2026		$44.61	$31.35	$75.96
Operators (Heavy, Class 01A - See Notes)	5/1/2025		$45.71	$31.16	$76.87
Operators (Heavy, Class 01A - See Notes)	5/1/2026		$46.86	$32.01	$78.87
Operators (Heavy, Class 02 - See Notes)	5/1/2025		$43.18	$30.41	$73.59
Operators (Heavy, Class 02 - See Notes)	5/1/2026		$44.34	$31.25	$75.59
Operators (Heavy, Class 02A - See Notes)	5/1/2025		$45.43	$31.08	$76.51
Operators (Heavy, Class 02A - See Notes)	5/1/2026		$46.59	$31.92	$78.51
Operators (Heavy, Class 03 - See Notes)	5/1/2025		$40.26	$29.55	$69.81
Operators (Heavy, Class 03 - See Notes)	5/1/2026		$41.43	$30.38	$71.81
Operators (Heavy, Class 04 - See Notes)	5/1/2025		$39.12	$29.22	$68.34
Operators (Heavy, Class 04 - See Notes)	5/1/2026		$40.28	$30.06	$70.34
Operators (Heavy, Class 05 - See Notes)	5/1/2025		$38.67	$29.09	$67.76
Operators (Heavy, Class 05 - See Notes)	5/1/2026		$39.83	$29.93	$69.76
Operators (Heavy, Class 06 - See Notes)	5/1/2025		$37.80	$28.82	$66.62
Operators (Heavy, Class 06 - See Notes)	5/1/2026		$38.96	$29.66	$68.62
Operators (Heavy, Class 07A - See Notes)	5/1/2025		$52.85	$34.71	$87.56

BUREAU OF LABOR LAW COMPLIANCE
PREVAILING WAGES PROJECT RATES

Project: 26-08377 - Heavy/Highway	Effective Date	Expiration Date	Hourly Rate	Fringe Benefits	Total
Operators (Heavy, Class 07A - See Notes)	5/1/2026		$54.32	$35.64	$89.96
Operators (Heavy, Class 07B - See Notes)	5/1/2025		$52.51	$34.60	$87.11
Operators (Heavy, Class 07B - See Notes)	5/1/2026		$53.97	$35.54	$89.51
Operators (Highway, Class 01 - See Notes)	5/1/2025		$42.56	$30.24	$72.80
Operators (Highway, Class 01 - See Notes)	5/1/2026		$43.72	$31.08	$74.80
Operators (Highway, Class 01a - See Notes)	5/1/2025		$44.81	$30.92	$75.73
Operators (Highway, Class 01a - See Notes)	5/1/2026		$45.97	$31.76	$77.73
Operators (Highway, Class 02 - See Notes)	5/1/2025		$41.39	$29.89	$71.28
Operators (Highway, Class 02 - See Notes)	5/1/2026		$42.55	$30.73	$73.28
Operators (Highway, Class 03 - See Notes)	5/1/2025		$40.70	$29.68	$70.38
Operators (Highway, Class 03 - See Notes)	5/1/2026		$41.87	$30.51	$72.38
Operators (Highway, Class 04 - See Notes)	5/1/2025		$40.26	$29.54	$69.80
Operators (Highway, Class 04 - See Notes)	5/1/2026		$41.41	$30.39	$71.80
Operators (Highway, Class 05 - See Notes)	5/1/2025		$39.73	$29.41	$69.14
Operators (Highway, Class 05 - See Notes)	5/1/2026		$40.89	$30.25	$71.14
Operators (Highway, Class 06 - See Notes)	5/1/2025		$42.80	$30.30	$73.10
Operators (Highway, Class 06 - See Notes)	5/1/2026		$43.95	$31.15	$75.10
Operators (Highway, Class 06/A - See Notes)	5/1/2025		$45.05	$30.96	$76.01
Operators (Highway, Class 06/A - See Notes)	5/1/2026		$46.21	$31.80	$78.01
Operators (Highway, Class 07/A - See Notes)	5/1/2025		$51.79	$34.38	$86.17
Operators (Highway, Class 07/A - See Notes)	5/1/2026		$53.25	$35.32	$88.57
Operators (Highway, Class 07/B - See Notes)	5/1/2025		$50.37	$33.97	$84.34
Operators (Highway, Class 07/B - See Notes)	5/1/2026		$51.84	$34.90	$86.74
Painters - Line Stripping	12/1/2024		$44.12	$27.91	$72.03
Painters - Line Stripping	12/1/2025		$45.12	$29.41	$74.53
Painters Class 2 (see notes)	5/1/2025		$35.61	$24.18	$59.79
Painters Class 2 (see notes)	5/1/2026		$38.00	$24.79	$62.79
Painters Class 3 (see notes)	5/1/2025		$41.71	$24.18	$65.89
Painters Class 3 (see notes)	5/1/2026		$44.10	$24.79	$68.89
Piledrivers	5/1/2025		$36.87	$20.49	$57.36
Piledrivers	5/1/2026		$37.63	$21.18	$58.81
Steamfitters (Heavy and Highway - Gas Distribution)	5/1/2025		$54.39	$44.73	$99.12
Truckdriver class 1(see notes)	5/1/2025		$41.87	$0.00	$41.87
Truckdriver class 2 (see notes)	5/1/2025		$41.94	$0.00	$41.94
Truckdriver class 3 (see notes)	5/1/2025		$42.43	$0.00	$42.43

WEEKLY PAYROLL CERTIFICATION FOR PUBLIC WORKS PROJECTS

☐ Contractor or ☐ Subcontractor (Please check one) **ALL INFORMATION MUST BE COMPLETED**

CONTRACTOR ADDRESS	SUBCONTRACTOR ADDRESS	DEPARTMENT OF LABOR & INDUSTRY COMMONWEALTH OF PENNSYLVANIA BUREAU OF LABOR LAW COMPLIANCE PREVAILING WAGE DIVISION 7TH & FORSTER STREETS HARRISBURG, PA 17120 1-800-932-0665

PAYROLL NUMBER	WEEK ENDING DATE	PROJECT AND LOCATION PROJECT SERIAL # PROJECT #

EMPLOYEE NAME	APPR. RATE (%)	WORK CLASSIFICATION	DAY AND DATE Su M Tu W Th F Sa HOURS WORKED EACH DAY	S-TIME 0-TIME	BASE HOURLY RATE	TOTAL FRINGE BENEFITS (C=Cash) (FB=Contributions)*	TOTAL DEDUCTIONS	GROSS PAY FOR PREVAILING RATE JOB(S)	CHECK #
						C: FB:			
						C: FB:			
						C: FB:			
						C: FB:			
						C: FB:			

*SEE REVERSE SIDE

PAGE NUMBER _____ OF _____

THE NOTARIZATION MUST BE COMPLETED ON FIRST AND LAST SUBMISSIONS ONLY. ALL OTHER INFORMATION MUST BE COMPLETED WEEKLY.

*FRINGE BENEFITS EXPLANATION (FB): Bona fide benefits contribution, except those required by Federal or State Law (unemployment tax, workers' compensation, income taxes, etc.)

Please specify the type of benefits provided and contributions per hour:

1) Medical or hospital care _____
2) Pension or retirement _____
3) Life insurance _____
4) Disability _____
5) Vacation, holiday _____
6) Other (please specify) _____

CERTIFIED STATEMENT OF COMPLIANCE

1. The undersigned, having executed a contract with _____
(AWARDING AGENCY, CONTRACTOR OR SUBCONTRACTOR)

_____ for the construction of the above-identified project, acknowledges that:

(a) The prevailing wage requirements and the predetermined rates are included in the aforesaid contract.

(b) Correction of any infractions of the aforesaid conditions is the contractor's or subcontractor's responsibility.

(c) It is the contractor's responsibility to include the Prevailing Wage requirements and the predetermined rates in any subcontract or lower tier subcontract for this project.

2. The undersigned certifies that:
   (a) Neither he nor his firm, nor any firm, corporation or partnership in which he or his firm has an interest is debarred by the Secretary of Labor and Industry pursuant to Section 11(e) of the PA Prevailing Wage Act, Act of August 15, 1961, P.L. 987 as amended, 43 P.S.§ 165-11(e).

   (b) No part of this contract has been or will be subcontracted to any subcontractor if such subcontractor or any firm, corporation or partnership in which such subcontractor has an interest is debarred pursuant to the aforementioned statute.

3. The undersigned certifies that:
   (a) the legal name and the business address of the contractor or subcontractor are: _____
   _____

   (b) The undersigned is: ☐ a single proprietorship ☐ a corporation organized in the state of _____
   ☐ a partnership ☐ other organization (describe) _____

   (c) The name, title and address of the owner, partners or officers of the contractor/subcontractor are:

NAME	TITLE	ADDRESS

The willful falsification of any of the above statements may subject the contractor to civil or criminal prosecution, provided in the PA Prevailing Wage Act of August 15, 1961, P.L. 987, as amended, August 9, 1963, 43 P.S. § 165.1 through 165.17.

_____
(DATE)

_____
(SIGNATURE)

_____
(TITLE)

_____
SEAL

Taken, sworn and subscribed before me this _____ Day

of _____ A.D., _____

SECTION 00 7400 - APPLICATION FOR PAYMENT FORMS

Documents AIA G732 and AIA G703, Application and Certificate for Payment are included for your reference. Original documents shall be used and may obtained from the American Institute of Architects

END OF SECTION 00 7400

AIA® Document G732® – 2019

Application and Certificate for Payment, Construction Manager as Adviser Edition

TO OWNER:

PROJECT:

APPLICATION NO:

DISTRIBUTION TO:

OWNER ☐
CONSTRUCTION MANAGER ☐
ARCHITECT ☐
CONTRACTOR ☐
FIELD ☐
OTHER ☐

PERIOD TO:

FROM CONTRACTOR:

VIA CONSTRUCTION MANAGER:

CONTRACT DATE:

PROJECT NOS: / /

CONTRACT FOR:

VIA ARCHITECT:

CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made for payment, as shown below, in connection with the Contract.
AIA Document G703™, Continuation Sheet, is attached.

1. ORIGINAL CONTRACT SUM …… $

2. NET CHANGES IN THE WORK …… $

3. CONTRACT SUM TO DATE *(Line 1 ± 2)* …… $

4. TOTAL COMPLETED AND STORED TO DATE *(Column G on G703)* …… $

5. RETAINAGE:

a. _____ % of Completed Work
(Column D + E on G703) $

b. _____ % of Stored Material
(Column F on G703) $

Total Retainage *(Lines 5a + 5b, or Total in Column I on G703)* …… $

6. TOTAL EARNED LESS RETAINAGE …… $
(Line 4 minus Line 5 Total)

7. LESS PREVIOUS CERTIFICATES FOR PAYMENT ……
(Line 6 from prior Certificate)

8. CURRENT PAYMENT DUE …… $

9. BALANCE TO FINISH, INCLUDING RETAINAGE
(Line 3 minus Line 6) $

SUMMARY OF CHANGES IN THE WORK	ADDITIONS	DEDUCTIONS
Total changes approved in previous months by Owner	$	$
Total approved this month, including Construction Change Directives	$	$
TOTALS	$	$
NET CHANGES IN THE WORK	$	

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certificates for Payment were issued and payments received from the Owner, and that current payment shown herein is now due.

CONTRACTOR:

By: _____ Date: _____

State of:
County of:
Subscribed and sworn to before me this day of
Notary Public:
My Commission expires: _____

CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on evaluations of the Work and the data comprising this application, the Construction Manager and Architect certify to the Owner that to the best of their knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT CERTIFIED.

AMOUNT CERTIFIED …… $

(Attach explanation if amount certified differs from the amount applied. Initial all figures on this Application and on the Continuation Sheet that are changed to conform with the amount certified.)

CONSTRUCTION MANAGER:

By: _____ Date: _____

ARCHITECT: *(NOTE: If multiple contractors are responsible for performating portions of the Project, the Architect's Certification is not required.)*

By: _____ Date: _____

This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract.

Sample

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AIA® Document G703® – 1992

Continuation Sheet

AIA Document G702®, Application and Certificate for Payment, or G732™, Application and Certificate for Payment, Construction Manager as Adviser Edition, containing Contractor's signed certification is attached. Use Column I on Contracts where variable retainage for line items may apply.

APPLICATION NO:
APPLICATION DATE:
PERIOD TO:
ARCHITECT'S PROJECT NO:

A	B	C	D	E	F	G		H	I
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED		MATERIALS PRESENTLY STORED *(Not in D or E)*	TOTAL COMPLETED AND STORED TO DATE *(D+E+F)*	% *(G ÷ C)*	BALANCE TO FINISH *(C – G)*	RETAINAGE *(If variable rate)*
			FROM PREVIOUS APPLICATION *(D + E)*	THIS PERIOD					
	GRAND TOTAL								

Sample

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SECTION 00 7500 - WAIVER OF CLAIMS AFFIDAVIT

This document is to accompany ALL Applications for Payment.

Date:

From:

Re: Application No. _____

Project Name: _____

Intending to be legally bound hereby, we certify that _____(Contractor) waives any and all claims for additional cost and/or time arising out of, or relating to, any of the work performed as of the date of the above-referenced Application, other than those claims for which has already provided Contractor notice in writing in accordance with the requirements of the Contract Documents.

By: _____

Title: _____

Date: _____

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SECTION 00 8020 - RACP GRANT INFORMATION

REDEVELOPMENT ASSISTANCE CAPITAL PROGRAM (RACP) GRANT INFORMATION

The Redevelopment Assistance Capital Program (RACP) is a Commonwealth grant program administered by the Office of the Budget for the acquisition and construction of regional economic, cultural, civic, recreational, and historical improvement projects. RACP projects are authorized in the Redevelopment Assistance section of a Capital Budget Itemization Act, have a regional or multi-jurisdictional impact, and generate substantial increases or maintain current levels of employment, tax revenues, or other measures of economic activity. RACP projects are state-funded projects that cannot obtain primary funding under other state programs.

Exeter Township has been awarded a State grant under the Redevelopment Assistance Capital Program (RACP) for the Emergency Services Facility project. Due to State regulations associated with this funding, Exeter Township is required to comply with numerous grant and compliance requirements throughout the duration of the project.

The following information must be submitted to Boyle Construction monthly, as applicable, by each Prime Contractor. Each Prime Contractor is responsible for obtaining the information from all of their subcontractors and suppliers. All submitted documentation will be subject to audit by a firm retained by the State. Failure to provide the required paperwork to Boyle Construction in a timely manner could result in pay applications being withheld and not approved until all documentation is adequately submitted and current.

Insurance Certificate:

If you are working on site, you are required to provide a Certificate of Insurance naming the following entities as Additional Insureds: the Commonwealth of Pennsylvania, Exeter Township, Boyle Construction, Inc., Manns Woodward Studios, Inc. **Please ensure that updated Certificates of Insurance are submitted to Boyle Construction, Inc. upon expiration of the current certificate.**

Certified Payroll (Weekly):

If you are working on site, Certified Payroll forms must be provided for **each week** of the project on the PA Labor & Industry form. The following criteria must be met:

1. First and last payroll must be notarized
2. Every payroll must be signed and dated
3. Work Classification must match exactly as shown on PA Prevailing Wage Determination Sheet
4. Fringe benefits must be broken out for every employee shown
5. "No Work Performed" must be shown for any weeks you are not working on job site
6. *Please do not combine payroll from multiple sources into a single document.*

To avoid potential corrections during the audits, the PA Labor & Industry form should be filled out correctly with the information listed above and must be equal to or greater than the total prevailing wage rate that corresponds with the labor class listed. If wages are reported incorrectly, restitution may be required to correct the discrepancy. Prevailing wage rates can be found in the specifications.

Steel Certifications:
Certifications should be collected at the time any steel for the project is purchased and delivered to ease the collection process. The following criteria must be met:

1. For any structural steel supplied, Steel Mill Certifications must be submitted along with the corresponding packing slips. The Bill of Lading number shown on the packing slip must be referenced on the Mill Certification to verify that the certification applies to the material shipped for this project.

2. When submitting documentation, please clearly identify the specific product for which each certification is provided.

3. For any non-structural steel supplied, you must complete and submit an ST-2, ST-3 or ST-4 form (blank forms attached). The ST form needs to be submitted to demonstrate that compliance, when and where necessary, has been met. Directions are listed on each ST form on how to complete. The ST forms do not replace the steel certification forms associated with structural steel.

4. You may also submit a letter requesting an exemption from providing a steel certification for your material. The Exemption List (attached) identifies products that are known to not meet U.S. steel requirements. All items listed in your Exemption Request letter (sample attached) must **match exactly** as they appear on the Exemption List.

The following documents with their referenced attachments are part of the requirements of the Redevelopment Assistance Capital Program Grant. They are made available for Bidders' convenience and information but are not a warranty of all requirements. It is the Contractor's responsibility to obtain all necessary current documents and follow the necessary protocol.

END OF SECTION 00 8020

Redevelopment Assistance Capital Program (RACP)

Program Guidelines

November 2024

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Section I – General

A) Introduction

Redevelopment Assistance Capital Program (RACP) projects are primarily economic development projects, authorized in the Redevelopment Assistance section of a Capital Budget Itemization Act, have a regional or multi-jurisdictional impact, and generate substantial increases or maintain current levels of employment, tax revenues or other measures of economic activity. Included are projects with cultural, historic, recreational, or civic significance.

RACP projects are state-funded projects that cannot obtain primary funding under other state programs. Projects that can normally obtain funding from PENNDOT, PENNVEST, the Department of Community and Economic Development, or other state agencies are generally restricted from participating in the Redevelopment Assistance Capital Program.

****If a RACP project does include and require improvements to housing, roads, bridges, tunnels, infrastructure, and/or drinking water/waste disposal/wastewater/stormwater systems, these improvements must not be the primary focus of the project; and as per Act 77 of 2013, they must be associated with a project that is part of an economic development project; and in the case of housing, must be part of a community revitalization plan and in accordance with RACP requirements. These additional requirements for housing projects are not required if the funding is from a designated special allocation for housing.*

B) Eligible Projects

All grants awarded through the Redevelopment Assistance Capital Program (RACP) MUST be for projects included in one (1) or more of the PA Capital Budget Project Itemization Acts. Only itemizations/projects from these Acts that have remaining "Project Allocation" amounts and that have not been statutorily "sunset" pursuant to Act 77 of 2013 are eligible (list of itemizations). Potential projects are typically added to Capital Budget Project Itemization Bills by members of the House of Representatives, Senate and Administration.

Redevelopment Assistance Capital Program grants must be eligible for tax-exempt bond funding under existing federal law requirements. The Applicant must demonstrate and document that the project qualifies for financing with federally tax-exempt bonds. Applicants will be required to comply with procedures to maintain the tax-exempt status of bonds issued to finance the project.

C) Eligible Grantees

Grantees for Redevelopment Assistance Capital Program funding must be one (1) of the following:

1) A redevelopment authority.
2) An industrial development authority.
3) A general purpose unit of local government.
4) A local development district that has an agreement with a general purpose unit of local government under which the unit assumes ultimate responsibility for debt incurred to obtain the non-State financial participation.
5) A public authority established pursuant to the laws of this Commonwealth.
6) An industrial development agency:
    a. which has been certified as an industrial development agency by the Pennsylvania Industrial Development Authority Board under the act of May 17, 1956 (1955 P.L.1609, No.537), known as the Pennsylvania Industrial Development Authority Act; and
    b. which is itself or which is acting through a wholly owned subsidiary that is exempt from Federal taxation under section 501 (c) (3) of the Internal Revenue Code of 1986.

D) Eligible Costs

A RACP project must have a total cost of at least $1,000,000.

1) Reimbursable Cost Categories – All costs below must be directly related to the RACP project. The following costs are typically eligible for reimbursement and/or can be a match for RACP funds.

    - Construction – the primary use and intent of RACP funds should be the reimbursement of construction costs.
    - Interest during construction – interest costs paid as a result of the use of interim or bridge financing for the project during construction can be reimbursed from RACP funds.
    - Permits – costs for acquiring permits needed for construction of the project can be reimbursed from RACP funds.
    - Land – if land is purchased for the project, a certified as-is appraisal must be provided. RACP funds may be used to reimburse the costs for land acquisition. The appraised value may include permanent improvements exclusive to the RACP project. The appraisal should be "as-is" value.
        - Land Acquisition Costs cannot be the sole use of RACP funds. The primary focus of the RACP scope of work should be construction.
        - The allowance of RACP funds for land acquisition costs is at the discretion of the Office of the Budget. If allowed, RACP funding for acquisition costs is generally limited to no more than 30% of the total grant amount. This 30% maximum allowance includes any land acquisition and/or equipment costs (see below).

- For land acquisition costs to be reimbursable, the purchase date must occur after the authorization date of the itemized project and have RACP scope construction activity occur on the site.

- Equipment – if equipment is purchased for the project, documentation of the useful life must be provided.
  - Equipment costs cannot be the sole use of RACP funds. The primary focus of the RACP scope of work should be construction.
  - The allowance of RACP funds for equipment costs is at the discretion of the Office of the Budget. If allowed, RACP funding for equipment costs is generally limited to no more than 30% of the total grant amount. This 30% maximum allowance includes any equipment and/or land acquisition costs (see above).
  - For equipment to be reimbursable, it must be fixed to the realty, have a substantial useful life, and be directly related to the RACP project.

2) Non-Reimbursable Cost Categories – All costs below must be directly related to the RACP project. The following costs are eligible match costs only and not allocated for reimbursement with RACP funds. These costs must be paid from non-state matching funds, which may include federal funds.

- Future physical maintenance & operation – a portion of any funds reserved for future physical maintenance and operation of facilities may be included as a part of the 50% match (non-state) participation, provided such funds do not exceed 15% of the total project cost. These reserved funds must have legally binding documentation explaining the intent, design, and operation of the dedicated fund. Salaries cannot be paid from reserve funds.
- Administrative costs – any fees for the administration of the project, whether by the Applicant's staff or by contract.
- Legal fees – any fees for the services of lawyers or solicitors.
- Financing/Accounting costs – any fees for financing and accounting services.
- Architectural/Engineering fees – any fees for application preparation, project administration, or other professional services incurred for the planning, design, and construction of the project.

E) Ineligible Projects

Projects located in a City Revitalization and Improvement Zone (CRIZ) and eligible for CRIZ benefits are not eligible RACP projects. However, approved RACP grants that existed prior to zone approval shall not be restricted.

Projects that are generally funded through other state programs are not eligible for Redevelopment Assistance Capital Program funds. Examples of those funding sources and projects are as follows:

Projects funded by PENNDOT or federal government:

- Highways, vehicular bridges, tunnels

Projects funded by PENNVEST:

- Drinking water, wastewater, stormwater and waste disposal facilities

An exception to the above would be; stormwater, water or sewer infrastructure or tunnels, bridges or roads when associated with a project that is part of an economic development project. As an example, RACP funding could be utilized to prepare and install water and sewer lines within an industrial/business park development. Costs associated with repairs or replacement of existing public or private water or sewer systems are not eligible expenditure of RACP funds.

Other state funded projects:

- Housing Units are fundable only when specialized funding specifically for that purpose is approved and remains unused. Acts 87 of 2005 & 82 of 2010 each allowed $25 million (for a total of $50 million) for the construction of housing units. Outside of the special allocation housing funding, housing projects are only eligible if they support and generate economic activity and are part of a community revitalization plan.

****If a RACP project does include and require improvements to housing, roads, bridges, tunnels, infrastructure, and/or drinking water / waste / disposal / wastewater / stormwater systems, these improvements must not be the primary focus of the project. Per Act 77 of 2013, they must be associated with a project that is part of an economic development project, and in the case of housing, must be part of a community revitalization plan and in accordance with RACP program requirements. These additional requirements for housing projects are not required if the funding is from a designated special allocation for housing.*

F) Match Funding Requirements

General Requirements - a RACP project must have matching funds that comply with the following:

1) At least 50% of the project cost must be match (non-state) participation.
2) At least 50% of the match (non-state participation) must be secured funding at the time of formal Project Management Proposal submittal with identifiable and firm commitments from all sources.
3) Sources of match funds can be local, private, land or building as-is appraised value, and/or federal funds.
4) The only non-cash, non-state match permitted are land or fixed assets, which have a substantial useful life and are directly related to the project.
5) Funds from other state sources, including legislative sources may not be used as match.
6) If financing/loans are used as match funding they typically must consist of permanent financing (i.e., a minimum term of 10 years). This policy does not apply to bridge or interim financing used in the project.
7) Funds (grants and/or loans) from other state sources, including legislative sources, may not be used as match. However, care must be taken not to mistake certain non-state funds as state funds just because they are distributed through a state agency. The disqualifying part is if the source of the funds is from the state. Some non-state (usually federal) funds are passed through a state agency. This pass-through does not make them ineligible to be used as MATCH in a RACP project. For example,

Community Development Block Grants (CDBGs) administered by the DCED is a federal source pass-thru so it is acceptable for use in a RACP project.

8) An exception to the prohibition of other state funds being used as match in a RACP project is certain gaming/casino source funds. As of July 1, 2011 (except as noted below), the use of the Gaming Local Share Assessment (LSA) can be used as matching funds for RACP in the following counties:
    - Allegheny
    - Carbon
    - Dauphin (effective October 26, 2017)
    - Lackawanna
    - Luzerne (effective October 26, 2017)
    - Monroe
    - Northampton
    - Pike
    - Washington
    - Wayne

Section II – Pre-Award, Grant and Reimbursement Process

A) Pre-Award Process

Candidates who have an authorized and eligible project will need to submit an e-Application to the Office of the Budget during an open funding round.

All submissions that pass an initial review of eligibility and completeness will be considered for a RACP grant award. The Office of the Budget staff will forward a complete listing of projects and summaries to the Administration for grant award consideration.

There is a 30-day "public comment period" after the closing of an e-Application window, which must be completed before awards can be made.

The final selection results will be posted to the website and all successful Candidates will be notified via an Award Letter.

If your capital project is approved by the Office of the Budget, you will receive an Award Letter to submit a formal Project Management Proposal (PMP).

If you did not receive an award letter by the date the Office of the Budget officially closes a funding round, as posted on the website, then you were not selected for an award. You will need to re-apply during a subsequent open funding round.

The award letter provided to each Candidate does NOT affirm eligibility nor compliance with program requirements. Instead, the award letter serves as written notification authorizing the preparation and submission to the Office of the Budget of a formal Project Management Proposal (PMP).

B) Grant Process

Candidates are required to notify the Office of the Budget within 30 days of receipt of an Award Letter as to whether or not they are accepting the grant award. The notification should come from the addressee of the Office of the Budget award letter (Applicant or Sub-Applicant).

Applicants who accept the award are then required to submit a formal Project Management Proposal (PMP) within 6 months of the date of the Award Letter. All RACP projects must submit the PMP through an eligible Applicant.

When the Office of the Budget receives the PMP, it conducts a preliminary review and then assigns a consultant to conduct a thorough assessment of the PMP. The state-assigned consultant then provides the Office of the Budget with a report detailing the assessment. The Office of the Budget reviews the report and prepares the grant agreement, which will contain applicable special conditions.

The proposed RACP scope submitted with this Project Management Proposal will be reviewed and possibly adjusted during the development of a grant agreement to ensure that it meets program requirements.

The grant agreement will be provided to the Grantee for signature. Grantees must execute an RACP Grant Agreement and return the agreement to the Office of Budget (OB) within 20 days of the date of the grant agreement transmittal from OB. If the Grantee fails to return the signed contract within the timelines established by the office, no contract may be executed by the office for the grant, as Act 77 stipulates.

Once it is returned to the Office of the Budget, it will be forwarded to the appropriate agencies within the Commonwealth administration for validation and execution.

A final copy of the executed grant will be provided to the Grantee. It is important to note that the Office of the Budget cannot reimburse on any RACP-compliant costs until a fully executed grant agreement is in place.

Once the grant agreement is fully executed, the Grantee will then have a maximum of six (6) months to meet the terms and conditions of the grant agreement. The Grantee would be qualified to receive reimbursements for paid costs once the construction activities have started and these terms and conditions are satisfactory.

Once construction activities have started, it is advised that the Grantee request a facilitation meeting. These meetings are conducted by the Office of the Budget personnel and are at no cost to the project.

Once the project has incurred eligible reimbursable costs, they may then submit a payment request to start receiving grant funds.

C) Facilitation Meeting

Facilitation meetings are conducted at the request of the Grantee to the Office of Budget. Once construction activities have started, it is advised that the Grantee request a facilitation meeting. The Grantee/Sub-grantee/project representatives are eligible to attend a facilitation meeting at no cost to the project. During these meetings, the Grantee will be able to ask questions concerning administration of the program and its effects on the project, RACP requirements will be discussed, and payment request procedures will be explained.

D) Special Conditions Satisfaction

Once the Grant Agreement is executed; the Grantee will then have six (6) months from the date of execution to provide documentation to satisfy the special conditions located in Appendix B of the grant agreement. The Grantee must submit a packet to address all special conditions identified in the grant agreement to the Office of the Budget.

Office of the Budget staff will review the submission and issue a funds available letter once all special conditions have been fully satisfied.

If the Grantee is not administering the project, a Cooperation Agreement will need to be in place between the Grantee and Sub-grantee (and project administrator) detailing each entities responsibilities and requiring the Sub-Grantee/Administrator to comply with all terms and conditions of the RACP grant agreement.

E) Reimbursement Process

To facilitate the receipt of grant funds, the Grantee must submit a request for payment. The project budget must account for three (3) important stipulations discussed below.

1) Reimbursement Program

The Redevelopment Assistance Capital Program will use a reimbursement system to fund projects. Grantees will apply for periodic project payments to cover a portion of paid eligible and reimbursable project expenses. Expenses must be paid prior to submission to the commonwealth for reimbursement.

This reimbursement will be limited by: a) total funds available through the Funding Accumulation Schedule; b) a proportionate amount of the matching funds expended to date versus RACP grant expenditures; and c) those other limitations that the Office of the Budget may deem necessary.

2) Funding Accumulation Schedule (36-month minimum)

The approved Funding Accumulation Schedule, which is located in Appendix C of the grant agreement, for a project shows the RACP amounts that will be accumulated for the project during the months indicated on the schedule. Generally, total funding will be accumulated in equal installments over a 36-month period unless the Secretary of the Budget authorizes a shorter period.

The use of a Funding Accumulation Schedule may contribute to the Grantee's need to obtain interim or bridge financing to fund the project. Exceptions to this requirement will be made on a case-by-case basis by request. Month one (1) for the period will be the first month after the execution of the Grant Agreement. Commonwealth reimbursements will be limited by the amount of funds accumulated for the project at the time the Payment Request is reviewed. The approved schedule is shown in Appendix C of the Grant Agreement.

The approved funding accumulation does not show a monthly reimbursement that the Grantee will automatically receive for the project. The schedule shows the funds that are available for the project in any month during 36-month accumulation period. The reimbursement that the Grantee is eligible to receive is also subject to the distribution factor.

3) Proportional reimbursement

To ensure that RACP funds are not fully disbursed prior to the completion of a project, RACP grants will be reimbursed on a proportional basis for direct land, building acquisition, construction and

other eligible reimbursable expenses. The proportion funded by RACP funds will be defined by the distribution factor, which is located in Appendix C of the grant agreement. The distribution factor will be the total non-state funding amount divided by the RACP grant. Eligible match costs are not reimbursable but are included in the factor. The proportional reimbursement may contribute to the Grantee's need to obtain interim or bridge financing to fund the project.

The distribution factor is a measure of the match participation with respect to RACP participation. The factor is calculated as follows:

Distribution Factor = Total Match Funds / RACP Grant.

A distribution factor of 2 indicates that for every $2 of match participation, there will be $1 of commonwealth participation. In other words, the commonwealth is providing $1 of grant for every $3 of total project cost.

The purpose of the distribution factor is to insure that the Grantee is contributing the required match components to the project as reimbursements are being provided. Generally, the distribution factor will control the amount of reimbursement, if there are sufficient funds accumulated per the funding accumulation schedule.

A Payment Request must include paid construction costs before any other items will be reimbursed. Therefore, if construction has not started, the Commonwealth will not reimburse on acquisition, permits, or interest costs.

The submission of completed, signed Payment Request (PR) forms and supporting documentation must be sent to the Office of the Budget. Aside from the facilitation meeting, a Reimbursement Handbook is available, to assist you in preparing the PR forms for submission.

Office of the Budget staff will 1) assess satisfaction of all terms and conditions of the grant; 2) verify compliance with all RACP program requirements; and 3) examine the PR forms and all supporting documentation.

The state-assigned consultant will issue Construction Monitoring Reports periodically, which will be used to assist the Office of the Budget staff in their assessment.

The PR forms will be sent to Treasury through Comptroller Operations for the release of grant funds when:

- special conditions (Appendix B of the Grant Agreement) have been fully satisfied via a letter from the Office of the Budget,
- all other terms and conditions of the grant are satisfactory,
- compliance with program requirements is verified, and
- the payment request forms are acceptable.

F) Project Monitoring

Projects will be monitored by the Office of the Budget or its state-assigned consultant(s) throughout the funding and construction phase. All projects will be subject to review. Prior to the initiation of monitoring, the Grantee will be notified, a monitoring schedule will be established, and procedures will be explained.

The Grantee is responsible for fully executing a successful Redevelopment Assistance Capital Program project by approving and executing any designs, plans, specifications, estimates, or other components related to the development and execution of the project and reviewing/examining for accuracy or compliance with any federal, state, or local regulations. During monitoring, the commonwealth will not be approving any actions related to the grantee's execution of the project.

The Grantee is responsible for compliance with any or all federal, state, and local requirements.

The Grantee is responsible for putting together a project team which should consist of personnel and designated parties that can provide administrative, financial, engineering, legal, and other necessary expertise necessary to execute the project.

Approval of reimbursements of state funds will depend on financial and program compliance. The intent of monitoring is to review financial and program compliance with the Redevelopment Assistance Capital Program.

G) Close Out Audit

A close-out audit will be performed by the Office of the Budget staff for all projects. The Grantee will not be required to pay for this audit.

A portion of the final grant proceeds shall be retained by the Office of the Budget until the completion of the statutorily-required final close out audit. The commonwealth may withhold up to 10% of the grant value from the final Payment Request. This percentage may be reduced at the discretion of the Office of Budget.

Generally, the Grantee, among other things, is required to:

- Maintain books, records, documents, correspondence and evidence pertaining to the costs and expenses to the project funded with the Grant Agreement.
- Retain records for a period ending the late of 1) seven (7) years after final payment is made by the Grantee with funds awarded via the Grant Agreement; 2) seven (7) years after the Grant Agreement has expired; or 3) seven (7) years after the effective date of any termination of the Grant Agreement.
- Provide access to Commonwealth auditors or its representatives during the term of the Grant Agreement and after as specified in the Grant Agreement for record retention.
- Repay to the Commonwealth with interest amounts that were expended on ineligible costs, unless otherwise directed in writing by the Office of the Budget.

H) Definitions and Acronyms

Itemization: A line item included in a PA Capital Budget Project Itemization Act, that authorizes a project for funding.

Candidate: Any entity that has an authorized eligible project and, subsequently, has submitted an e-Application, but has not received an award or rejection letter.

e-Application: Pre-Award application for grant funding submitted through the electronic single application.

Applicant: An eligible entity that has received a RACP award letter and, subsequently, has submitted a formal Project Management Proposal. It may be the candidate itself, or if they are not an eligible applicant, a separate "sponsor" entity selected by the candidate.

Sub-Applicant: In cases where a RACP candidate is not an eligible applicant, the candidate becomes the sub-applicant and selects an eligible applicant to "sponsor" them and submit the formal Project Management Proposal.

Project Management Proposal (PMP): Post-Award application which details the proposed project scope and match funding, this is used to develop the grant agreement.

Grantee: An applicant that meets eligibility requirements and has received a grant agreement for execution.

Sub-Grantee: An entity that, through the cooperation of a grantee, will use RACP funds for an eligible project.

Special Conditions (SC): Items identified during the development of a grant agreement that require additional supporting documentation, located in Appendix B of the grant agreement.

Payment Request (PR): Submission, including invoices and proof of payments, to request grant funds for the reimbursement of paid project costs.

Funding Accumulation Schedule: Shows the RACP amounts that will be available for reimbursement during the months indicated on the schedule, located in Appendix C of the grant agreement.

Distribution Factor: A measure used to control the amount of reimbursements, to insure that the Grantee is contributing the required match components to the project. The factor is calculated as Total Match Funding divided by RACP Grant, located in Appendix C of the grant agreement.

State-assigned consultant: Firm employed by the commonwealth to monitor and report on RACP construction projects.

Redevelopment Assistance Capital Program (RACP)

Key Compliance Guidelines

November 2024

KEY COMPLIANCE GUIDELINES

It is suggested that a copy of this complete document be given to your Project, Construction Manager, and/or Architect so that they are fully aware of the RACP requirements related to each. This document should be included in your bid packages and should be made an addendum to any and all construction contracts, plans and specifications related to the RACP project.

Compliance with all RACP requirements, including the key items in these guidelines will be monitored frequently throughout the construction phase of your project and will be reviewed once more during the legislatively mandated close-out audit.

COMPETITIVE BIDDING REQUIREMENTS

The sole and exclusive bidding requirement for RACP projects is in the Capital Facilities Debt Enabling Act (Act 67 of 2004), which states "Notwithstanding any other provision of law, the solicitation of a minimum of three written bids for all contracted construction work on redevelopment assistance capital projects shall be the sole requirement for the composition, solicitation, opening and award of bids on such projects." Unless the terms of the law change, the Office of the Budget cannot grant waivers for bidding requirements to Grantees.

RACP projects are not subject to separation of trades. You are REQUIRED to solicit a minimum of three (3) bids for "all generally contracted work" being performed within the RACP defined scope of work. You are not required to receive three (3) bid responses. However, you should provide documentation to prove that at least three bids were solicited by providing copies of the solicitation letters (preferably on letterhead of the bidding entity) used in the bidding process. You are not required to select the lowest bidder, but if you do not, you will have to provide a brief written justification for your selection. Note: there is NO threshold level under the RACP program regardless of the size or dollar amount associated with the work to be performed. You need to show that you solicited a minimum of three (3) bids for any contract to be eligible for RACP.

Bidding is acceptable at either the general contractor level (described in option a. below) or at the sub-contractor level (described in option b. below):

- **General Contractor (GC) Level** - If you chose to bid at the GC level, please note that the bid should encompass the entire RACP scope of work to be performed including all associated construction work. The dollar amount bid on the project must include 100% of the work to be performed by the GC and the sub-contractors. Bidding at the GC level will require submission of bidding and construction related documents at the GC level only (see Sub-Contractor level below for a distinction)
- **Sub-Contractor Level** - If you choose not to solicit three bids for a General Contractor, then you are required to solicit a minimum of three bids for EACH Sub-Contractor covering all trades involved in the project. Note that any self-performed work by a non-bid GC is NOT an eligible cost for reimbursement OR match purposes. Bidding at the Sub-Contractor level will require submission of bidding and construction related documents at the sub level…meaning proof of

bidding, construction contracts, payment and performance bonds, insurance etc. will need to be provided for every sub-contractor in the RACP scope.

Professional Services: Professional services associated with the project are not required to be bid as these associated costs are only eligible as match.

Change Orders: Grantees and/or Sub-Grantees are not required to competitively bid out change orders as long as the work was within the RACP scope of the original bid and is less than 20% of the total contract. If a change order is for work beyond the RACP scope of work originally bid, the Grantee will be required to competitively bid out the new scope of work in order to be considered RACP eligible.

PENNSYLVANIA STEEL PRODUCTS PROCUREMENT ACT

The Office of the Budget (OB) cannot grant waivers to the Pennsylvania Steel Products Procurement Act (SPPA) unless the terms of the law change. All RACP Grantees must comply with the SPPA. If a Grantee/RACP project fails to abide by the SPPA, it does so at its own risk.

A full explanation on the RACP steel requirements is available as a PDF download.

Up to 2011, OB only accepted the ST-4 Form (justification for the use of foreign steel) that the Department of General Services (DGS) had exclusively devised to address exceptions linked to the requirements of the SPPA, when it was necessary. Since 2011, OB has approved the acceptability of two more DGS ST Forms (ST-2, ST-3) with some caveats, providing that the forms are properly filled out. The ST-1 Form will not be accepted by OB. It is not necessary for the ST-2, ST-3, and ST-4 Forms to be notarized.

Since 2013, OB has utilized the DGS Exempt Machinery and Equipment Steel Products listings as part of the RACP steel policy. DGS published a Statement of Policy - Steel Products Procurement in the Pennsylvania Bulletin Volume 43, Number 6 dated February 9, 2013 (See PA Bulletin #43, pages 85-86) that discussed their production of an annual list, based on their analysis of submitted ST-4 forms, which exempts certain steel products not produced domestically in sufficient quantity. DGS publishes an updated "Exemption List" annually.

Please be aware that ST forms are acceptable only in cases where nonstructural steel needs to be addressed. The DGS ST forms do not replace the steel certification forms associated with structural steel. OB will continue to require the submission of steel mill certifications to demonstrate compliance with the steel requirements for structural steel.

The PDF copies of the three acceptable ST Forms for RACP listed below can be obtained from the RACP website:

- ST-2 Steel Origin Certification: Non-Identifiable, Non-Structural Steel
- ST-3 75% U.S. Manufacture Certification
- ST-4 Not Domestically Manufactured: Prime Contractor (only to be used when requesting items to be exempted that are not found on the current year's List of Exempt Machinery and Equipment Steel Products)

It is suggested that the certifications be collected at the time any steel for the project is purchased and delivered to ease the collection process.

Be advised that OB DOES NOT need to approve the ST forms prior to the start of the construction period. The ST forms need to be submitted to demonstrate that compliance, when and where necessary, has been met.

We shall deem as ineligible all contracts that are unable to demonstrate compliance via the submission of steel certifications for Structural Steel and for Non-structural Steel the submission of steel certifications and/or ST forms and/or DGS Exempt Machinery and Equipment Steel Products List. Therefore, the value of construction contracts associated with non-compliant steel will be removed (both materials and labor costs) from the scope of the project, which may in turn affect the project's ability to leverage their full grant amount (project may not receive its full grant).

Recycled products, melted from previously used steel, are acceptable, providing that adequate documentation from the supplier has been furnished. The supplier shall certify that the recycled steel product was produced in the USA.

TRADE PRACTICES ACT

In accordance with the Trade Practices Act of July 23, 1968, P.L. 686 (71 P.S. § 773.101 et seq.), the Grantee cannot and shall not use or permit to be used in the work any aluminum or steel products made in a foreign country which is listed below as a foreign country which discriminates against aluminum or steel products manufactured in Pennsylvania. The countries of Argentina, Brazil, South Korea, and Spain have been found to discriminate against certain products manufactured in Pennsylvania. Therefore, the purchase or use of those countries' products, as listed below, is not permitted:

- **Argentina:** carbon steel wire rod and cold-rolled carbon steel sheet.
- **Brazil:** welded carbon steel pipes and tubes; carbon steel wire rod; tool steel; certain stainless steel products, including hot-rolled stainless steel bar; stainless steel wire rod and cold-formed stainless steel bar; pre-stressed concrete steel wire strand; hot-rolled carbon steel plate in coil; hot-rolled carbon steel sheet; and cold-rolled carbon steel sheet.
- **South Korea:** welded carbon steel pipes and tubes; hot-rolled carbon steel plate; hot-rolled carbon steel sheet; and galvanized steel sheet.
- **Spain:** certain stainless steel products, including stainless steel wire rod, hot-rolled stainless steel bars; and cold-formed stainless steel bars; pre-stressed concrete steel wire strand; and certain steel products, including hot-rolled steel plate, cold-rolled carbon steel plate, carbon steel structural shapes; galvanized carbon steel sheet, hot-rolled carbon steel bars, and cold-formed carbon steel bars.

Penalties for violation of the above paragraphs may be found in the Trade Practices Act, which penalties include becoming ineligible for public works contracts for a period of three years.

This provision in no way relieves the Grantee of responsibility to comply with those provisions which prohibit the use of foreign-made steel and cast iron products.

PUBLIC WORKS CONTRACTORS' BOND LAW (PAYMENT & PERFORMANCE BONDS)

The requirement for 100% payment and performance (P&P) bonds is a state law; the Office of the Budget cannot waive this requirement.

A performance bond must be obtained at 100% of the contract amount, conditioned upon the faithful performance of the contract in accordance with the plans, specifications, and conditions of the contract. Such bond shall be solely for the protection of the contracting body which awarded said contract.

A payment bond must be obtained at 100% of the contract amount. Such bond shall be solely for the protection of claimants supplying labor or materials to the Grantee, its contractor or to any of its subcontractors, in the prosecution of the work provided for in such contract, and shall be conditioned for the prompt payment of all such material furnished or labor supplied or performed in the prosecution of the work. "Labor or materials" shall include public utility services and reasonable rentals of equipment, but only for periods when the equipment rented is actually used at the site.

PA PREVAILING WAGE ACT (PWA)

The Office of the Budget cannot grant waivers for the PA Prevailing Wage Act. All Grantees must comply with the act. Grantees that fail to abide by the Prevailing Wage Act do so at their own risk. Please do not assume that PA Prevailing Wage is always consistent with your local union wages.

All projects should apply for a wage determination letter prior to the start of construction by registering the project with the PA Department of Labor and Industry to obtain the prevailing wage rates relevant to your project. This determination sheet will provide the necessary trade classifications for the project, along with their corresponding hourly wage and hourly fringe rates that are required for the certified payrolls required as part of RACP. The wage determination should be obtained within 120 days of the award of construction contracts. If necessary, the Department of Labor and Industry can issue determinations letters after construction has begun.

The prevailing wage information and forms can be found on the PA Department of Labor & Industry website.

AMERICANS WITH DISABILITIES ACT (ADA)

Typically your architect should provide a letter stating the plans and specs are in compliance with ADA regulations. Additionally, the Grantee agrees to comply with the General Prohibitions Against Discrimination, 28 C.F.R. § 35.130, and all other regulations promulgated under Title II of The Americans with Disabilities Act which are applicable to all benefits, services, programs, and activities provided by the commonwealth through contracts.

FIDELITY BONDS

The Grantee shall procure and furnish evidence to OB, of fidelity bonds with coverage to be maintained under the administrative title of the position, in amounts and for such positions as are reasonably determined by OB. Fidelity Bonding is also commonly known as "Employee Dishonesty Insurance."

Grantees should submit certificates of insurance to support fidelity bond coverage is in effect and the coverage amount meets or exceeds the RACP grant amount, or the coverage amount meets or exceeds the monthly project funding schedule contained in Appendix C of the grant agreement. For Grantees with multiple projects and/or grants larger than $5,000,000 the coverage amount can be the lesser of either $1,000,000 or 20% of the RACP grant amount(s).

INSURANCE REQUIREMENTS

- Worker's Compensation Insurance - The Grantee shall provide Worker's Compensation Insurance where required, and shall accept full responsibility for the payment of premiums for Worker's Compensation Insurance and Social Security, as well as income tax withholding and any other taxes or payroll deductions required by law for its employees who are performing services related to the project.

- General Liability & Property Damage Insurance - The Grantee will provide and maintain comprehensive general liability and property damage insurance in the minimum amount of $250,000.00 per person for injury and death in a single occurrence; $1,000,000.00 per occurrence for injury or death of more than one (1) person in a single occurrence; and $500,000.00 for a single occurrence of property damage, and which shall be endorsed to protect the commonwealth.

- Flood Insurance – If the project is wholly or partially within a floodplain, proof of sufficient flood insurance coverage must be provided. In any case, a project is required to provide a copy of a floodplain map of the project area, with the project site being delineated thereon.

Identify Commonwealth as Additional Insured: The commonwealth shall be listed on the above insurance policies as an additional insured. Upon request, the Grantee shall furnish proof of insurance as required by this section to OB.

RESTRICTIONS ON GOVERNMENTAL ENTITIES SELLING RACP PROJECTS

Article 8 of the RACP Grant Agreement spells out sale price restrictions for a governmental entity that sells property that was acquired and/or improved with RACP funds. The restrictions are required to insure that the Grantees CANNOT sell the property for a net gain or even recoup the value of the grant in the sale price. A PDF download is available that contains more information on Article 8.

Redevelopment Assistance Capital Program (RACP)

Frequently Asked Questions

November 2024

FREQUENTLY ASKED QUESTIONS

The following are frequently asked questions by Redevelopment Assistance Capital Program (RACP) Partners on RACP related projects.

Section 1 – Eligibility/Scope

Section 2 – Pre-Award/e-RACP Application

Section 3 – Post-Award/Project Management Proposal

Section 4 – Match Funding/Interim Financing

Section 5 – Grant Agreement

Section 6 – Special Conditions (Appendix B)

Section 7 – Reimbursement

Section 8 – Compliance/Bidding/PWA/Steel/etc.

Section 9 – Risk and Compliance

Section 1 – Eligibility/Scope

1. **WHAT TYPE OF GRANTEE IS RACP-ELIGIBLE?** Grantees must be either (1) a general-purpose form of local government unit (city, borough, township or county), (2) any public authority, (3) a federally designated Local Development District or (4) an industrial development agency, which has been certified as such by the Pennsylvania Industrial Development Authority (PIDA) board and which is itself or is acting through a wholly owned subsidiary exempt from federal taxation under section 501 (c) (3) of the Internal Revenue Code of 1986. The Grantee must follow strict guidelines to avoid jeopardizing the tax-exempt status of the bond funding.
2. **IS A SCHOOL DISTRICT AN ELIGIBLE GRANTEE?** A school district, which is a "special purpose of local government," would not be eligible because RACP Grantees must be authorities or "general-purpose forms of local government." (See the answer to Question 1 above.) However, a school district can be the Sub-Grantee of an eligible Grantee.
3. **DURING THE APPLICATION PROCESS, THE AGENCY THAT RECEIVED THE AUTHORIZATION FOR THE PROJECT WAS DISSOLVED AND ANOTHER ORGANIZATION PICKED UP THE PROJECT. MAY THE NEW ORGANIZATION USE THE RACP FUNDS TO COMPLETE THE PROJECT?** It depends on the circumstances of the dissolution. The Office of the Budget will treat such situations on a case-by-case basis. For instance, if the dissolution resulted in an acquisition or a merger, the project can be pursued.
4. **WHAT TYPE OF PROJECT IS RACP ELIGIBLE?** A project is eligible for a RACP grant if it has a cultural, civic, recreational, historical, regional, or multi-jurisdictional impact and generates substantial increases in employment, tax revenues or other measures of economic activity.
5. **WHAT TYPE OF PROJECT IS NOT RACP-ELIGIBLE?** Projects that are state-funded; facilities or projects that can normally obtain primary funding under other state programs; projects whose main purpose is for highways (including road and street improvements) and vehicular bridges, drinking water and wastewater facilities, housing units and waste disposal facilities are not eligible for RACP grants. If an RACP project does include and require improvements to housing, roads, bridges, tunnels, infrastructure, and/or drinking water/waste disposal/wastewater/stormwater systems, these improvements must not be the primary focus of the project. Per Act 77 of 2013, they must be associated with a project that is part of an economic development project; and in the case of housing, must be part of a community revitalization plan. These additional requirements for housing projects are not required if the funding is from a designated special allocation for housing. Projects located in a City Revitalization and Improvement Zone (CRIZ), and eligible for CRIZ benefits, are not eligible RACP projects. However, approved RACP grants that existed prior to zone approval shall not be restricted.
6. **IS THERE A MINIMUM THRESHOLD FOR A RACP PROJECT?** The statutes governing the RACP program require a minimum threshold of $1 million for each project before it can be funded.
7. **WHAT IS THE IMPORTANCE OF THE CAPITAL BUDGET PROJECT ITEMIZATION BILL TO MY PROJECT?** All grants awarded through RACP MUST be for projects included in one or more of the Capital Budget Project Itemization Acts passed by the General Assembly and signed into law by the Governor. You will need to 1) identify the appropriate Act(s) for which your project has been itemized and 2) verify that sufficient funding remains from said itemization in order to submit an e-RACP Application to RACP for consideration and evaluation of your project. Only

itemizations/projects from these Acts that have remaining "Project Allocation" amounts and that have not been statutorily "sunset" in accordance with Act 77 are eligible. No project expense paid prior to the project's Capital Budget Itemization Act's effective date is usable as a reimbursable and/or match item for the RACP project (excluding land match).

8. **OUR COMMISSIONERS HAVE A SALES AGREEMENT IN PLACE WITH A DEVELOPER AND WOULD LIKE TO PURCHASE A PARCEL OF LAND. MAY WE USE THE RACP GRANT TO BUY THE PROPERTY WHILE WE DECIDE WHAT TO BUILD ON IT?** The statutes governing the RACP grant program permit the use of RACP proceeds for land acquisition; however, this cannot be the entire scope of the RACP grant. Some of the grant funding must be used for construction activities. The Office of the Budget cannot reimburse on land only, without any construction work.
9. **MY CONSTRUCTION PLANS HAVE CHANGED SINCE I SUBMITTED MY PROJECT MANAGEMENT PROPOSAL. WHAT DO I NEED TO DO?** Changes to the project scope presented in the Project Management Proposal will be reviewed during the grant and scope development stage. If the change in scope is identified after the grant agreement has been fully executed the project will need to submit a rescope request to the Office of the Budget for review. It is not guaranteed that a revised scope will be approved by the Office of the Budget.
10. **ARE "ELIGIBLE COSTS" THOSE INCURRED AFTER THE LEGISLATIVE AUTHORIZATION DATE OR AFTER RECEIPT OF THE AWARD LETTER?** Costs are eligible after the legislative authorization date, assuming the costs meet all RACP requirements (bidding, prevailing wage, etc.). Your award letter included the Itemization Act number and the year your project received legislative approval. Your authorization date by month, day and year is listed in your Grant Agreement in Appendix B.
11. **MAY I MAKE A COMPLEX RACP PROJECT SIMPLER?** The Office of the Budget may allow this in instances where certain items can be carefully carved out to make a streamlined project. In doing so, you must remember that the simplified project must obey the spirit of the law, in that construction activities must occur and full compliance with our requirements must be met. All changes in scope need to be sent in writing to the Office of the Budget for review and approval.
12. **CAN MY RACP SCOPE BE LIMITED TO ONLY LAND ACQUISTION COSTS?** The Capital Facilities Debt Enabling Act defines a redevelopment assistance capital project as the 'design and construction of a project.' Therefore, the primary focus of all RACP projects should be on construction. The Office of the Budget cannot reimburse on land only, without any construction work. The allowance of RACP funds for land acquisition costs is at the discretion of the Office of the Budget, if allowed, RACP funding for acquisition costs is generally limited to no more than 30% of the total grant amount. This 30% maximum allowance includes any land acquisition and/or equipment costs. For land acquisition costs to be reimbursable, the purchase date must occur after the authorization date associated with the itemized project and have RACP construction activity occur on the site.

Section 2 – Pre-Award/e-RACP Application

1. **HOW DO I APPLY FOR A RACP AWARD?** The Candidate must submit an e-RACP Application to the Office of the Budget during an open Funding Round. The Candidate should refer to the Funding Round Schedules on the RACP website and choose the round that will be closest to the

anticipated start date of the project construction. All e-RACP applications must be submitted using the electronic single application (ESA) website.

2. **WHEN ARE THE RACP FUNDING ROUNDS OPEN?** Funding Rounds are opened and closed at the discretion of the Governor. The RACP website will be updated to provide notice of when a new round will be open.
3. **HOW DO I CHOOSE AN ITEMIZATION?** When choosing an itemization to apply for a RACP award look for the following items:
    - Locate the county that the project site is located.
    - Verify that the entity/location noted in the municipality column corresponds to the site location and/or is directly related to the project.
    - Verify that the Act's LAD Date is prior to any incurred project costs.
    - Verify the Act's Project Description fits your project scope.
    - Verify that the act has a remaining available act amount equal to or greater than the amount of funding being requested.
4. **HOW DO I GET MY PROJECT ADDED TO AN ITEMIZATION ACT?** Potential projects are added to Capital Budget Project Itemization Bills by members of the House of Representatives, Senate, and Administration.
5. **HOW WILL I KNOW IF MY PROJECT WAS SELECTED FOR AN AWARD?** All recipients of RACP funding will be notified via an Award Letter sent to the contact person noted in the e-Application. The Award Letter will provide further instructions on the RACP grant process.

Section 3 – Post-Award/Project Management Proposal

1. **WHAT IS A PROJECT MANAGEMENT PROPOSAL?** This is a new streamlined post award application that replaces the prior formal Application and Business Plan (A&BP). Any funding recipient that has not yet submitted a formal Application and Business Plan should now complete a Project Management Proposal (PMP) for the project. The PMP submission would supersede the need to submit the formal A&BP.
2. **WE HAVE RECEIVED AN AWARD LETTER FOR THE RELEASE OF FUNDING FOR OUR RACP PROJECT. WHAT DO WE NEED TO DO TO OBTAIN THE FULL GRANT AMOUNT?** After the release of funding for a RACP project is approved, the Office of the Budget issues an Award Letter to serve as written notification authorizing the preparation and submission to the Office of the Budget of a post award application for the project. Grant Recipients are required to notify the Office of the Budget within 30 days of receipt of an Award Letter as to whether or not they are accepting the grant. The Project Management Proposal (PMP) contains sections that must be addressed, including the match amount, budget, and detailed sources of funding. A Project Management Proposal Template can be downloaded from the RACP website, in addition a Project Management Proposal Handbook can be downloaded from the RACP website and contains the necessary instructions for the preparation of the PMP. The Project Management Proposal must be submitted in electronic format (PDF) via upload to an RACP FTP site. The eligible Applicant/Grantee designated for the project will be emailed a unique Username and Password to access this FTP site within approximately 3 weeks of receiving the Award Letter.

3. **GIVEN THE DIRECTIVE REGARDING THE FILING OF THE PROJECT MANAGEMENT PROPOSAL WITHIN SIX MONTHS OF THE AWARD LETTER, WILL THE FUNDING BE TERMINATED FROM A PROJECT EVEN IF AN EXTENSION REQUEST HAS BEEN SUBMITTED BEFORE THE DEADLINE?** The Office of the Budget must receive the Project Management Proposal within six months of the date of the Award Letter. If the Grantee fails to submit the Project Management Proposal within the allotted time frame, funding for the project may be terminated.
4. **I HAVE SUBMITTED MY PROJECT MANAGEMENT PROPOSAL. WHAT HAPPENS NEXT?** Once the Office of the Budget receives a Project Management Proposal, the Office of the Budget conducts a preliminary review and hires a consultant to conduct an exhaustive review. A consultant will contact you to set up the Project Management Proposal review. After the consultant completes the review, he or she sends a report to the Office of the Budget. The Office of the Budget is then able to draft the agreement between the Commonwealth and the Grantee.

Section 4 – Match Funding/Interim Financing

1. **MAY WE USE OUR MORTGAGE AS A MATCH FUNDING SOURCE?** Generally, the Office of the Budget allows mortgages to be used as match funding as long as adequate supporting documents are available. The adequacy of any document is at the discretion of the Office of the Budget. We would be looking for terms of at least 10 years on any financing instruments.
2. **WHAT ARE THE REQUIREMENTS FOR HAVING THE MATCH FUNDING SECURED?** One-half (50%) of the match funding must be secured at the time of the Project Management Proposal submission and before the grant agreement is drafted. After the grant agreement has been drafted, the Applicant/Grantee must document that 100% of the match funding is readily available before the Office of the Budget will start the reimbursement process. Signed pledges that are not yet received may count as the secured match only before the grant agreement is drafted. After that, evidence of the availability of the match (a cash receipt) must be demonstrated. Loans intended for match funding must be in the form of a long-term financing instrument.
3. **WHY MUST LOANS INTENDED FOR MATCH FUNDING BE IN THE FORM OF A LONG-TERM FINANCING INSTRUMENT?** The Capital Facilities Debt Enabling Act requires that RACP projects be funded from proceeds of Commonwealth of Pennsylvania General Obligation (GO) bonds. GO bonds issued to finance the RACP grant program have a publicized maturity term of 10 years. Consequently, when a RACP Grantee uses loans as match funding, they must have a maturity cycle that demonstrates the long-term viability of the project. Past experiences have shown that RACP projects that use loans as match funds are in a better position to withstand economic downturns when those loans are in the form of a long-term financing instrument.
4. **MAY WE USE A SIX-MONTH LINE OF CREDIT AS A MATCH FUNDING SOURCE?** A six-month line of credit is not viewed as long-term financing; therefore, it would be ineligible for RACP matching purposes. Loans used as match funding should be in the form of a long-term financing instrument.
5. **WE HAVE A SHORTFALL. MAY I USE MY LINE OF CREDIT AS A SECURED FINANCING INSTRUMENT FOR THE MATCH PORTION OF THE PROJECT?** Asking the Office of the Budget to recognize lines of credit or a business line as secured financing for the shortfall on a project is not satisfactory.

The Office of the Budget accepts lines of credit as sources of interim financing but not as secured match funding.

6. **WHAT IS THE PURPOSE OF INTERIM FINANCING?** All RACP projects are required to have permanent match funding in place for the match costs associated with that particular project. RACP is a reimbursement-based program. Consequently, a project will need to have interim financing in place to pay for monthly construction expenses before it can receive the RACP grant. Interim financing is also needed to bridge the gap between the time a Payment Request is submitted and the time a payment is disbursed. Please refer to the Grant Agreement and Drawdown section above for more information on the payment processing time.
7. **MAY THE ENTIRE MATCH BE LAND?** The appraised value (see below Question #8 for appraisal requirements) of land and buildings may typically serve as part of the match. The Office of the Budget would need to know the full cost of the project before saying land may be the sole match. Acceptance of land as the entire match would be at the sole discretion of the Office of the Budget. Any time that land is used in part or in total for the match, the grant recipient should own the property that is being listed as the match and would need to supply a copy of the title or deed. No lien is placed on the deed by the Office of the Budget.
8. **WHAT DO I NEED TO PROVIDE TO SHOW THE VALUE OF LAND TO BE USED AS MATCH?** Land match valuation is legislatively required to be supported by a "certified appraisal". The certified appraisal needs to include the sales comparison method as at least one of the methods used by the appraiser to compute an "as-is" value. The "as-is" value should be before/without including any of the RACP scope of work in the valuation. If the RACP scope of work was started and/or completed before the valuation is computed, then a "retroactive" certified appraisal would be required.
9. **MAY FEDERAL OR MUNICIPAL FUNDS BE USED AS THE MATCH FUNDING SOURCE?** Yes, federal and local funds that are specifically earmarked for the project may serve as the match. Certain federal tax credits may also be used as the match. The statutes governing the RACP grant program do not allow the leveraging of other state funds within the confines of the RACP-defined project. Therefore, all other state funds must be removed from the project scope.
10. **OUR AWARD IS FOR $2 MILLION, BUT OUR SPECIAL CONDITIONS STATE THAT WE NEED TO DOCUMENT SECURED MATCH FUNDING OF $4 MILLION. WHY DO WE NEED TO DOCUMENT A MATCH FOR MORE THAN THE $2 MILLION GRANT AMOUNT IF THE TOTAL PROJECT AMOUNTS TO $6 MILLION?** You are required to document any and all of the match funding necessary to complete the project. Your total project cost is $6 million, and the grant is $2 million; therefore, you would need to document a match of $4 million, which is the balance of the project cost. The Office of the Budget wants to make sure that you have enough non-state funding to complete the project. In essence, the total project cost minus the RACP grant amount is the amount you need to document for the match.
11. **WE DO NOT HAVE ANY MATCHING FUNDS. CAN YOU WAIVE THIS REQUIREMENT TO FACILITATE THE RECEIPT OF THE STATE GRANT?** The requirement for matching funds cannot be waived. The RACP program requires that one-half (50%) of the match funding be secured at the time of the Project Management Proposal submission and before the grant agreement is drafted. Therefore, without matching funds, there is no RACP grant. The RACP grant operates on a proportional reimbursement basis. As the Grantee incurs and pays construction expenses, the Commonwealth will reimburse – contingent upon the corresponding expenditure of match funding.

12. **THERE IS THE POSSIBILITY OF IN-KIND SERVICES FOR OUR PROJECT. FOR EXAMPLE, ONE OF THE CONTRACTORS AGREED TO DO SOME WORK AT NO CHARGE. MAY WE COUNT THE FAIR VALUE OF IN-KIND GIFTS TOWARD OUR MATCH?** While it would clearly be beneficial to a RACP project to have such a donated gift, it cannot count toward the match, since all work must comply with the stated conditions, such as being contracted for and bid out and paying the prevailing wage.

Section 5 – Grant Agreement

1. **HOW IS MY GRANT AGREEMENT VALIDATED AND EXECUTED?** The draft grant agreement, including any applicable special conditions, is sent to the Grantee for signature. Once it is signed and returned to the Office of the Budget, it is circulated within the Commonwealth for validation and execution, a procedure that typically lasts from eight to ten weeks. The signatories are the Secretary of the Budget; the Office of the Budget's Chief Counsel; the Deputy General Counsel; the Deputy Attorney General; and the Comptroller.
2. **WHAT IS THE AVERAGE TIME TO HAVE THE GRANT AGREEMENT EXECUTED?** In most cases, after receiving the signed grant agreement from the Grantee, it can be executed within ten (10) to twelve (12) weeks of receipt of the Project Management Proposal review report.

Section 6 – Special Conditions (Appendix B)

1. **WHAT ARE "SPECIAL CONDITIONS"?** Special conditions are additional documentation that Grantees must submit in order to receive any grant funding. The special conditions are located in Appendix B to the grant agreement.
2. **HOW DO I SATISFY MY SPECIAL CONDITIONS**? After the grant agreement is fully executed, a six (6) month time period is set to submit documentation to satisfy the special conditions. Grantees must submit the original special conditions documentation to the Office of the Budget and send a copy to the state consultant assigned to their project. Transmittal letters should be included with all submissions of documents to the Office of the Budget and the consultant. All transmittals should reference the contract number found on the first page of the executed Grant Agreement.
3. **CAN I SUBMIT MY SPECIAL CONDITIONS PACKET ELECTRONICALLY?** All submissions of Special Conditions Documents must be done via upload to RACP's specified FTP site. The eligible Applicant/Grantee designated for the project should have been emailed a unique Username and Password to access the RACP FTP site after receiving their award letter. Special Conditions are outstanding documentation that is required to be submitted prior to an entity being eligible to receive grant funds. They are found in Appendix B of a typical RACP Grant Agreement. Please refer to Project Management Proposal Handbook for information on how to access the RACP FTP site. Note: Please upload the documents to the "Special Conditions" sub-folder at this stage of the grant process.
4. **MY SIX-MONTH TIME PERIOD FOR SUBMITTING DOCUMENTATION TO SATISFY THE SPECIAL CONDITIONS IS NEARING, CAN I OBTAIN AN EXTENSION?** You can submit an extension request to the Office of the Budget stating the need for the extension, the reason(s) why the original deadline could not be met and your current project status. The Office of the Budget will review

your request and, if significant progress has been made, may grant an extension. You will receive written notification if such an extension is granted.

5. **ONE OF MY SPECIAL CONDITIONS REQUIRES A COOPERATION AGREEMENT TO BE SUBMITTED FOR REVIEW AND SUBSEQUENT APPROVAL. IS THERE A COOPERATION AGREEMENT TEMPLATE AVAILABLE?** Due to the unique relationship associated with the parties executing a Cooperation Agreement, the Office of the Budget (OB) is unable to provide a template that would accommodate the uniqueness of each RACP project. The agreement should outline the responsibilities of each party and include the following four elements: 1) RACP project name; 2) ME 300-xxxx; 3) RACP grant award amount; and 4) an indication that the Sub-Grantee(s) will comply with the terms and conditions of the RACP Grant Agreement and Redevelopment Assistance program. Please note that dependent on your project's situation, OB may request additional elements be added.
6. **I HAVE JUST RECEIVED MY GRANT AGREEMENT WITH THE SPECIAL CONDITIONS LISTED. I HAVE ALREADY INCURRED CONSTRUCTION COSTS FOR REIMBURSEMENT. MAY I SUBMIT A PAYMENT REQUEST BEFORE MY SPECIAL CONDITIONS ARE SATISFIED?** You may submit your Payment Request forms while you are still submitting documentation and waiting for special conditions to be approved by the Office of the Budget. We can begin to process both items simultaneously. Please keep in mind, however, that no grant payment can be released until the special conditions have been satisfied, the compliance requirements have been met, and the Payment Request has been reviewed and accepted by the Office of the Budget.

Section 7 – Reimbursement

1. **MY SPECIAL CONDITIONS HAVE BEEN SATISFIED, AND I SUBMITTED MY FIRST PAYMENT REQUEST. NOW WHAT HAPPENS?** When reviewing a Payment Request, Office of the Budget looks at the Payment Request forms, the verifying documentation for appropriate cost categories, and the latest construction monitoring report from the Commonwealth assigned consultant. No funds can be released until all special conditions are satisfied and the project is in compliance. Once the review process is completed by the Office of the Budget, the Payment Request is then sent to the Comptroller's Office, who then sends it to the Treasury Department. For this reason, adequate interim financing should be in place to bridge the gap between the time a Payment Request is submitted and the time a payment is actually disbursed. Please see the match funding/interim financing section for more information on interim financing.
2. **HOW DOES THE RACP REIMBURSEMENT PROCESS WORK?** Once all special conditions to the Grant Agreement have been satisfied and compliance met, Commonwealth grant funds will become available for reimbursement. The RACP grant program operates on a proportional reimbursement basis. As the Grantee incurs and pays construction expenses, the Commonwealth will reimburse – contingent upon the corresponding expenditure of matching funds. Sufficient documentation regarding reimbursable expenditures and matching expenditures should be provided with any request for reimbursement.
3. **WHEN MAY I START MY DRAWDOWN?** Grantees may start submitting their Payment Requests for reimbursement as soon as they have started construction and paid eligible costs. Reimbursements are subject to compliance with the RACP Grant Agreement and the satisfaction

of all the special conditions listed in Appendix B to the contract. The monthly drawdown amount is subject to the limitations shown in Appendix C to the Grant Agreement.

4. **WILL I RECEIVE RACP GRANT FUNDS UP FRONT JUST BY ASKING FOR THEM?** During construction activities, the project is monitored for compliance by the consultant assigned to the project during the Project Management Proposal process. The Office of the Budget is required to reimburse the RACP grant on a proportional basis based on the corresponding expenditure of matching funds. It is important to know that the entire scope of the project must: (1) be in compliance with all RACP requirements listed in the Grant Agreement, such as those governing bidding, adherence to the Prevailing Wage Act and use of domestic steel and (2) satisfy all of the special conditions identified in the agreement between the Office of the Budget and the grant recipient before access to the RACP funding is granted. After the project reaches 100% completion, a portion of the grant may be retained pending satisfactory compliance of all RACP program requirements.
5. **WHERE MAY I DOWNLOAD THE PAYMENT REQUEST FORMS?** All reimbursement materials can be downloaded from RACP Handbook & Forms section on the RACP section of the Office of the Budget Web site.
6. **CAN I BE REIMBURSED FOR LAND ACQUISITION COSTS?** The allowance of RACP funds for land acquisition costs is at the discretion of the Office of the Budget. If allowed, RACP funding for acquisition costs is generally limited to no more than 30% of the total grant amount. This 30% maximum allowance includes any land acquisition and/or equipment costs. Land Acquisition Costs cannot be the sole use of RACP funds. The primary focus of the RACP scope of work should be construction. For land acquisition costs to be reimbursable, the purchase date must occur after the authorization date of the itemized project and have RACP scope construction activity occur on the site.
7. **CAN I BE REIMBURSED FOR EQUIPMENT COSTS?** The allowance of RACP funds for equipment costs is at the discretion of the Office of the Budget. If allowed, RACP funding for equipment costs is generally limited to no more than 30% of the total grant amount. This 30% maximum allowance includes any equipment and/or land acquisition costs. Equipment costs cannot be the sole use of RACP funds. The primary focus of the RACP scope of work should be construction. For equipment to be reimbursable, it must be fixed to the realty, have a substantial useful life, and be directly related to the RACP project. Documentation of the useful life must be provided.
8. **WHEN SUBMITTING A REIMBURSEMENT REQUEST, WHAT SUPPORTING DOCUMENTATION IS REQUIRED FOR MATCH ONLY COST CATEGORIES?** Payment Request submissions must include all supporting documentation, including copies of invoices and proof of payment, for all cost categories whether they are reimbursable or match only. Typical proof of payment consists of the front & back of canceled checks. Alternate proof of payment can consist of the front of a check & bank statement confirming withdrawal from the payor's account, electronic payment records (provided they clearly identify the payor, payee, dollar amount and date), or something similar. The Office of the Budget also reserves the right to request additional information and/or documentation after review of an initial payment request submission up to and including during performance of the legislatively mandated close-out audit.
9. **WHAT CAN BE USED AS MATCH COSTS?** Typically, match costs include administration, legal, financing/accounting, architectural/engineering, land, furniture, fixtures, equipment, and relocation costs that are directly related to the RACP project. Expenses paid before the authorization date are not eligible RACP costs (use of land as match ONLY is permissible.)

10. **IS ANYONE FROM THE OFFICE OF THE BUDGET AVAILABLE TO MEET WITH ME TO GO OVER THE RACP PROCESS AND EXPLAIN HOW TO PREPARE THE PAYMENT REQUEST FORMS?** Yes, the Grantee/Sub-Grantee (or their designated representatives) may request, at no cost to them, a facilitation meeting with an Office of the Budget employee involved in the RACP program. It is strongly suggested that meetings be held at the beginning of construction to go over the process and the preparation of the Payment Request forms. Requests for meetings should be made to the Office of the Budget RA-OB-RACP@pa.gov. Past experience has shown that these meetings are very beneficial to the successful culmination of the grant process.
11. **MAY I RECEIVE MY GRANT DISBURSEMENT DIRECTLY INTO MY CHECKING ACCOUNT?** Yes, all grant disbursements are now being made to Grantees through the Commonwealth's Automated Clearing House (ACH) Network, which are commonly known as direct deposits. All Grantees must submit or must have already established its ACH information in the Commonwealth's Master Database. Grantees/grant recipients should register as a Non-Procurement Vendor. Non-procurement vendor help is available here. Note: It is the responsibility of the Grantee to ensure that the ACH information contained in the Commonwealth's Master Database is accurate and complete. Failure to maintain accurate and complete information may result in delays in grant disbursements.
12. **DOES THE OFFICE OF THE BUDGET HOLD A CERTAIN PERCENTAGE OF THE PAYMENT? IF SO, HOW MUCH DOES IT HOLD?** Our retainage procedure differs from the typical procedure in the construction industry. The Office of the Budget reserves the right to retain up to 10% of the total grant amount. The retainage is calculated and applied after the Grantee submits the final Payment Request for reimbursement. The retained amount will be withheld from any amount due in the final Payment Request(s). The Grantees will be contacted, and the retainage will be released after the close-out audit has been successfully completed.
13. **ARE RACP GRANTS TAXABLE, AND WILL I RECEIVE A 1099 FOR THE GRANT PROCEEDS?** The Office of the Budget enters into grant agreements with various entity types, per criteria established in the Capital Facilities Debt Enabling Act. The Office of the Budget does NOT provide tax, legal or accounting advice. Grantees/Sub-grantees should consult a qualified tax professional with respect to the tax consequences of receiving RACP funds. The Office of the Budget does not issue Form 1099-MISC for grants awarded through RACP.

Section 8 – Compliance/Bidding/PWA/Steel/etc.

1. **IS COMPLIANCE WITH THE GRANT AGREEMENT MONITORED DURING THE PROJECT'S CONSTRUCTION?** One of the Commonwealth's consultants will contact you to go over the construction monitoring phase review procedures. Usually, some type of monitoring begins when the Project Management Proposal review report is submitted. Periodic construction monitoring reports will be prepared by the consultant and submitted to the Office of the Budget and to the Grantee/Sub-Grantee once construction has begun. These reports are the basis for the Payment Request review procedures performed to determine ongoing compliance before Commonwealth funds are released. The project must be in full compliance to receive and continue to receive any RACP funds.
2. **I NEED TO LET OUT MY BIDS. WHAT ARE THE BIDDING REQUIREMENTS?** The sole and exclusive bidding requirement for RACP projects is in the Capital Facilities Debt Enabling Act (Act 1 of 1999, as amended), which states, "Notwithstanding any other provision of law, the solicitation of a

minimum of three written bids for all contracted construction work on redevelopment assistance capital projects shall be the sole requirement for the composition, solicitation, opening and award of bids on such projects. Notwithstanding the foregoing, the construction work shall be performed subject to the act of March 3, 1978 (P. L. 6, No. 3), known as the Steel Products Procurement Act." This means that all prime contractors, general contractors, and subcontractors must be bid. Please note that solicitation is meant to indicate the act of actively asking, seeking, or pursuing firms to complete construction-related services based on the RACP-defined project scope. The law mandates that three written solicitations must be pursued; therefore, phone solicitations will not meet RACP bid requirements. Please be advised that self-bidding election must be approved by our Legal Department prior to bidding the RACP-delineated project scope. Please be advised that the bidding requirements would be satisfied if the RACP-defined project is publicly bid. The bidding format is at the discretion of the project representatives and subject to local requirements on trades composition.

3. **CAN THE BIDDING REQUIREMENT BE WAIVED?** Unless the terms of the law change, the Office of the Budget cannot grant waivers for bidding requirements to Grantees.
4. **DO I NEED TO BID FOR EACH SEPARATE TRADE IF MY GENERAL CONTACTOR WAS BID FOR THE WHOLE CONTRACT AMOUNT?** RACP projects are not subject to separation of trades. You simply need to solicit three bids for "all generally contracted work,". You do not need to take the lowest bid however; you must provide the Office of the Budget with an explanation as to why the lowest bidder was not selected.
5. **DOES MY CONSTRUCTION MANAGER POSITION HAVE TO BE BID?** Construction manager services do not have to be bid. However, if the construction manager is not bid and serves mostly as a project manager/administrator, his or her costs could count only as match. The Office of the Budget will not reimburse any of the construction manager costs if they self-perform any of the construction work, since that work was not bid. Additionally, in order to protect the project/owner, performance and payment bonds must cover 100% of the total value of the construction.
6. **MAY RACP FUNDS BE USED TO COMPLETE A DESIGN/BUILD PROJECT?** You may proceed with a design/build approach and select whomever you want. However, in order to meet the RACP bidding requirement, the Office of the Budget will examine the bidding of the various subcontractors. To the extent the winning design/build contractor self-performs some of the construction work, you will need to demonstrate that you solicited three bids for the design/build approach. In addition, design costs are not reimbursable. Only the following costs are reimbursable: Construction, interest during construction, land (subject to certain restrictions) and permits.
7. **I INTEND TO SOLICIT BIDS VIA ELECTRONIC MEANS. WHAT DOCUMENTATION DO I NEED TO PROVIDE TO SUPPORT BID COMPLIANCE WITH RACP REQUIREMENTS IF THE BID SOLICITATION METHOD WAS PERFORMED VIA ELECTRONIC MEANS?** Please, be advised that the use of an electronic bidding software packages or free/paid website to solicit bids does not preclude/waive the requirement that documentation to support compliance with RACP bidding requirements be submitted for review. Please also note that if an electronic bidding software package or free/paid website is utilized to conduct the bid solicitation, a signed and notarized explanation on letterhead of the entity that conducted the bid solicitation will need to be submitted. The letter should include details, such as the name of the bidding software package or free/paid website used, how

it works, date and time the solicitation was sent out, and any relevant information deemed appropriate by OB. Please ensure that copies of the electronic records are maintained, saved and available for submission to support compliance with RACP bidding requirements. The types of electronic records, which should be maintained and saved for submission should include, but is not limited to, copies of 1) emails - regular/standard and/or invitation to bid sent to the various contractors; 2) replies/queries; 3) emails/other written documentation, which indicate a decline to bid or will not bid status 4) documentation (i.e. bid forms, description of work, plans and specifications, etc.) emailed or made available for download as part of the bid solicitation; 5) transaction-type logs, which contain information, such as a) the work being solicited, b) the contractors solicited, and c) the date and time-stamp of when the solicitation was sent out; 6) screenshots; and 7) proposals received.

8. **OUR GENERAL CONTRACTOR / CONSTRUCTION MANAGER WAS SELECTED. MAY OUR GENERAL CONTRACTOR / CONSTRUCTION MANAGER SELF-BID ON THE CONSTRUCTION WORK WITHIN THE RACP-DEFINED PROJECT SCOPE?** Please be advised that any self-bidding election must be reviewed and approved by our Legal Department prior to its occurrence in any phase of the construction work within the RACP-defined project scope. To assist you better, please forward the following detailed information, which includes, but is not necessarily limited to:
    - the exact method the bid solicitation will be conducted.
    - who will be in charge of the bidding process.
    - who will solicit the contractors.
    - who will receive the proposals.
    - what method will the proposals be submitted.
    - who will open the proposals.
    - who will be present at the opening of the proposals.
    - who will conduct any negotiations (i.e., value engineering) prior to contract award;
    - who will determine who the contract is awarded to, etc.
    - Please note that the above requested information will need to be reviewed by our Legal Department. The review process could take a number of weeks before a decision is rendered. If a project pursues and/or completes any self-bidding process prior to the review and approval of OB Legal, the project does so at its own risk. Contracts that have deemed to be non-bid complaint are not eligible for reimbursements, nor match.
9. **ARE BID SOLICITATIONS REQUIRED FOR EQUIPMENT PURCHASES?** Bid solicitation is not required for equipment purchased separately. Please note that IF the purchase of equipment also includes installation services, the contract is NOT subject to PA Prevailing Wage Act. However, if the equipment contract does not include the installation, then the labor associated with the installation IS subject to PA Prevailing Wage Act AND the labor associated with the installation of the equipment must be bid. Please be advised that in both cases, the labor component cannot be disassociated from the purchased equipment. It is discretionary to the Office of the Budget what type of items fall into the equipment category and are RACP-eligible costs. Please be further advised that equipment and the labor associated with the installation of the equipment must both be present and directly related to the RACP-delineated scope.
10. **WE DO NOT HAVE ANY CERTIFIED PAYROLLS TO DEMONSTRATE COMPLIANCE WITH THE PENNSYLVANIA PREVAILING WAGE ACT. CAN THIS REQUIREMENT BE WAIVED TO FACILITATE THE RECEIPT OF THE STATE GRANT?** The Office of the Budget cannot grant waivers for the

Prevailing Wage Act. All Grantees must comply with the act. Grantees that fail to abide by the Prevailing Wage Act do so at their own risk. Additionally, the Grantee/Sub-Grantee must provide a copy of the Department of Labor & Industry's Pennsylvania Prevailing Wage Determination Letter issued for the specific project to demonstrate compliance with the Prevailing Wage Act. The project should apply to the Department of Labor & Industry for the determination letter before construction begins. If necessary, the Department of Labor & Industry can issue determination letters after construction has begun. Prevailing wage information and forms can be found at: Visit the Labor and Industry website to obtain Prevailing wage information and forms.

11. **WE DO NOT HAVE ANY STEEL CERTIFICATES TO DEMONSTRATE COMPLIANCE WITH THE PENNSYLVANIA STEEL PROCUREMENT ACT. CAN YOU WAIVE THIS REQUIREMENT TO FACILITATE THE RECEIPT OF THE STATE GRANT?** The Office of the Budget cannot grant waivers for the Pennsylvania Steel Procurement Act unless the terms of the law change. All Grantees must comply with the Steel Procurement Act. Steel certificates noting milled/manufactured in the United States are required to document compliance with the Steel Act and must be supplied for all structural steel. The appropriate ST form or DGS Exemption letter will be necessary for non-structural steel to be in compliance. If a Grantee fails to abide by the Pennsylvania Steel Procurement Act in anticipation of a waiver, it does so at its own risk.
12. **OUR CONSTRUCTION CONTRACTOR CANNOT OBTAIN THE 100% OF CONSTRUCTION COST PERFORMANCE AND PAYMENT BOND REQUIREMENT. CAN THIS BE WAIVED?** The requirement for 100% performance and payment bonds is a state law. The Office of the Budget cannot waive that requirement.
13. **THE GRANT AGREEMENT REQUIRES EVIDENCE OF FIDELITY BOND COVERAGE, IS THERE A MINIMUM AMOUNT OF COVERAGE NEEDED?** Grantees should submit certificates of insurance to support fidelity bond coverage is in effect and the coverage amount meets or exceeds the RACP grant amount, or the coverage amount meets or exceeds the monthly project funding schedule contained in Appendix C of the grant agreement. For Grantees with multiple projects and/or grants larger than $5,000,000 the coverage amount can be the lesser of either $1,000,000 or 20% of the RACP grant amount(s).
14. **DO I NEED A PROJECT SIGN OR ACKNOWLEDGEMENT FOR MY RACP FUNDED PROJECT?** Yes, the RACP grant agreement requires the acknowledgement of Commonwealth financial assistance. Depending on the timing of the RACP award, Commonwealth funding acknowledgment should be displayed upon the commencement of the project, but no later than the effective date of the project's grant agreement. The erected project sign should state "Financial Assistance provided by the Commonwealth of Pennsylvania, Honorable [name of current governor], Governor." Any publications concerning the project should also acknowledge Commonwealth financial assistance in the same manner. Acknowledgement of Commonwealth financial assistance may be combined with an acknowledgement of other funding sources on the project sign(s) and in project publications, provided that the acknowledgement of Commonwealth assistance shall be listed first and no less prominently than any other source.
15. **CAN I USE A PURCHASING COOPERATIVE, SUCH AS COSTARS, KEYSTONE PURCHASE NETWORK (KPN), OR TIPS-USA PURCHASING COOPERATIVE, TO MEET RACP BIDDING REQUIREMENTS?** Selecting pre-qualified contractors from a purchasing cooperative does NOT meet RACP bid requirements. If a RACP project wishes to utilize a purchasing cooperative for bidding, their written solicitation must be for the specific stated RACP scope of work / trades covered under

the RACP scope. Further, it must be sent to a minimum of three construction contractors - whether all from the purchase cooperative list OR partly from the purchase cooperative list and partly "outsiders" (i.e., those not part of the purchasing cooperative) - to comply with RACP bidding requirements. Please note one of the key important components here is that when the written solicitation occurs, it covers the specific RACP scope and not a general scope of work. Prior to proceeding with any contractor selection via purchasing cooperatives, project representatives can request a preliminary bid compliance review and further guidance by sending an email to RA-OB-RACP@pa.gov.

Section 9 – Risk and Compliance

1. **I HAVE BEEN CONTACTED BY A STATE RISK AND COMPLIANCE OFFICER TO SET UP A CONFERENCE FOR ACLOSE-OUT AUDIT OF MY RACP PROJECT FOR WHICH I RECENTLY SENT IN MY LAST PAYMENT REQUEST. IS THIS NORMAL?** Yes. All RACP projects must have a legislatively mandated close-out audit performed to comply with Act 39 of 1993 and in accordance with Article 5 of your grant agreement.
2. **THE LIST OF DOCUMENTS THE RISK AND COMPLIANCE OFFICER SENT ME TO HAVE AVAILABLE FOR THE CLOSE-OUT AUDIT INCLUDES DOCUMENTATION PREVIOUSLY SUPPLIED TO THE STATE CONSULTANT FOR MY PROJECT. DOES THE SAME DOCUMENTATION NEED TO BE REVIEWED AGAIN?** Yes. Keep in mind that the state consultant is part of the monitoring process. The risk and compliance officer will need to examine documentation to be able to render a close-out audit opinion. The Grantee/Sub-Grantee must keep all documentation concerning the project costs and RACP compliance and make it available during the close-out audit period. Many times, the list will include documentation previously submitted to the Office of the Budget in order to satisfy special conditions.
3. **WHO WILL BE PERFORMING THE CLOSE OUT AUDIT OF MY RACP PROJECT?** A close-out audit will be performed by the Office of the Budget or its representative for all projects. The Grantee will not be required to pay for this close out audit.
4. **MY RACP PROJECT WILL BE COMPLETED IN PHASES, WILL AN AUDIT BE COMPLETED AFTER EACH PHASE OR AT THE COMPLETION OF ALL PHASES?** In the interest of document availability, once a specific phase is completed the Office of the Budget will perform an audit on that phase. After completion of all phases, a final close-out audit will be performed.

Redevelopment Assistance Capital Program (RACP)

Steel Guidance

November 2024

GUIDANCE ON STEEL CERTIFICATION

The following guidance is a clarification from the Office of the Budget (OB) regarding the requirements associated with the Pennsylvania Steel Products Procurement Act (SPPA) relative to the RACP program whose statutes are regulated under Act **1** of 1999, as amended. In the past, many grantees have inquired about specific cases and we were able to provide each individual project with specific directions. Additionally, we had only accepted the ST-4 form that the Department of General Services (DGS) had exclusively devised to address exceptions linked to the requirements of the SPPA in the handling of special cases or exceptions. Please note that cost consideration (or convenience) is not an acceptable justification that the ST-4 form can address. Filled out ST-4 forms premised on cost consideration will not be accepted by OB.

OB accepts two DGS ST forms (ST-2 and ST-3) with some caveats, providing that the forms are properly filled out. The ST-1 form is NOT a valid option and shall NOT be accepted by OB. It is not necessary for the ST-2, ST-3, and ST-4 forms to be notarized. Please, be advised that this guidance is specifically tailored to suit the published and programmatic needs of OB as the overseer of RACP program. This is not a commonwealth-wide policy. Any attempt to impose this guidance on other state agencies is strongly discouraged.

Please, be aware that the aforementioned ST forms are acceptable only in cases where non-structural steel needs to be addressed. The DGS ST forms do not replace the steel certification forms associated with structural steel. It remains the responsibility of the project representatives to provide documented evidence that a non-structural steel product is not domestically produced in sufficient quantities.

OB shall continue to require that steel mill certifications be submitted to demonstrate compliance with the steel requirements. Please, be further advised that OB DOES NOT need to approve the ST forms prior to the start of the construction period. The ST forms need to be submitted to demonstrate that compliance, when and where necessary, has been met. The ST forms exceptions are displayed below. Please submit questions to RA-OBRACP-Steel-Cost@pa.gov.

It is suggested that the certifications be collected at the time any steel for the project is purchased and delivered to ease the collection process.

Since 2013, OB has utilized the DGS Exempt Machinery and Equipment Steel Products listings as part of the RACP steel policy. DGS published a Statement of Policy - Steel Products Procurement in the Pennsylvania Bulletin Volume 43, Number 6 dated February 9, 2013 (See PA Bulletin #43, pages 85-86) that discussed their production of an annual list, based on their analysis of submitted ST-4 forms, which exempts certain steel products not produced domestically in sufficient quantity.

No other changes in RACP steel policy resulted from this new adjustment; consequently, the use of steel certificates for structural steel will still be required. Please note that the use of ST 2, 3, and 4, as requested for other steel products, will still be utilized unless an exemption based on the list has been formulated and forwarded to OB.

OB's guidance is to make sure the Grantee/Subgrantee's are aware that it's their responsibility to certify all applicable steel components incorporated within RACP projects. In some

instances, OB/RACP staff and/or the state assigned consultant may limit their compliance analysis to significant steel components. The projects' architect/engineers are responsible for preparing/providing a significant steel component listing, not the RACP assigned consultant.

Two distinct approaches are presented below for steel products that are structural and/or have a significant building component.

Structural Steel Products

Pursuant to the SPPA, OB will require a mill certificate containing the statement "milled, melted, and manufactured in the USA" for all structural steel products used on RACP projects. We shall deem as ineligible all contracts that are unable to demonstrate compliance via the submission of steel certifications. Therefore, the value of construction contracts associated with non-compliant steel will be removed (both materials and labor costs) from the scope of the project.

Non-Structural Steel Products

Pursuant to the SPPA, OB will require, either a mill certificate containing the statement "milled, melted, and manufactured in the USA" or the appropriate ST form or an **Exemption Request** to utilize the DGS current years' Final List of Exempt Machinery and Equipment Steel Products to demonstrate compliance associated with the non-structural steel products used on RACP projects. OB shall deem as ineligible all contracts that are unable to demonstrate compliance via the submission of **steel certifications /ST forms/Exemption Request** based on the DGS Exempt Machinery and Equipment Steel Products listing. Therefore, the value of construction contracts associated with non-compliant steel will be removed (both materials and labor costs) from the scope of the project.

Recycled products, melted from previously used steel, are acceptable, providing that adequate documentation from the supplier has been furnished. The supplier shall certify that the recycled steel product was produced in the USA.

Furthermore, the burden of proof for all non-structural steel products not produced domestically in sufficient quantities is still the project's responsibility to provide.

Please be aware that the acceptance of ST forms is contingent upon the form being fully filled-in and compliant with the submission guidelines for steel certifications for DGS projects with the following exceptions:

A. It is not necessary for the forms to be notarized; however, all ST forms must be signed. Original signatures or electronic signatures through Adobe fill/sign, DocuSign, or Nuance (program which allows electronic signature similar to Adobe fill/sign) are acceptable.
B. Any questions regarding steel certification submissions and/or compliance with the Act shall be submitted to the OB Steel Resource Account (RA-OBRACP-Steel-Cost@pa.gov).
C. The Steel certification forms do NOT need to be submitted and approved by OB before the steel product arrives on site so as not to interfere with the project construction schedule.
D. OB assumes responsibility for acceptance of the DGS ST forms in accordance with this policy.

Completion of the ST-2, ST-3, and ST-4 forms shall follow the DGS directions attached to the form with the following exceptions:

- ST forms do NOT need to be submitted and approved by OB before the steel product arrives on site so as not to interfere with the construction schedule.
- RACP ME# assigned to the project shall be inserted in all areas requiring the DGS contract number (Line#5).
- RACP official project name shall be inserted in all areas requiring the contract title (Line #6).

Note:

Acceptance of each ST form shall be determined by OB at its sole discretion. All documents and other information to be delivered in order to demonstrate compliance with the steel requirements shall be and are, in form, content and substance, subject to the approval of OB, which approval may be withheld or delayed at OB's discretion. OB reserves the right to reject all improperly filled out or unsupported ST forms.

Below are links to PDF copies of the three acceptable ST Forms that can be obtained from the RACP website:

- ST-2 Steel Origin Certification: Non-Identifiable, Non-Structural Steel
- ST-3 75% U.S. Manufacture Certification
- ST-4 Not Domestically Manufactured: Prime Contractor (only to be used when the items requested to be exempted are not found on the appropriate year's List of Exempt Machinery and Equipment Steel Products [see section below entitled "Year of DGS Exemption Listing to Use"])

To implement the RACP policy on Non-structural Steel **Exemption Request** utilizing the DGS's current years' Final List of Exempt Machinery and Equipment Steel Products, referred to as the "Exemption List", please follow the below requirements:

1. The Project must be under "active" construction (workers on site) on or AFTER 1/01/2013 (RACP effective date) to use the "Exemption List".
2. "Active" construction does not include performance of just "punch list" items.
3. Effective date is based on the "active" construction date and not the date the machinery and equipment were purchased.
4. There is no retroactive application of utilization of the "Exemption List".
5. No ST-4 form is required for a RACP Exemption Request based on the "Exemption List".
6. RACP Exemption Request (to utilize the "Exemption List") must come from a contractor involved in the construction of the project and be:
   - On Construction Company Letterhead.
   - Dated and signed by appropriate company official (does not need to be notarized).
   - Should be addressed to Office of Budget
   - Should contain RACP project name and/or ME #
   - Lists any/all machinery and equipment that the Company is requesting to have exempted from ST-4 documentation.
   - All items listed on RACP Exemption Request letter must clearly match-up to an item

on the appropriate year's "Exemption List" and the Exemption List year should be notated for each item.

- There can/may be multiple construction company RACP Exemption Request letters utilized for various machinery and equipment, as applicable, per project.
- Exemption Request can be submitted directly by the project to OB or through the State Assigned Consultant for their project.
- Any questions regarding the exemption request submission and/or compliance with the Act shall also be submitted to OB (RA-OBRACP-Steel-Cost@pa.gov)

Year of DGS Exemption Listing to Use:

A project should be using the exemption listing for when they are in active construction. For example, if construction was active (and complete) in 2021 they would use the 2021 listing. If a project overlaps a calendar year, they should use the latest listing in which construction is active. For example, if construction is active in 2021 and 2022, they would use the 2022 listing.

If a project is phased, they should use the listing for the year they are in active construction for each phase. For example, if the first phase starts and ends in 2021 whereas the second phase starts and ends in 2022, the first phase would use the 2021 listing while the second phase would use the 2022 listing. If a phase overlaps a calendar year, follow the 1st paragraph above.

Among other items, the DGS web page for Steel Products Procurement Act information includes links for a copy of the Act; the current year's Final List of Exempt Machinery and Equipment Steel Products; the PA Bulletin's Steel Products Procurement Act Statement of Policy; and Frequently Asked Questions. Certain prior years DGS Exemption Lists are downloadable from the RACP website.

Please be aware that all other steel items not specifically exempted or that may require any type of interpretation would be discretionary to OB's policy. Be reminded that this exemption listing is not effective for structural steel.

Note:

Acceptance of each Exemption Request shall be determined by OB at its sole discretion. All documents and other information to demonstrate compliance with the steel requirements shall be in form, content, and substance, subject to the approval of OB, which approval may be withheld or delayed at OB's discretion. OB reserves the right to reject all improperly filled out or unsupported Exemption Request.

ST-2

This form must be filled out for non-identifiable, non-structural steel products.

SECTION A **To be filled out by the Purchaser, the firm that pays the Fabricator**

Line #1 This is the name of the firm that is dealing directly with the Fabricator

Line #2 This is the purchaser's mailing address.

Line #3 This is the purchaser's business phone.

Line #4 This is the date the ST-2 form is sent to the fabricator.

Line #5 This is the ~~DGS contract number or~~ RACP ME# for the project.

Line #6 This is the ~~DGS project description~~ RACP Project Name.

Line #7 This is the "steel product" being certified, such as a chiller, condenser, hollow metal doors. The prime contractor may not fill in the line with a description like "structural steel", "heating unit" or "air conditioning Unit". The model number, if any, of the steel product must be listed as indicated.

LINE #7 IS THE MOST CRITICAL PART OF THE FORM.
FAILURE TO PROPERTY FILL OUT LINE #7 ON EACH ST FORM
MAKES THE ENTIRE FORM INVALID AND A NEW FORM MUST BE SUBMITTED.

SECTION B **To be filled out by the Fabricator, the firm that assembles the product listed on Line #7.**

Line #1 This is the Fabricator's name.

Line #2 This is the Fabricator's mailing address.

Line #3 This is the Fabricator's business phone.

Line #4 This is the date the Fabricator receives the ST-2 from the Purchaser.

Line #5 This is the Fabricator's Federal I.D. number.

SECTION C

1. Language – **No modifications, cross-outs or alterations of any type may be made to the language of this certification paragraph.**

2. Signature – Two signatures are required on the ST-1 form. The Prime Contractor's President/Vice President must sign on one line and the Secretary or Treasurer must sign as a witness. The names should be typed or printed beneath the signature lines. Failure to type in the names **does not** invalidate the ST form.

ST-2 STEEL ORIGIN CERTIFICATION:
NON-IDENTIFIABLE, NON-STRUCTURAL STEEL

This form must be executed by the Purchaser and the Fabricator of any item containing steel that is not structural steel. This form must be submitted to the APM within 30 days from the date the Professional approved a submittal listing a "steel product". No steel product may be delivered on-site unless DGS has received the ST form. Structural steel is defined as steel products used as a basic structural element or a project (i.e. steel beams, columns, decking stairways, reinforcing bars, pipes, etc.). Purchasers of structural steel products (contractors or subcontractors) **must** provide bills of lading, invoices **and** mill certifications that the steel was manufactured in the United States instead of this form. The Fabricator shall be herein defined as the firm that assembles the component parts of the product to be purchased. The Department of General Services will accept the certification of firms that are earlier in the chain of purchase (i.e. manufacturers of components, steel suppliers) in lieu of the Fabricator.

A. TO BE COMPLETED BY THE PURHCASER:

1. Name of purchasing firm:_____

2. Firm's address:_____

3. Firm's phone number:_____ 4. Date submitted to Fabricator: _____

5. Contract No. DGS_____ 6. Contract Title:_____

7. Steel Product Certified:_____

Model:_____

B TO BE COMPLETED BY THE FABRICATOR/MANUFACTURER:

1. Name of firm:_____

2. Address of firm:_____

3. Firms phone number:_____ 4. Date Received:_____

5. Federal Employer ID. No:_____

CERTIFICATION: I, the undersigned officer of the Fabricator/Manufacturer, do certify that our firm assembled/fabricated the components to the steel products listed in Section A, Item 7, and that all steel components therein are comprised of steel that is melted and/or fabricated in the United States. I understand that, by signing this document, I certify that I have received assurances from the suppliers/manufacturers of the components that said components do not contain foreign manufactured steel. I further understand that this document is subject to the provisions of the Unsworn Falsification to Authorities Act (18 P.S. § 4904). I also understand that I am subject to the provisions of the Steel Products Procurement Act (73 P.S. § 1881, et. seq.) which provides penalties including, but not limited to, debarment from supplying any products for Commonwealth of Pennsylvania Public works projects for a period of five (5) years for violations therein. I agree to provide documentation supporting these facts if requested by the Commonwealth. The Commonwealth reserves the right to pursue any action deemed necessary to protect the Commonwealth's interest and ensure compliance with the laws of the Commonwealth.

WITNESS:

_____ _____(Seal)

Name: Name:
Secretary or Treasurer President or Vice President

ST-3

2-STEP ELIGIBILITY ANAYLSYS:

BEFORE A PRIME CONTRACTOR CAN SUBMIT AN ST-3,
THE FOLLOWING ANALYSIS MUST BE SATISFIED

STEP #1: The contractor must establish that the "product" **contains BOTH**:

- Steel melted in the USA

AND

- Foreign Steel

Note: Step #1 focuses upon the **content** of the "product".

Note: The % need not be close; it can be 99-1, so long as there is both foreign and domestic steel in the "product".

STEP #2: The contractor must establish that 75% of the **cost** of the "product" has been mined, produced or manufactured in the USA.

Note: Step #2 focuses upon the cost of the entire "product", not just the steel within it.

SECTION A

Line #1 This is the Prime Contractor's name.

Line #2 This is the Prime Contractor's business address.

Line #3 This is the Prime Contractor's phone number.

Line #4 This is the date the ST-3 is submitted to the fabricator.

Line #5 This is ~~DGS contract number or~~ RACP ME# for the project for the project.

Line #6 This is the ~~DGS project description~~ RACP Project Name.

Line #7 This is the "steel product" being certified, such as a chiller, condenser, hollow metal doors. The prime contractor may not fill in the line with a description like "structural steel", "heating unit" or "air conditioning unit". The model number, if any, or the steel product must be listed as indicated.

LINE #7 IS THE MOST CRITICAL PART OF THE FORM.
FAILURE TO PROPERLY FILL OUT LINE #7 ON EACH ST FORM MAKES THE ENTIRE FORM INVALID AND A NEW FORM MUST BE SUBMITTED.

SECTION B **To be filled out by the Fabricator/Manufacturer, the firm that fabricates the product listed on Line A7.**

Line #1 This is the Fabricator's name.

Line #2 This is the Fabricator's business address.

Line #3 This is the Fabricator's business phone.

Line #4 This is the date the Fabricator receives the ST-3 from the purchaser.

Line #5 This is the Fabricator's Federal I.D. Number.

Line #6 The Fabricator must insert the percentage of the cost of the articles, materials and supplies which have been mined, produced or manufactured in the U.S. for the product listed on Line #7.

SECTION C

1. Language – **No modifications, cross-outs or alterations of any type may be made to the language of this certification paragraph.**
2. Signature – Two signatures are required on the ST-3 form. The Fabricator's President/Vice President must sign on one line **and** the Secretary or Treasurer must sign as a witness. The names should be typed or printed beneath the signature lines. Failure to type in the names does not validate the ST form.

NOTES on ST-3 Forms:

• It is not necessary to submit an ST-1 with the ST-3.

• DGS reserves the right to request additional documentation to support the percentage specified on Line 14. If the Fabricator/manufacturer refuses to produce such documentation and/or DGS deems it to be in the Commonwealth's best interests, DGS may request the Office of Inspector General to investigate the submission of the ST-3 form.

ST-3

75% U.S. MANUFACTURE CERTIFICATION

The Steel Products Procurement Act (73 P.S. § 1881, et. seq.) allows the use of steel products with **both** foreign and domestic steel **if at least 75 percent of the cost** of the materials (including steel, rubber, wood, plastics, etc.) in the product are manufactured or produced, as the case may be, in the United States.

This form must be executed by a Fabricator of any item containing BOTH U.S. AND FOREIGN STEEL. The fabricator shall hereby be defined as the firm that assembles the component parts of the product to be purchased. The Department of General Services will accept the certification of firms that are **earlier** in the chain of purchase (i.e., manufacturers of components, steel suppliers) in lieu of the Fabricator.

This form must be submitted to the APM within 30 days from the date the Professional approves a submittal listing a "steel product". No steel product may be delivered on-site unless DGS has received an ST form.

A. **TO BE COMPLETED BY THE PRIME CONTRACTOR (PURCHASER):**

1. Name of Contractor:_____
2. Address of Contractor:_____
3. Phone Number:_____ 4. Date submitted to Fabricator:_____
5. Contract No. DGS:_____ 6. Contract Title:_____
7. Steel Product Certified:_____

   Model:_____

B. **TO BE COMPLETED BY THE FABRICATOR/MANUFACTURER:**

1. Name of Firm:_____
2. Address of Firm:_____
3. Firm's Phone number:_____ 4. Date Received:_____
5. Federal Employer ID No. _____

6Percentage of the cost of the articles, materials and supplies which have been mined, produced or manufactured in the U.S. for the product listed above on line 7:_____

CERTIFICATION: I, the undersigned Officer of the Fabricator/Manufacturer, do certify that our firm assembled/manufactured the components to the steel product listed in Section 7, that the steel in said product is both foreign and domestically manufactured, and that all the facts contained in this document are true. I agree to provide documentation supporting these facts if requested by the Commonwealth. I further understand that this document is subject to the provisions of the unsworn Falsification to Authorities Act (18 P.S. § 4904) and the Steel products Procurement Act (73 P.S. §1881, et seq.) which provide penalties including, but not limited to, debarment from supplying any products for Commonwealth of Pennsylvania public works projects for a period of five (5) years for violations therein. The Commonwealth reserves the right to pursue any action deemed necessary to protect the Commonwealth's interest and ensure compliance with the laws of the Commonwealth.

WITNESS:

_____ _____(Seal)

Name: Name:

Secretary or Treasurer President or Vice President

ST-4

This form may be submitted in circumstances where the Prime contractor believes that the "product" on Line #7 is not made in sufficient quantities to satisfy the requirements of the contract.

The information submitted by a Prime contractor is subject to verification by the Department. Any Prime contractor who executes a Purchase Order or other type of purchase agreement encompassing a "steel product" prior to receiving the Department's written determination that the "steel product" listed on Line #7 of the ST-4 form is not manufactured in sufficient quantity to meet the requirements of the project does so at its own risk and faces penalties including, but not limited to, non-payment for the product; removal and replacement of the product at its own costs; and/or an Office of Inspector General investigation which may lead to debarment.

Domestic availability will be determined as of the date the ST-4 form is submitted to DGS for approval

Line #1 this is the Prime Contractor's formal business name.

Line #2 This is the Prime Contractor's business address.

Line #3 This is the Prime Contractor's business phone.

Line #4 This is the date the ST-4 form is submitted to ~~DGS~~. Office of the Budget.

Line #5 This is the ~~DGS contract number or~~ RACP ME# for the project.

Line #6 This is the ~~DGS project description~~ RACP Project Name.

Line #7 This is the "steel product" being certified, such as a chiller, condenser, hollow metal doors. The prime contractor may not fill in the line with a description like "structural steel", "heating unit" or air conditioning unit".

**LINE #7 IS THE MOST CRITICAL PART OF THE FORM.
FAILURE TO PROPERLY FILL OUT LINE #7 ON EACH ST FORM
MAKES THE ENTIRE FORM INVALID AND A NEW FORM MUST BE
SUBMITTED FOR APPROVAL.**

Line #8 These four lines, (a) through (d), are to be filled out completely by the Prime Contractor. At least four suppliers/manufacturers must be contacted by the Prime Contractor to ascertain if the "product" on Line #7 is manufactured with domestic steel.

CERTIFICATION

1. Language – **No modifications, cross-outs or alterations of any type may be made to the language of this certification paragraph.**
2. Signature – Two signatures are required on the ST-4 form. The Prime Contractor's President/Vice President must sign on one line **and** the Secretary or Treasurer must sign as a witness. The names should be typed or printed beneath the signature line. Failure to type in the names **does not** invalidate the ST form.

NOTE ON ST-4 FORMS:

- It is not necessary to submit an ST-1 form with an ST-4 form.

ST-4 NOT DOMESTICALLY MANUFACTURED: PRIME CONTRACTOR

This form must be executed by the Prime Contractor and submitted to the APM within 30 days from the date the Professional approves a submittal listing a "steel product". No steel product may be delivered on-site unless DGS has received, reviewed and provided written approval of the ST-4 form. An ST-4 form can only be submitted for approval when a steel product is not domestically produced in sufficient quantities. DGS will verify the accuracy of the information on the ST-4 form and will contact additional suppliers/manufacturers to ascertain the availability of a domestic steel product.

1. Prime Contractor:_____ 2. Address:_____

3. Phone Number:_____ 4. Date Submitted:_____ 5. Contract No. DGS: ME #4271-00

6. Contract Title:_____ 7. Steel Product:_____
8. Suppliers/manufacturers contacted by the Prime Contractor that claimed that the above product is not produced/manufactured with U.S. manufactured steel. At least four Suppliers/Manufacturers are needed. Manufacturers listed in specifications must be contacted.

a. Firm Name:_____ Phone Number:_____
Address:_____
Person Contacted:_____ Date Contacted:_____

b. Firm Name:_____ Phone Number:_____
Address:_____
Person Contacted:_____ Date Contacted:_____

c. Firm Name:_____ Phone Number:_____
Address:_____
Person Contacted:_____ Date Contacted:_____

d. Firm Name:_____ Phone Number:_____
Address:_____
Person Contacted:_____ Date Contacted:_____

CERTIFICATION: I, the undersigned Officer of the Contractor, do certify that I have contacted the firms listed in Section 8, and was informed that said firms do not produce/manufacture the steel product listed on Line 7 with U.S. Steel in sufficient quantities to complete the above-referenced project. I understand that this document is subject to the provisions of the Unsworn Falsifications to Authorities Act (18 P.S. § 4904) and the Steel Products Procurement Act, which provide penalties including, but not limited to, debarment from bidding on any Commonwealth of Pennsylvania public works project for a period of five years. The Commonwealth reserves the right to pursue any action deemed necessary to protect the Commonwealth's interest and ensure compliance with the laws of the Commonwealth.

WITNESS:

_____ _____(SEAL)

Name: Name:
Secretary or Treasurer President or Vice President

2026 List of Exempt Machinery and Equipment Steel Products

The Department of General Services (DGS) has reviewed all comments and supporting documentation received prior to the end of the thirty-day (30) comment period and presents here its annual list of exempt machinery and equipment steel products. Contractors, subcontractors, suppliers, bidders, offerors and public agencies may rely on the list of exempt steel products in preparing bids and contracts for any project that is subject to the Steel Products Procurement Act.

Pursuant to the department's Statement of Policy and the Steel Products Procurement Act, DGS will not make any changes to this list during the calendar year for which it was created. In early 2027 DGS will identify, from ST-4 waivers approved in calendar year 2026, specific machinery and equipment steel products that have been recognized as not being produced in the United States in sufficient quantities to meet the 2026 contract requirements. Those items will be added to the list presented below and the resultant list will be published in the Pennsylvania Bulletin for a thirty-day (30) public comment period at that time.

Exempt Machinery and Equipment Steel Products

Air Conditioning Units
Air Duct Housing w/Sample Tubes
Air Handling Units
Anchor Bolt
Audio RA Station
Annunciator Panel
AV Rack Kit
Back Box
Backflow Preventer
Battery Cabinet
Blank Filler Plate for Fiber (for rackmount and wall mount enclosures)
Blank Metal Door
Blank Plate for Outer Door
Bottom Dead Front Panel
Bridge for Cameras
Cabinet
Cardcage
Cast Iron Inverted Bucket Traps
Cast Steel Gate Valve
CCTV Power Supply
Ceiling Flange
Central Control Unit
Centrifugal pumps

Channel Video
Circulating Pump
Closers
Color Monitor
Combination Round Head Steel Zinc- Plated Toggle Bolts
Condensing Boilers
Conduit Fittings
Control Module Plate
Control Panel
Control Valve
Data Converter Unit
Deck Inserts
Deck and Rub Rail Fasteners
Digital Communicators
Digital Record
Door Protection
Door Trim/Handles
Drinking Fountain
Drip Pan ELL
Drop-In Anchors
Dry Tape Transformer
Drywall Screws
Dual Interface Module
Duct Detector w/Relay
Duct Housing
Ductless Split System
DVR Rack
Electric Traction Elevators
Electric Water Cooler
Electronically Operable Panel Partitions
Elevator Controller
Elevator Hoistway
Encl. for Annunciator
Exit Devices
Exp Cage
Fence System Nuts and Bolts
Fire Alarm NAC Extender
Fire Alarm Peripherals
Flexible Drops
Full Blank Plate
Galvanized Carriage Bolts
Garage Door Tracking

Gas Furnace
Gas Piping Butt Weld Tees
Generator
Globe Valve (Steam)
Hand Dryer
Hanger Mounting Plates
Hangermates
Hangers Supports
Horn/Strobe
Inclined Platform Wheelchair Lifts
Inner & Outer Door
Inner Door Blank Plate
Interface Module
Lag Bolts
Large Remote Cab
Lighting Fixtures, Interior/Recessed
Lighting Fixtures, Surface Wrap
Lighting Fixtures, Track Head
Lock Cylinders
Locknuts
Locksets
Low Temp. Detection Thermostats
Lubrication Unit
Machine Screws
Main Control Board
Metal Lockers
Manual Pull Station
Med. Enclosure
Middle Dead Front
Mini-Interface Module
Monitor Mount
Monitor Wall Brk
Mounting Plate
Network Fiber Switch
Overhead Door
Overhead Stops
Patient Wandering Alarm
Pipe Clamps
Pivots
Power Supply
Pull Station Box
RA Annunciator Panel

Rack Mount Card Cage
Rack Mount Kit
Radiant Panels
Reader Interface
Relay Module
Remote Chiller
Roof Drains Rings and Strainers (**NEW**)
Round Head Machine Screw
Safety Relief Valve
Sampling Tube
Security Panel
Security Unit
Security/CCTV Camera Housing
Self-Turn / Self Tapping Screw
Shower/eye Washers
Signal Extender Module
Single Blank
Smoke Detector Wire
Speaker
Speaker/Strobe
Split HVAC System
Split Ring Hangers
Split Rings
Split System Air Conditioning
SSD-C Remote Display w/Control
SSD-C-REM Rem Display
Stainless Flat Bars
Stainless Steel Cable
Strobe
Submersible pump
Sump Pump
Surface Mount Speaker
Surface Station Box
Surge Arrester
Surge Protector
T8 Light Troffer
Tamper Proof Screws & Nuts
Threaded Rod Hanger
Tie Wire 21 gauge
Tie Wire Anchor
Toggle Wing

Transformer
Tube Steel (**NEW**)
Turbine Pumps
Uninterruptible Power Supply
VRV Fan Coils/Cond. Units
Wall Mounted Boiler
Wall Mounted Fountain
Water Coolers
Water Fountain Mounting Frame
Water Heater
Wing Toggle

CONTRACTOR LETTERHEAD

Date

Mr. Scott Bowman, RACP Manager
Redevelopment Assistance Capital Program
Office of the Budget
Bureau of Redevelopment, Capital and Debt
555 Walnut Street, 9th Floor
Harrisburg, PA 17101-1921

Reference: **Project Name** - ME# XXXXX
Steel Products Exemption Request

Dear Mr. Bowman,

Contractor Name is the **Trade** contractor for the above referenced project. Active construction of the project began in **Month / Year and is scheduled to be / was completed in Month / year.** The following exemption request is being made, consistent with the DGS 2026 List of Exempt Machinery and Equipment Steel Products.

We hereby request exemptions for the following steel products which were used on the **Project Name**:

EXEMPTION LIST

NOTE: THE PRODUCTS REQUESTED FOR EXPEMTION MUST MATCH EXACTLY THE PRODUCTS LISTED ON THE 2026 EXEMPTION LIST. BELOW IS A SAMPLE FOR REFERENCE

Air Conditioning Units
Air Handling Units
Drywall Screws
Generator
Metal Lockers
Pipe Clamps
Remote Chiller
Sump Pump
Tie Wire Anchor
Transformer
Water Heater

CONTRACTOR LETTERHEAD

Thank you for your consideration and we look forward to your positive response to this request. Should you have any questions, please feel free to contact this office at your convenience.

Contractor Name,

Signature
Title

Attachments: 2026 DGS Exempt Equipment List

WEEKLY PAYROLL CERTIFICATION FOR PUBLIC WORKS PROJECTS

☐ Contractor or ☐ Subcontractor (Please check one) **ALL INFORMATION MUST BE COMPLETED**

CONTRACTOR ADDRESS	SUBCONTRACTOR ADDRESS	DEPARTMENT OF LABOR & INDUSTRY COMMONWEALTH OF PENNSYLVANIA BUREAU OF LABOR LAW COMPLIANCE PREVAILING WAGE DIVISION 7TH & FORSTER STREETS HARRISBURG, PA 17120 1-800-932-0665

PAYROLL NUMBER	WEEK ENDING DATE	PROJECT AND LOCATION PROJECT SERIAL # PROJECT #

EMPLOYEE NAME	APPR. RATE (%)	WORK CLASSIFICATION	DAY AND DATE / HOURS WORKED EACH DAY	S-TIME 0-TIME	BASE HOURLY RATE	TOTAL FRINGE BENEFITS (C=Cash) (FB=Contributions)*	TOTAL DEDUCTIONS	GROSS PAY FOR PREVAILING RATE JOB(S)	CHECK #
		Must show classification description per prevailing wage rate form			Base Rate per hour	C: Difference in cash to add up to total hourly FB: Fringes per hour			
						C: FB:			
						C: FB:			
						C: FB:			
						C: FB:			

*SEE REVERSE SIDE

PAGE NUMBER _____ OF _____

THE NOTARIZATION MUST BE COMPLETED ON FIRST AND LAST SUBMISSIONS ONLY. ALL OTHER INFORMATION MUST BE COMPLETED WEEKLY.

*FRINGE BENEFITS EXPLANATION (FB): Bona fide benefits contribution, except those required by Federal or State Law (unemployment tax, workers' compensation, income taxes, etc.)

Please specify the type of benefits provided and contributions per hour: Breakdown of fringes per hour per person

1) Medical or hospital care _____
2) Pension or retirement _____
3) Life insurance _____
4) Disability _____
5) Vacation, holiday _____
6) Other (please specify) _____

CERTIFIED STATEMENT OF COMPLIANCE

1. The undersigned, having executed a contract with _____
(AWARDING AGENCY, CONTRACTOR OR SUBCONTRACTOR)

_____ for the construction of the above-identified project, acknowledges that:

(a) The prevailing wage requirements and the predetermined rates are included in the aforesaid contract.

(b) Correction of any infractions of the aforesaid conditions is the contractor's or subcontractor's responsibility.

(c) It is the contractor's responsibility to include the Prevailing Wage requirements and the predetermined rates in any subcontract or lower tier subcontract for this project.

2. The undersigned certifies that:

(a) Neither he nor his firm, nor any firm, corporation or partnership in which he or his firm has an interest is debarred by the Secretary of Labor and Industry pursuant to Section 11(e) of the PA Prevailing Wage Act, Act of August 15, 1961, P.L. 987 as amended, 43 P.S.§ 165-11(e).

(b) No part of this contract has been or will be subcontracted to any subcontractor if such subcontractor or any firm, corporation or partnership in which such subcontractor has an interest is debarred pursuant to the aforementioned statute.

3. The undersigned certifies that:

(a) the legal name and the business address of the contractor or subcontractor are: _____
_____

(b) The undersigned is: ☐ a single proprietorship ☐ a corporation organized in the state of _____
☐ a partnership ☐ other organization (describe) _____

(c) The name, title and address of the owner, partners or officers of the contractor/subcontractor are:

NAME	TITLE	ADDRESS

The willful falsification of any of the above statements may subject the contractor to civil or criminal prosecution, provided in the PA Prevailing Wage Act of August 15, 1961, P.L. 987, as amended, August 9, 1963, 43 P.S. § 165.1 through 165.17.

_____
(DATE)

_____
(SIGNATURE)

_____
(TITLE)

_____
SEAL

Taken, sworn and subscribed before me this _____ Day
of _____ A.D., _____

Notarize 1st and last week worked

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SECTION 01 1000 - SUMMARY

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. Project information.
2. Work covered by Contract Documents.
3. Work performed under Owner’s separate contracts.
4. Work sequence.
5. Contractor’s use of site and premises.
6. Coordination with occupants
7. Work restrictions.
8. Specification and Drawing conventions.
9. Miscellaneous provisions

B. Related Requirements:
1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

A. Project Identification: Exeter Township Emergency Services Facility.
1. Project Location: 70 Gibraltar Road, Reading, PA 19606.

B. Owner: Exeter Township.

C. Owners Representative Identification: The Construction Manager (CM) for the project is Boyle Construction, Inc. 3850 Sierra Circle, Suite 400, Center Valley, PA 18034. Telephone 484.223.0726.
a. Rob Lenosky, Project Manager.
b. Mobile: 484.357.0716.

D. Email: rlenosky@boyleconstruction.com.

E. Architect: MW Studios., 8098 Sandpiper Circle, Suite H, Nottingham, MD 21236.

F. Additional Project contact information is specified in Section 00 0103 - Project Directory.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:

1. Site clearing and staging area preparation.
2. New building construction and associated site work.
3. Utility work in public right-of-way.

B. Project will be constructed under coordinated, concurrent multiple contracts. See Section 011250 "Multiple Contract Summary" for a list of multiple contracts, a description of work included under each of the multiple contracts, and the responsibilities of Project coordinator.
1. Site (SC).
2. General (GC).
3. Fire Protection (FP).
4. Plumbing (PC).
5. Mechanical (MC/HVAC).
6. Electrical (EC).

C. Testing:
1. Contractors are to perform all factory or shop testing, and any other testing required.
2. Contractors are to perform any field testing of electrical systems or data wiring systems.
3. Contractors are to perform testing of above or below ground pipes, ductwork, and mechanical systems including pressure, air, water, or vacuum testing required.
4. All contractor testing shall be performed in the presence of the Construction Manager and/or (if required) in the presence of the municipal agency having jurisdiction.

D. Construction Waste Management for all Project activities is by each Prime Contractor. Construction Waste Management for any demolition work and any site features is by the Contractor performing the work.

E. The Contractor responsible for installation of the systems and equipment is responsible for commissioning each system. The minimum commissioning requirements in accordance with Section 01 9113 and other specific project requirements, including coordination and verification, shall be the responsibility of the Contractor.

1.5 WORK PERFORMED UNDER OWNER'S SEPARATE CONTRACTS

A. Cooperate fully with Owner and separate Owner-hired firms and/or agencies so work may be carried out smoothly, without interfering with or delaying Work under this Contract. Coordinate the Work of this Contract with work performed under Owner's separate contracts.
1. Construction testing and special inspections will be by separate firm hired by the Owner. The Owner will procure and bear costs for only the following: field testing for earthwork, concrete, masonry, asphalt and concrete paving, fireproofing, and structural steel.
2. Commissioning Verification Authority and HVAC testing, adjusting, and balancing (CVA/TAB) will be by separate firm hired by the Owner and will require the participation and cooperation of all contractors. The Mechanical Contractor is responsible for all pressure testing of any pipes, ductwork, or field systems and for coordinating and supporting all the testing and balancing.
3. Other contracts are at the Owner's sole discretion.

1.6 WORK SEQUENCE

A. The entire Work shall be completed in compliance with the Project phasing indicated on the Drawing Staging and Logistic Plan(s), the erosion and sedimentation control plan(s), and the milestone completion dates listed. Any deviations from these requirements shall be subject to the approval of the Construction Manager. The Owner reserves the right to enforce liquidated damages for contractor's non-compliance with any of the phasing, milestone, and substantial completion dates.
   1. The Notice to Proceed will be issued as indicated in Section 00 1810 - Construction Milestone Schedule.
   2. Completion for each phase and milestones are noted on the Construction Milestone Schedule and must be strictly complied with; refer to Section 00 1810 - Construction Milestone Schedule.
   3. Completion for all contracts is as follows:
      a. Project Substantial Completion – Building – 4/10/2028.
      b. Project Substantial Completion – Site – 4/13/2028.
      c. Project Final Completion – 5/11/2028.

B. Refer to Section 00 1810 - Construction Milestone Schedule for milestone dates. The contractors' sequence and CPM schedule shall incorporate all milestone dates and comply with all dates noted therein for completing the Project. The dates provided are the milestone completion dates which will be enforced. All building systems are to be installed in compliance with the milestone dates identified on the Phasing Plans.

C. Contractors shall reference Section 014000, "Quality Control Requirements" and the Staging and Logistic Drawings for special requirements.

D. Construction work for the building shall be performed in a sequence to ensure that all building systems are systematically installed in an efficient manner. The mechanical and electrical rooms shall be constructed in an early sequence to permit rough-in by the Mechanical, Electrical, and Plumbing trades and to ensure proper operation of life safety systems in occupied areas of the building in the timeframes identified on the Staging and Logistic Plans.

E. Contractor is to clean and turn over the building in a sequence for Owner fit-out needs but not occupancy, at least one month prior to the substantial completion date or as stated on the Staging and Logistic Plans.

F. If the Notice to Proceed is delayed for any reason beyond the control of any Prime Contractor that prevents the Contractor from performing Work, all phased completion dates and milestone completion dates will be adjusted by the exact same number of days with no cost implications to the Owner.

G. If a specific milestone or phased completion date is delayed for any reason beyond the control of any Prime Contractor that prevents the Contractor from performing Work, and the delay impacts subsequent milestone and phased completion dates, remaining milestone and phased completion dates will be adjusted by the exact same number of days with no cost implications to the Owner.

H. Liquidated damages apply for all milestone completion as noted in the Milestone Schedule Specification.

I. All Work must be completed in accordance with the Staging and Logistic Drawings, the Project, the approved Project schedule, and in a sequence approved by the Construction Manager, Architect, and Owner.

J. The Staging and Logistic Plans identify timeframes necessary for the Owner to complete moving operations for occupancy of individual building areas. In the event of any delay in the Work that will impact the relocation or moving of Owner's operations, furnishings, or equipment, the Owner has the discretion to adjust its move or relocation milestone schedule by up to 30 days. Such action by the Owner shall be issued in writing to the contractor not less than 30 days prior to the anticipated milestone date.

1.7 CONTRACTOR'S USE OF SITE AND PREMISES

A. General: Contractor shall have limited use of Project site for construction operations as designated on the Staging and Logistic Plan(s) during construction period. The site is surrounded by business uses and public streets. The Contractor must coordinate activities and cooperate with adjacent uses. Contractor must also schedule, coordinate, and perform construction activities to avoid disruption of ongoing operations. Contractor must schedule and perform certain work on weekends and holidays to avoid disruptions. This may include street and utility work.

B. Contractors shall place trailers and materials in designated areas as indicated on Staging and Logistic Plan(s) and in coordination with Construction Manager.

C. Burial of waste materials is not permitted.

1.8 COORDINATION WITH OCCUPANTS

A. Owner Occupancy: Owner will occupy adjacent buildings and properties during construction period. Contractors shall cooperate with Owner during construction to minimize conflicts. Perform work so as not to interfere with Owner's day-to-day operations.

B. Maintain access to existing walkways and other adjacent occupied or used site facilities. Do not close or obstruct walkways, driveways, or other occupied or used areas without written permission from Owner and approval of authorities having jurisdiction.
   1. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited Owner occupancy.
   2. Before limited Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.

1.9 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Technical Specifications are organized into Divisions and Sections using the CSI/CSC's "MasterFormat" numbering system.

1.10 MISCELLANEOUS PROVISIONS

A. Prior to acceptance as substantially complete, all general construction, all mechanical, electrical, and plumbing systems shall be complete, fully operational, tested as required, inspected by approval authorities, and certified complete.

B. Each Prime Contractor shall ensure subcontractors contracted to perform a portion of the Work have possession of Contract Documents. Subcontractors shall be responsible for reviewing Contract Documents including, but not limited to, Drawings and Specifications and providing items outlined within the documents to be provided along with connections, systems, supports, and miscellaneous items required for the items to function properly as intended.

C. Drawing Coordination: Generally, requirements for materials and products identified on the Drawings are described in detail within the Specifications. However, items may be indicated either only on the Drawings or only within the Specifications. If items are indicated in one document only, it is responsibility of the Contractor to provide the item indicated along with the components, connections, systems, supports or other miscellaneous items required for the proper operation and installation of the items identified within the single document.

D. References within the Drawings and/or Specifications to other Drawings and/or Specifications indicates the potential existence of additional information. If no additional information exists within the referenced drawing(s) or specification(s), the Prime Contractor is responsible for the installation of the Work indicated or graphically depicted.
   1. Where Work typically would be structural or load bearing in nature, provide reinforcement, bracketing, bracing, or otherwise attach such Work as indicated within similar details existing within the Drawings and/or Specifications.
   2. Seek clarification for such items prior to submitting a bid to perform the Work. If no clarification is requested for such submission of a bid, it will be deemed that the Prime Contractor understands the extent of Work both indicated and graphically depicted and has included such within the Contract Sum.

1.11 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.
   1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Work Hours are 7AM to 5PM Monday through Friday. Additional hours can be scheduled, but will not be considered extra to the contract, and will be directed by the owner and construction manager. All after hours work must be coordinated with the Construction Manager and Owner 72 hours prior.
   1. Township noise ordinance permits work between the hours of 7AM and 10PM, Monday thru Saturday. No Sunday or Holiday work is permitted. Refer to Township Noise Ordinance for additional information.

C. All Construction activity to take place within the Construction Fenced Areas. Coordinate any work outside of fenced areas with Construction Manager and Owner 72 hours prior. Contractor performing the work is responsible for all safety fence and traffic control, as necessary.

D. Restricted Substances: Use of tobacco, alcohol, and other controlled substances on Project site is not permitted. This will be strictly enforced.

1.12 SPECIFICATION AND DRAWING CONVENTIONS

A. 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. Imperative mood and streamlined language are generally used in the Specifications. 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.
   2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to Sections of the Specifications.

C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

D. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
   1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
   2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.
   3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 COMPLETION

A. Contractor shall complete all work in the time period specified in the Contract. Contractor(s) shall include all necessary time, and the related cost required including but not limited to; overtime, shift work, weekends, and holidays in order to complete the work as specified within the Contract time.

END OF SECTION 01 1000

SECTION 01 1200 - MULTIPLE CONTRACT SUMMARY

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes a summary of each contract, including responsibilities for coordination.

B. Specific requirements of each contract are also indicated in individual Specification Sections and on Drawings.

C. Related Sections include the following:
1. Division 01 Section 011000 "Summary" for the Work covered by Contract Documents and for work sequence.
2. Division 01 Section 013100 "Project Management and Coordination" for general coordination requirements.
3. Division 01 Section 015000 "Temporary Facilities and Controls" for specific requirements for temporary facilities and controls.
4. Division 01 Section 019113 “General Commissioning Requirements” for additional information and procedures.

D. Definitions:
1. Permanent Enclosure: As determined by Architect and/or Construction Manager, permanent or temporary roofing is complete, insulated, and weather tight; exterior walls are insulated and weather tight; and all openings are closed with permanent construction or substantial (watertight and insulated) temporary closures.
2. Coordinate: The term “coordinate” means “to cooperate with related trades to furnish and install all connections between the trades in correct sequence size and location to create a complete system ready for intended use.”
3. Verify: The term “verify” means “to measure, investigate, review, test, check the accuracy or correctness of and prove by demonstration, evidence, or testimony the location, size, dimension and condition of an item.”
4. Furnish: The term “furnish” is used to mean “supply and deliver to the project site, ready for unloading, unpacking, assembly, installation and similar operations.”
5. Install: The term “install” is used to describe operations at the project site including the actual “unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, performing, coordinating with other trades, protecting, cleaning, and similar activities.”
6. Provide: The term “provide” means “to furnish and install, complete and ready for the intended use.”

1.3 COORDINATION

A. Project Coordinator shall be responsible for coordination between the General Construction Contract, Site Work Contract, Plumbing Contract, Fire Protection Contract, HVAC (also referenced as Mechanical) Contract, and Electrical Contract.
   1. General Construction Contractor shall act as and assume responsibilities of Project Coordinator or Lead Contractor which are designated throughout the Contract Documents. The General Contractor shall be the full-time Project Coordinator and shall be experienced in Administration and Supervision of building construction activities, including Site Work, Mechanical, Electrical, Plumbing, and Fire Protection work.

B. Site, HVAC, Plumbing, Fire Protection, & Electrical Coordinators are responsible for coordinating with the Project Coordinator.

C. The HVAC Contractor shall be responsible for the assembly of coordination drawings for himself, and the inclusion of coordination drawings provided by the Electrical, Plumbing, and Fire Protection Contractors.

D. The HVAC (Mechanical) Contractor shall be the primary M/E/P/FP coordinator and shall be responsible for the preparation of 2D CAD electronic coordination drawings between HVAC, Plumbing, Fire Protection and Electrical trades. 2D CAD files are required to be provided by all contractors with final coordination drawings provided from HVAC Contractor. 3D CAD files and coordination drawings are preferred. The Plumbing, Fire Protection, and Electrical Contractors shall provide such information electronically to fully coordinate their work with that of the other primes and in the format requested by the HVAC Contractor. All Prime Contractors shall cooperate and be responsible for preparation and compliance with coordination drawings.

E. GC shall coordinate all work in accordance with project phasing requirements and scheduled activities of all other contractors.

1.4 PROJECT COORDINATOR RESPONSIBILITIES

A. Project Coordinator: Full-time Project Coordinator shall be experienced in administration and supervision of building construction, including HVAC, plumbing, fire protection, and electrical work.
   1. Coordination activities of Project Coordinator include, but are not limited to, the following:
      a. Provide typical overall coordination of the Work.
      b. Provide overall coordination for project.
      c. Coordinate shared access to workspaces.
      d. Coordinate product selections for compatibility.
      e. Provide overall coordination of temporary facilities and controls.
      f. Coordinate, schedule, and approve interruptions of permanent and temporary utilities, including those necessary to make connections for temporary services.
      g. Coordinate construction and operations of the Work with work performed by each Contract and Owners subcontractors.
      h. Prepare Coordination Drawings to coordinate work by more than one contract except for HVAC, electrical, plumbing, and fire protection coordination drawings which are the responsibility of the respective Contractors and primarily the HVAC Contractor.
      i. Coordinate sequencing and scheduling of the Work. Include the following:
         1) Initial Coordination Meeting: At earliest possible date, arrange and conduct a meeting with contractors for sequencing and coordinating the Work; negotiate reasonable adjustments to schedules.

2) Prepare a combined Contractor's Construction Schedule and monthly updates for entire Project. Base schedule on Preliminary Construction Schedule. Secure time commitments for performing critical construction activities from contractors. Show activities of each contract on a separate sheet. Prepare a summary sheet indicating combined construction activities of contracts.
3) Submit schedules to Construction Manager for approval.
4) Prepare recovery schedules as needed.
5) Construction Manager will distribute copies of approved schedules to Architect, Owner, and Contractors.

j. Provide photographic and video documentation of existing conditions, work as it progresses and at completion.
k. Provide quality-assurance and quality-control services specified in Section 014000 "Quality Requirements."
l. Coordinate sequence of activities to accommodate tests and inspections, and coordinate schedule of tests and inspections.
m. Provide information necessary to adjust, move, or relocate existing utility structures affected by construction.
n. Perform field engineering, construction layout, and locate existing permanent benchmarks and control points. Provide similar reference points and establish permanent benchmarks, control points, and elevations on project site for use by other prime contractors and all trades.
o. Provide field surveys of in-progress construction and site work.
p. Coordinate progress cleaning of areas or pieces of equipment where more than one contractor has worked. Progress cleaning of building and site shall be performed on a daily basis.
q. Coordinate final cleaning of building with all Contractors.
r. Coordinate cutting and patching.
s. Coordinate protection of the Work.
t. Coordinate completion of interrelated punch list items.
u. Construction Manager will coordinate preparation Record Documents if information from more than one contractor is to be integrated with information from other contractors to form one combined record.
v. Print and submit Record Documents if installations by more than one contractor are indicated on the same Contract Drawing or Shop Drawing.
w. Construction Manager will collect Record Specification Sections from other contractors, collate Sections into numeric order, and submit complete set.
x. Construction Manager will coordinate preparation of operation and maintenance manuals if information from more than one contractor is to be integrated with information from other contractors to form one combined record.
y. Before building foundations are placed, create a rough-in drawing indicating locations through-foundation-wall penetrations (horizontal and vertical dimensions). Coordinate with all other Prime Contractors and submit drawing to the Construction Manager for confirmation of all penetrations with Design Professionals.
z. Before the concrete floor slab is poured, create a rough-in drawing indicating location of under slab and in-wall conduits and utilities related to Work by Owner’s Vendors. Intent: Vendors’ Work requires coordination with Prime Contractors’ Work.
aa. Coordinate work of all Owner vendors.

B. HVAC, Electrical, Plumbing and Fire Protection (MEP&FP) Coordinators: Full-time HVAC, Electrical, Plumbing, and Fire Protection Coordinators shall be experienced in coordination of M/E/P/FP construction, including coordination of type of operations required for this Project.
   1. Coordination activities of HVAC, Electrical, Plumbing and Fire Protection Coordinators include, but are not limited to, the following:
      a. Schedule and sequence of activities.
      b. Coordinate sharing access to workspaces.
      c. Coordinate integration of work into limited spaces.
      d. Coordinate protection of completed work.
      e. Coordinate cutting and patching work.
      f. Take the lead and be responsible Coordination Drawings. Coordination drawings must be reviewed with Project Coordinator for finish ceiling heights. Drawings shall coordinate and include but not be limited to the following components:
         1) Structural System limits.
         2) Electrical Systems.
         3) Fire Protection Systems.
         4) Mechanical piping and ductwork.
         5) Storm and sanitary piping.
         6) Data and telecommunications.
      g. Coordinate tests and inspections.
      h. Coordinate temporary services and facilities.
      i. Coordinate with all utility companies with bringing all utilities into the site (i.e. electric, cable, water, sewer, etc.). Further Coordinate with Project Coordinator, Construction Manager, and Site Contractor for all Utility Company work.

1.5 GENERAL PARAMETERS FOR HVAC, ELECTRICAL, PLUMBING AND FIRE PROTECTION COORDINATION DRAWINGS

A. HVAC Contractor is responsible for integrating Coordination Drawings.

B. Coordination drawings must be prepared electronically and in CAD format. 2D drawings are required and 3D drawings are preferred for project model integration.

C. Comply with the requirements for Coordination Drawings as specified in the Division 01 Section “Project Management and Coordination.”

D. HVAC Contractor shall within 20 days of a fully executed contract, distribute layout drawings in CAD format to all Contractors. Layout drawings shall include but not be limited to the following:
   1. Columns and beams.
   2. Ceiling heights.
   3. Ceiling dimensional layouts per the reflected ceiling plans.
   4. Ceiling grid.
   5. Coordination drawings of ceiling cavities and mechanical rooms demonstrating the spatial relationships and necessary clearances within the available space above ceilings and within rooms for HVAC, Electrical, Plumbing and Fire Protection structural systems.
   6. Wall to wall dimensions.
   7. Partition layouts.
   8. Windows, doors and other openings.
   9. Heights from ceiling to structural components.

10. Dimensions from column centerlines.
11. Other appropriate building features.

E. Upon receipt of layout CAD files, each contractor shall proceed immediately and independently to indicate their work as overlays on the CAD files. This work shall be done within the next 5 days unless otherwise agreed upon by the Construction Manager.

F. The drawing layout prepared by each contractor shall be transmitted to HVAC contractor and other contractors for comment and adjustments.

G. Coordination meetings will be held, and all contractors will be required to attend and cooperate. Changes shall be made as requested by HVAC contractor. This process shall take up to 30 days.

H. Contractors shall also prepare additional CAD drawings as necessary to adequately and completely show the intended routing and layout of their work. Additional drawings may include riser diagrams, flow sheets, elevations, details, sections, isometric layouts, etc. as determined by the HVAC contractor and the Architect.

I. The Prime Contractor responsible for Work in each of the following categories shall prepare or arrange for preparation of Coordination Drawings for the following systems:
1. HVAC systems
2. Plumbing systems
3. Fire protection systems including sprinklers
4. Electrical systems
5. Openings and sleeves in structural slabs
6. Ceiling systems

J. Include on Coordination Drawings the information listed below for each of the following categories of Work:
1. Mechanical Systems:
    a. Sizes and bottom/headroom elevations of new unit heaters.
    b. Weights of each unit and the proposed attachment structure.
    c. Locations of major components, including ductwork, piping, dampers, valves, diffusers, cleanouts, and electrical distribution equipment.
    d. Curb locations of penetrations through roofing assemblies.
2. Electrical Systems:
    a. Horizontal and vertical runs of conduit 1-1/4-inch diameter and larger.
    b. Light fixture locations and mounting type including bottom of fixture AFF.
    c. Smoke and Carbon Monoxide detector locations.
    d. Panel boards, switch boards, switch gear, transformers, busways, generator, and motor control center.
    e. Exit signs, strobe/horn, emergency battery pack locations, Fire Alarm Panels, and Generator annunciator panels.
    f. Pull box dimensioned from column centerlines.
3. Fire Protection Systems:
    a. Sizes and centerline elevations of sprinkler piping.
    b. Sprinkler head locations with elevations referenced to ceiling heights.
    c. Fire Pump Room Layout and Riser Diagram.
    d. Locations of major valves.
4. Structural Work:

a. Openings and sleeve locations required in slabs, walls, beams, and other structural elements, including required openings not indicated on Contract Documents.
b. Slab edge locations.

5. Elevated floor and roof Structure, Reflected Ceiling:
   a. Locations and attachment methods of mechanical, fire protection and electrical items, including grilles, registers, diffusers, light fixtures, smoke detectors, sprinkler heads, exit signs, speakers, and other items.
   b. Conform to locations indicated on Contract Drawings to the minimum extent possible.
   c. Indicate positions relative to acoustical ceiling grid where applicable.

K. HVAC Contractor shall assemble all information for final preparation and submission of integrated coordination drawings. This shall be done within 60 days of a fully executed contract for all areas of the building unless otherwise approved by Owner.

L. All communication related to coordination drawings must include the Construction Manager and Project Coordinator on said communication. This includes but is not limited to emails, document distribution in any format, and coordination meetings.

M. Any Contractor not complying with any of the coordination requirements including the timelines will be assessed $1,000.00 for each day that Contractor is not in compliance.

1.6 GENERAL REQUIREMENTS OF CONTRACTS

A. Extent of Contract: Unless the Contract Documents contain a more specific description of the Work, names, and terminology on Drawings and in Specification Sections determine which contract includes a specific element of Project.
   1. Unless otherwise indicated, the Work described in this Section for each contract shall be complete systems and assemblies, including products, components, accessories, and installation required by the Contract Documents.
   2. Local custom and trade-union jurisdictional settlements do not control the scope of the Work of each contract. When a potential jurisdictional dispute or similar interruption of work is first identified or threatened, affected contractors shall negotiate a reasonable settlement to avoid or minimize interruption and delays.
   3. Trenches are not to be left open unless they are enclosed by fencing or barriers.
   4. Blocking, backing panels, sleeves, and metal fabrication supports for the work of each contract shall be the work of each contract for its own work.
   5. Furnishing of access panels for the work of each contract shall be the work of each contract for its own work. Installation and finishing of access panels shall be the work of the General Contractor.
   6. Work involving a structural element shall be completed by the General Contractor.
   7. Roof Mounted Equipment Curbs for the work of Each Contract shall be the work of each contract. GC is responsible for all roof curb blocking. Flashing of Roof Mounted Curbs is by General Contractor.
   8. Painting for the work of each contract shall be the work of the General Contractor.
   9. Cutting and Patching – Provided under each contract for its own work. Exterior Patching of Penetrations through exterior assemblies shall be by General Contractor. Patching in finished surfaces to be the work of the General Contractor.
   10. Through-penetration fire-stopping and thermal insulation for the work of each contract shall be provided by each Contractor.

11. Dust and Smoke Control: Each contract shall be responsible for controlling dust and smoke production and distribution in occupied areas of the building that require work. Do not do work that produces dust, smoke or other airborne particulates without adequate control facilities. Protections include but are not limited to:
    a. HEPA vacuums to collect dust.
    b. Temporary dust enclosure.
    c. Negatively pressurize the space and exhaust to a location not disruptive to the Owner.
    d. Employ water spray for concrete saws.
    e. When using gasoline powered equipment inside an occupied building, this shall be limited to times when the building is not occupied. Alternatively use electric or compressed air powered equipment.
    f. Comply with all current OSHA requirements for smoke and dust control.
12. Protection of Ceilings: Each contract shall be responsible for removing, carefully storing, and reinstall ceilings in rooms with above ceiling work where new ceiling tiles have already been installed. Where ceilings are damaged, the cost of replacement or repairs will be divided equally between prime contractors with above ceiling work in that room.
    a. Where a Prime Contractor requires extended access above a newly installed ceiling, that Contractor shall coordinate with the GC to not install the permanent ceiling panels, and that contractor shall provide and install temporary ceiling panels in place of the permanent ceiling panels. Temporary ceiling panels can be salvaged from demolition work (if applicable), or reused from some other source, or may be the lowest cost panel available to that Contractor. When access is no longer required, that Contractor shall remove the temporary panels and coordinate the permanent installation of ceiling tiles with the GC.
13. Concealed sealants for the Work of each contract shall be provided by each contract for its own Work. Comply with Division 07 requirements for sealants.
14. Contractors' Startup Construction Schedule – Within ten (10) working days after initial Preconstruction Meeting horizontal bar-chart-type construction schedule submittal has been received from Project coordinator, submit a matching startup horizontal bar-chart schedule showing construction operations sequenced and coordinated with overall construction.
15. Permits and Inspections: The plans will be submitted to Exeter Township for a plan review by the Architect. Upon award, each successful prime contractor must complete any applicable permit forms (and business licenses if required) and submit to the Exeter Township and obtain the approved plans. Building permit and inspection fees will be paid for by the Owner. Any additional costs incurred due to failed inspections shall be paid by the prime contractor. Any required contractor or business license fees required by the municipality are to be paid for by each prime contractor.
16. See the “Construction Milestone Schedule” for mandatory, contractual, completion dates through the duration of the project. Schedule must be held. There will be no exceptions.
17. Each prime contractor is responsible for importing any and all material required for their work including cost of the material, hauling placement and compaction.
18. All utility company tap-in or new service fees such as electric; natural gas; sanitary sewer and water service are to be paid for by the Owner.
19. Construction testing shall be provided by the Owner.
20. HVAC Testing, adjusting and Balancing and Commissioning Verification shall be provided by the Owner. Each Contractor is responsible for the startup, initial balancing, and commissioning of their equipment and systems.
21. Each prime contractor is responsible for offsite storage of their own materials. Onsite storage may only be permitted as space allows. Construction Manager will approve storage locations. Construction Manager reserves the right to deny use of storage.

22. Each prime contractor shall be responsible for their own daily clean-up.
23. Each prime contractor shall remove all packaging or protective film on all of their finishes just prior to final cleaning.
24. Each prime contractor is responsible for their own as-built drawings to include final CAD file as-built drawings.
25. Each and all primes are responsible for all drawings for coordination and layout purposes.
26. Contractor shall be required to conduct his activities in a safe manner and shall be responsible for observing the safety requirements of OSHA and local life safety agencies.
    a. Comply with all applicable laws, ordinances, rules, regulations, and orders of the governing authorities having jurisdiction for safety of persons and property to protect them from damage, injury and/or loss.
    b. Erect and maintain as required by conditions and progress of the work, all necessary safeguards for safety and protection, including fences, railings, barricades, lighting, posting of danger signs and other warnings against hazards.
    c. Be solely responsible for initiating maintaining and supervising all safety precautions and programs in connection with the project.
    d. Where noxious or nuisance fumes and odors occur due to construction processes, the contractor shall take every precaution to inform occupants of adjacent buildings and shall take every precaution to prevent the fumes or odors from penetrating the adjacent building. Precautions may include but are not limited to sealing vents and louvers and providing fans to direct odors away from the occupied areas. Contractor shall coordinate with the Construction Manager and Owner minimum of 72 hours prior to beginning such processes.
27. Non-compliance by any Prime Contractor with the agreed upon schedule that results in delays of the project schedule and results in additional time expenditure and/or additional Work for any other Prime Contractor shall result in a Change Order to the offending Prime Contractor. It shall be the responsibility of the affected Prime Contractors to provide proof of delay resulting in additional time and Work as back-up upon issuance of a Change Order Request for the delay caused by another Prime Contractor. The Change Order Requests accompanied by acceptable back-up from the affected Prime Contractors shall be the basis to establish the Change Order issued to the offending Prime Contractor. The Construction Manager will review all information regarding schedule delays and determine fault and accuracy of all claims made.

B. Substitutions: Each contractor shall cooperate with other contractors involved to coordinate approved substitutions with remainder of the Work.
    1. The General Construction Contract shall coordinate applicable substitutions by other contractors.

C. Each Prime Contractor responsible for installation of the systems and equipment is responsible for commissioning each system. The minimum commissioning requirements in accordance with Division 01 and other specific project requirements, including coordination and verification, shall be the responsibility of the Contractor.

D. Each Prime Contractor is responsible for coordinating, installing, maintaining, and removing all Temporary Facilities & Controls as outlined in Division 01 Section 015000 "Temporary Facilities and Controls".

1.7 MULTIPLE PRIME COORDINATION CLARIFICATIONS

A. General Contractor shall furnish and install all lintels and structural supports required for openings and recesses to allow the passage of the Work of his Contract and the Work of the Plumbing, Fire Protection, HVAC, and Electrical Prime Contracts.

B. To the extent that the work of all of the contracts represents a complete and integrated whole, each Prime Contractor shall become thoroughly familiar with all of the construction documents. Work of a particular contract shall be substantially located on the documents referenced below, but such references do not relieve each Contractor for responsibility to provide work in compliance with requirements on all of the documents as follows:
   1. Information contained on any construction document shall be enforceable on each Contractor as indicated on drawings and specifications, by reference to contractor designations (SC, GC, MC, PC, FPC, and EC).
   2. Dimensional information on the Architectural, MEP/FP and Site drawings that relates to the work of a particular contract shall be the responsibility of that Contractor to install the item where located. In the absence of specific dimensional information on the Architectural, MEP/FP and Site plans for exposed items provided by the HVAC, Plumbing, Fire Protection and Electrical Contracts, consult Architect, Engineer, or Construction Manager for decisional requirements before installing exposed item.
   3. In case of conflicts, assignment of responsibilities shall be at the sole interpretation of the Architect, Engineer, or Construction Manager.

C. General Contractor shall provide chases and openings 12” x 12” or larger for equipment in new and existing construction, including all roof areas, as directed, supervised, located, marked, and configured within the project structure, by the Plumbing, HVAC, and Electrical Prime Contractors' personnel onsite. These openings shall be sealed by the prime contractor requiring the opening until permanent equipment is in place and flashings are installed by the GC. All sleeves, conduits, and sealing of the same shall be furnished and installed by the prime contractor that requires the access for installation of systems. Roofing Subcontractor to the GC shall perform cutting and patching of roof materials as directed by the other Prime Contractors for the implementation of their work.

D. The Prime Contractors shall be responsible to seal all roof openings. GC and Roofing Subcontractor are responsible up to curb flashings. The HVAC Contractor shall layout all openings and curbs and shall furnish all roof curbs to GC for installation. GC shall provide all blocking and accessories to install curb(s). Roofing subcontractor will provide all permanent roofing and flashing to the curbs. HVAC Contractor is responsible to seal any temporary or permanent openings and install new equipment keeping the opening watertight at all times.

E. During placement of concrete slabs, each Prime Contractor that has rough-in requirements in the slab shall provide on-site personnel while slabs are being poured to direct, supervise, locate, mark, and configure rough-in requirements. Sleeves required for floor, wall, and roof penetrations shall be furnished and installed by the Prime Contractor(s) that require the sleeves. The Prime Contractor using the sleeves is responsible for installing sealant, fire-safing, and/or escutcheons necessary for a finished installation.

F. Prime Contractors who fail to properly coordinate their work in new construction work and whose work requires an opening, or recess, in completed construction shall be responsible to provide that alteration; to furnish and install lintels and structural supports required; and to patch the construction to match the completed unaltered.

G. General Contractor shall apply sealant around wall mounted outside air intake louvers provided and installed by the HVAC Contractor.

H. Site Contractor shall provide sanitary sewer system from a point five feet outside the perimeter of the building, unless noted otherwise. Plumbing Contractor shall provide sanitary system within building, including underground to a point five feet outside the building perimeter, unless noted otherwise, and shall make final connection to sanitary system.

I. General Contractor shall provide building exterior stormwater conveyance including exterior gutters and downspouts, and make final connections to boots. GC to coordinate with SC for downspout and boot locations. SC will install all exterior storm piping up to and including boot locations for downspout connections. Site Contractor shall provide below grade drainage as shown on the Civil drawings.

J. Site Contractor shall provide domestic and fire suppression water supply system into the Water/Sprinkler Room from Meter Pit. Plumbing Contractor shall provide plumbing water supply system within building and underground from riser in the Water/Sprinkler Room. The Fire Protection Contractor shall provide fire suppression system within building from riser in the Water/Sprinkler Room.

K. Interior concrete bases and pads required for plumbing, fire suppression, heating, ventilation, and air conditioning, and electrical equipment shall be provided by the General Contractor and coordinated with the contractor installing the equipment unless noted otherwise.

L. Site Contractor shall provide exterior concrete pads and bases with exception of exterior light bases and transformer vault. Exterior light pole bases and transformer vaults are provided by the Electrical Contractor and installed by the Site Contractor. Site Contractor will install the generator pad and coordinate with Electrical Contractor for all layout.

M. HVAC and Plumbing Contractors shall provide control interlock wiring for their associated system equipment.
   1. The MC, PC, FPC and EC shall be responsible for coordinating watertight conditions for all roof penetrations and openings that are part of their scope with the GC. GC is responsible for maintaining all watertight conditions.
   2. Electrical Contractor shall provide disconnect switches for HVAC and Plumbing system equipment except where such items are factory installed as an integral part of the equipment.
   3. Electrical Contractor shall provide manual motor starters, or magnetic motor starters, for HVAC and Plumbing equipment except where such equipment is provided with factory installed starters as an integral part of the equipment or equipment control panel. Variable frequency drives shall be an integral part of HVAC equipment and HVAC variable speed pumping package.
   4. Electrical Contractor shall provide fuses for disconnects and disconnect/starter switches. HVAC and Plumbing Contractors shall furnish the Electrical Contractor with required motor data to properly size and select fuses and overload protection in accordance with the National Electrical Code requirements. HVAC and Plumbing Contractors shall furnish to the Electrical Contractor the equipment manufacturers' circuit protection data.
   5. Where fireproofing is indicated for the project, each Prime Contractor shall install clips, hangers, supports, sleeves, runners, and other items required prior to installation of fireproofing. Each Prime Contractor shall protect fireproofing material; damages to fireproofing shall be repaired by the General Contractor and charged to the Prime Contractor responsible for the damage; this includes items installed out of sequence.
   6. Plumbing, Fire Protection, HVAC, and Electrical Contractors shall provide miscellaneous steel members for support of hanging systems installed under their contract and shall reinforce joists for non-panel point concentrated loads. When running parallel to joists, hanging systems shall be supported from steel installed perpendicular to joists and spanning a minimum of three (3) joists. All miscellaneous steel required shall be provided by contractor installing the systems under their contract; do not use joists for support. Supporting from metal roof deck and deck systems is prohibited.
   7. HVAC Contractor shall set controls, panelboards, and appurtenances installed in pipelines and ductwork and shall provide control wiring.

8. Electrical Contractor shall provide devices, wiring within casework, and final connections for casework as provided for in the Contract Documents.
9. Plumbing Contractor to provide all fixtures, traps, etc. to provide all installation and final connections of sinks, faucets, and fittings. Coordinate this work with the General Contractor as provided in the contract documents.
10. Fire Protection Contractor to coordinate tie-in of sprinkler system to fire alarm system with Electrical Contractor. Fire Protection Contractor to provide flow and tamper switches for connection to fire alarm system.
11. Plumbing, HVAC, and Electrical Prime Contracts shall furnish any access panels which are required for access to their work. Coordinate opening requirements with the General Contractor for installation by GC.
12. General Contractor to furnish and install all exterior Architectural vents and louvers.
13. The disconnection and/or reconnection of existing equipment shall be by the Plumbing/ HVAC/ Electrical Contractor as applicable.

N. All roofing work will be performed by GC:
1. GC shall coordinate all work in accordance with project scheduled activities of all other contractors. GC shall perform cutting and patching of all roofing materials including concrete and metal deck. Any structural reinforcement required is by the General Contractor.
2. The GC shall be responsible to maintain watertight conditions between the roof and curbs, pipes and conduits for both permanent and temporary flashing. The MC, PC, FPC and EC shall be responsible for providing temporary enclosures that are watertight for all roof penetrations and openings that are part of their scope in order to maintain watertight conditions beyond the roofer's flashings. GC is responsible for installing all required leveling blocking for curbs. HVAC to furnish and install curbs and layout. GC is responsible for curb flashing.
3. Reference Article 1.7.B of this Section for additional requirements.

O. BUILDING PAD - Building pad shall be priced and procured as follows:
1. SC shall provide building pad at Finish Floor minus concrete slab and stone thickness.
2. GC will then sign-off and approve of the Pad.
3. GC will install footings and foundations. GC is responsible for back fill, compaction, and restoration of the pad.
4. MEP primes will then sign-off and approve the slab.
5. MEP trades will install underground rough-ins. MEP trades are responsible for back fill, compaction, and restoration of the pad.
6. GC will then sign-off and approve the slab.
7. The MEP trades are responsible for any concrete required for their trenches, drains, or conduits.
8. Each trade (GC or MEP) is responsible for dewatering for its own construction activities.
9. GC will stone the building pad and prepare, as required, for pours.
10. GC to coordinate the installation of tie-rod or hair pins (if required) with the MEP trades.

1.8 MULTIPLE PRIME COORDINATION FOR ELECTRONIC/ELECTRIC TEMPERATURE CONTROLS, DIVISION 23

A. The HVAC Contractor is defined herein to include the work of the Mechanical Contractor, H.C., M.C., ATC Sub-Contractor, and/or BAS Contractor.

B. The HVAC Contractor shall provide wiring, fiber, and data cable between all Ethernet Network Controllers Standalone Digital Control Units, workstations, software, sensors, transducers, relays, valves, dampers, damper operators, control panels, and other accessory equipment, along with a complete system of electrical interlocking wiring to fill the intent of the specification and provide for a complete and operable system as specified in Division 23.

C. The Electrical Contractor shall provide electric power wiring to new plumbing and HVAC equipment. HVAC Contractor shall provide electric power wiring and control wiring for ATC equipment and devices.

D. The Electrical Contractor shall furnish duct smoke detectors. The Mechanical Contractor shall install duct detector in ducts. The Electrical Contractor shall wire the duct smoke detectors to the fire alarm system. The Electrical Contractor shall provide fire alarm relays adjacent to the mechanical equipment, and the Mechanical Contractor shall wire to the ATC/BAS system to de-energize the fan.

E. The Electrical Contractor shall provide the kW/KWH transducer specified at each secondary metering location if required. The HVAC contractor shall provide control wiring to the points specified.

F. The Electrical Contractor shall provide auxiliary contacts on generator/transfer switch as required in the points list in Division 23. The HVAC Contractor shall provide control wiring to the points.

G. The HVAC Contractor shall provide all interlock wiring specific to equipment.

1.9 SITE CONSTRUCTION CONTRACT (SC)

A. The Work under the Site Construction Contract includes all construction and other activities traditionally recognized as site work required by any of the Contract Documents including, but not limited to, the site drawings, specification Divisions 00, 01, 31, 32 and 33 except when specifically assigned to another contract for construction. Work in the Site Construction Contract includes, but is not limited to, the following:
   1. Work not identified as work under other contracts.
   2. Site Preparation including demolition, clearing, grubbing, and earthwork.
   3. Utility installation to inside the building pad at ultimate location shown on the MEP and FP Drawings and coordinated with MEP and FP Contractors for final layout. Excavation for all conduits and concrete pole bases. Trenching, stone base, and backfill for MEP Primes outside of building pad. All Primes to furnish and install any necessary conduits, piping etc. Site Contractor to coordinate with all other primes for trenching and backfill work. Utility Installation clarifications are as follows:
      a. Installation of underground storm piping and connections for downspout locations is by the SC. This includes all work from tie-ins to the main storm water runs to the building including the cast boot at grade where downspouts will tie-in. GC will make final connection of downspouts to cast boot. Coordinate all connection points of downspouts with GC.
      b. Installation of all sanitary piping and connections to include the installation of the oil/sand separator. PC will install all piping and connections from the building to the oil/sand separator.
      c. Installation of sanitary piping from valve location behind curb on the site to five feet outside the building. PC will bring sanitary to the exterior of the building and make final connections.
      d. PAWC (Utility Provider) will install all sanitary piping and structures in the public right of way to inside the curb line as shown.
      e. PAWC (Utility Provider) will install all water piping and structures in the public right of way and will also install the water meter pit. SC will install all water piping from the water meter pit to the Water/Sprinkler Room including the installation and testing of the riser in the Water/Sprinkler Room.

f. Installation of gas pipe casing/conduit/sleeves from the building and meter piping riser location to outside edge of driveway. UGI will install gas piping in right of way to include the service to the building inside the installed sleeve from the SC. UGI will conduct all excavation, installation, and backfill in the right of way. Refer to Civil plans for gas piping details and profiles.

4. Establishment of building pad to be provided at Finish Floor minus concrete slab and stone thickness.
5. All storm water systems to include piping, structures, and underground and or infiltration basins.
6. Construction of all new concrete curbs and sidewalks. Including subbase, ramps, and detectable warning surfaces.
7. Landscaping, seeding, topsoil, and mulching. SC is responsible for irrigation for complete stabilization until NOT is received for NPDES permit.
8. Existing Irrigation Line to the neighboring golf course on the South East corner of the site will be relocated by others. SC is required to coordinate all work in this area and confirm relocation has been completed prior to work taking place in this location.
9. Subbase stone and asphalt paving.
10. Subbase stone and concrete paving.
11. Parking bumpers/curb stops.
12. Excavation, grading, cut/fill, export, import, amended soils. All Earthwork responsibilities.
13. Line striping.
14. Fencing, gates, and operators. Coordinate all access control and power connections with EC and Access Control Vendor.
15. E&S Controls and maintenance thereof.
16. Post-mounted signage, and signals. Include temporary traffic signals and controls as required for new installation.
17. Grass cutting and maintenance from start of project through NOT.
18. Dumpster enclosure bollards and concrete only.
19. All Bollards.
20. SC is responsible for capping, rolling, and crowning site grade for positive flow of rain water until building pad is established.
21. Testing required for all water and sewer lines. Including videoing for all storm sewer, sanitary and water piping. Final cleaning of all storm piping prior to turnover to the Owner.
22. Concrete pads for all equipment including generator pad and excluding work under GC Contract.
23. Trenching, stone base and backfill for all Site electrical & data distribution including all conduit & pull boxes installations.
24. Site Contractor shall provide below grade drainage as shown on the Civil drawings.
25. Coordinate with all Owner's Vendors equipment. Review Owner's Vendors Equipment in Information to Bidders for items to be included in Bid.

1.10 GENERAL CONSTRUCTION CONTRACT (GC)

A. The Work under the General Construction Contract includes architectural and structural construction, and other activities traditionally recognized as general construction required by any of the Contract Documents including, but not limited to, the architectural and structural drawings, specification Divisions 00, 01, 03 through 14, except when specifically assigned to another Contract for construction. Work in the General Construction Contract includes, but is not limited to, the following:

1. Work not identified as work under other contracts.
2. All work shown on structural plans, all duct chases, and platforms. This includes all steel and miscellaneous metals construction.

3. Dumpster Enclosure Privacy Slatted Fence and Posts. GC to coordinate install with SC for installation of post foundations and under slab work prior to concrete paving installation.
4. Foundations, including footings, foundation walls and column piers.
5. Slabs-on-grade, including earthwork, sub drainage systems, and insulation.
6. All concrete pads for all work including pads for all other primes within the building footprint.
7. Below-grade building construction, including excavation, backfill, and thermal and moisture protection.
8. Superstructure, including floor and roof construction.
9. Pre-Engineered Metal Building Structure including all hairpins, grade beams and footings.
10. Insulation and fireproofing. GC to provide rated joints and assemblies outside of individual MEPF contractor firestopping of penetrations.
11. Exterior closures, including walls, doors, garage doors, four-fold doors, windows, sheathing, thermal and moisture protection and exterior finishes.
12. Masonry work to include all accessories and grout.
13. Exterior patio seat wall to include all excavation, concrete, masonry, and backfill. Coordinate all rough-ins for gas and electric with PC and EC.
14. Rough and finish carpentry.
15. Framing for all roof and floor openings and supported equipment, including coordination for all roof work.
16. General Contractor shall provide all door louvers.
17. All roofing, gutters and downspouts, roofing accessories, all blocking required for installation of roof curbs, and final flashing to roof curbs.
18. Interior construction, including partitions, insulation, doors (wood, hollow metal, aluminum, etc.), fittings, finishes, hardware, and glazing.
19. General floor flash patching and leveling.
20. Fire suppression specialties and fire-rated framing and glass.
21. Stairs, including railings and finishes.
22. General Contractor to clean and provide final polishing of terrazzo floors as indicated on the Construction Documents.
23. Finishes to include all flooring and floor systems, painting and coatings, countertops, lockers, tiling, wall coverings, corner guards, FRP, toilet accessories, toilet partitions, way finding signage and code signage.
24. GC is responsible for coordination and placement of 9/11 memorial steel. CG is responsible for providing memorial support structure and all miscellaneous features specified for a proper installation. Coordinate and confirm final placement with Construction Manager, Architect, and Owner.
25. Installation and finishing of access panels.
26. Installation of vendor supplied Antenna Mount for radio antenna. Complete all finishing and sealants on exterior of building for water tightness.
27. Furnishings, including casework, specialty casework, and window treatments.
28. Temporary fire protection including fire extinguishers.
29. Openings including windows, doors, and hardware. Provide all aluminum windows, storefronts, entrance doors, curtainwalls, glass, and glazing. Provide temporary opening enclosures as required.
30. Exterior Canopies and exterior Flagpoles. Flagpoles include foundations.
31. Monument Sign construction. Coordinate electrical with EC and Sign Vendor.
32. GC shall provide all final cleaning for move-in condition by the Owner. Final cleaning includes but is not limited to: removal of all debris; vacuuming of all floors; wet cleaning; ceramic floors mopped and cleaned accordingly; all fixtures cleaned and free of dust; all cabinets vacuumed of any dust or debris; all horizontal services wiped cleaned; all windows (glass and frames) cleaned inside and outside; all exterior surfaces cleaned and dirt free including sweeping and power washing as required.

33. Starting, commissioning, adjusting, and training of all General Construction systems and equipment in accordance with manufacturers' recommendations and in conjunction with Owner's Commissioning Verification and Testing Agent(s).
34. All drywall, metal studs, and insulation.
35. All acoustical ceilings and grid, and drywall ceilings.
36. All expansion joints and covers.
37. All interior and exterior building joint sealants.
38. Installation of manhole ring for training prop in Mezzanine floor.
39. Installation of Owner-furnished items as noted on the plans and specifications. This includes but is not limited to motorized chain winches, magnetic white boards, roller shades, and blocking for TV/monitor locations.
40. Provide all blocking necessary to install Owner-furnished items.
41. GC shall perform cutting and patching of all roofing materials including concrete and metal deck. Any structural reinforcement required is by the General Contractor.
42. GC is responsible for all caulking and sealing of all penetrations, expansion joints and transitions between dissimilar materials.
43. GC is responsible to protect all adjoining properties and Owner's existing property exterior to the building. The GC shall video the property prior to construction to identify any areas of concern and also video the building and property upon completion. Any necessary repairs will be the responsibility of the GC.
44. GC is responsible for safe pedestrian access along the entire frontage of the building.
45. GC shall be responsible for all sprinkler head penetrations that relate to new Fire Protection drawings. FPC shall verify all locations prior to install.

1.11 HVAC CONTRACT (MC/HVAC)

A. The Work under the HVAC Construction Contract includes all construction and other activities traditionally recognized as mechanical work required by any of the Contract Documents including, but not limited to, the HVAC drawings, specification Divisions 00, 01, 03, 07, 11, 14, 23 and 31 except when specifically assigned to another contract for construction. Work in the HVAC Contract includes, but is not limited to, the following:

1. All Work as specified in the contract documents and shown on the Mechanical Drawings.
2. HVAC Systems and Equipment as shown and specified.
3. HVAC instrumentation and controls.
4. Starting, Commissioning, adjusting, and training of all HVAC equipment.
5. Coordination of HVAC commissioning, testing, adjusting, and balancing in conjunction with the Owner's Commissioning Verification and Testing Agent(s).
6. Coordinate work with all contractors including, but not limited to electrical, general, and plumbing contractors. Coordinate and confirm locations and rough-in for all work with all contractors. Make location adjustments as required.
7. All roof curbs and accessories for HVAC equipment including louvers and vents. MC shall furnish curbs and layout for installation by GC.
8. All exhaust air systems.
9. Mechanical connections to equipment furnished by other contracts including dryer vents.
10. Final low voltage wiring and electrical connections to all heating, ventilating and air conditioning equipment as required.
11. Preparation of ductwork and HVAC/Electrical coordination drawings.
12. Firestopping of HVAC work.

13. All new duct work must be professionally cleaned prior to turnover of the system to the Owner.
14. MC shall be responsible for the disassembling and reassembling of any equipment related to their scope of work that does not fit in the accessible routes (Doors, Elevator, Stairs to Attic Area).
15. MC shall be responsible for coordinating with Exeter Township, CM, and Architect on the requirements of having any reassembled equipment and following the UL Certification Guidelines.
16. MC shall be responsible for maintaining all warranties for any equipment that is disassembled and reassembled.
17. MC shall implement the certification schedules into the Project Schedule to prevent long lead times and any delays with startup dates.
18. The MC shall be responsible for coordinating with the scope of the FPC as needed.
19. Provide temporary heat, as required; refer to Section 015000.
20. Provide temporary dust and fume control machines as required.

1.12 PLUMBING CONTRACT (PC)

A. The Work under the Plumbing Construction Contract includes all construction and other activities traditionally recognized as plumbing work required by any of the Contract Documents including, but not limited to, the plumbing drawings, specification Divisions 00, 01, 03, 07, 11, 14, 21, 22 and 31 except when specifically assigned to another contract for construction. Work in the Plumbing Contract includes, but is not limited to, the following:
1. All Work as specified in the contract documents and shown on the Plumbing Drawings.
2. Domestic water distribution from riser in Water/Sprinkler Room including main water service systems.
3. Plumbing fixtures including domestic water heater, combustion air, and vent.
4. Sanitary waste piping, accessories, and complete systems within the building to outside perimeter wall connections. PC to install sanitary piping and connections to the oil/sand separator on site.
5. Natural gas piping from meter through the entirety of the building and tie-ins to all equipment, fixtures, and appliances..
6. Plumbing connections to equipment furnished by the General Construction Contract, Fire Protection Contract, HVAC Contract, and Electrical Contract.
7. Plumbing Connections and installations required for Owner-furnished items as noted on the plans and specifications.
8. Coordinate work with all contractors including, but not limited to electrical, general, fire protection, and HVAC contractors. Coordinate and confirm locations and rough-in for all work with all contractors. Make location adjustments as required.
9. Firestopping of Plumbing Contractor Work.
10. Contractor shall include temporary feeds (including additional piping and valves) and connection to permanent system.
11. Perform all starting, commissioning, testing, adjusting, balancing, and training of all plumbing systems and equipment in accordance with the manufacturers' recommendations and in conjunction with Owner's Commissioning Verification and Testing Agent(s).
12. Coordinate with the EC on wiring and connections as needed.
13. All Plumbing fixtures as identified in the Contract Documents.
14. All devices such as hose bibbs, washing machine outlet box, water conditioner, water filter, and pet cock for icemaker.
15. Domestic water distribution.
16. Sanitary routing, waste, and vents.
17. Radon Piping and system as Delegated Design.

18. Low voltage final electrical connections to all plumbing contracts supplied electrically powered equipment.
19. New sanitary lines must be cleaned and videoed professionally prior to turnover of the system to the Owner.
20. Responsible for cutting, capping and or removing any existing lines (Copper, Steel, Aluminum Etc.) that are abandoned that interfere with any new construction and/or new equipment being installed.
21. Coordinate with all trades and to include the Owner and CM as needed.

1.13 FIRE PROTECTION CONTRACT (FPC)

A. The Work under the Fire Protection Construction Contract includes all construction and other activities traditionally recognized as fire protection work required by any of the Contract Documents including, but not limited to, the fire protection drawings, specification Divisions 00, 01, 03, 07, 11, 14, 21, 22 and 31 except when specifically assigned to another contract for construction. Work in the Fire Protection Contract includes, but is not limited to, the following:

1. Fire suppression sprinklers including pumps, sprinkler piping, heads, flow and tamper switches, corrosion mitigation system, trim, accessories, and support.
2. Fire suppression hydraulic calculations to size fire suppression system.
3. Professional engineered fire suppression drawings for submission to the Township and permit.
4. Perform all required Fire Protection system flushes and fills as required.
5. FPC shall coordinate with the GC on all penetrations for new and existing sprinkler heads.
6. Firestopping for Fire Protection Contractor Work.
7. Perform all starting, commissioning, testing, adjusting, balancing, and training of all fire protection systems and equipment in accordance with the manufacturers' recommendations and in conjunction with Owner's Commissioning Verification and Testing Agent(s).

1.14 ELECTRICAL CONTRACT (EC)

A. The Work under the Electrical Construction Contract includes all construction and other activities traditionally recognized as electrical work required by any of the Contract Documents including, but not limited to, the electrical drawings, specification Divisions 00, 01, 03, 07, 08, 11, 12, 14, 26, 27, 28, 31 and 33 except when specifically assigned to another contract for construction. Work in the Electrical Contract includes, but is not limited to, the following:

1. Site electrical distribution.
2. Site lighting including site pole concrete footing and bases.
3. Site conduits, ducts, handholes for lighting, power communications and security.
4. Electrical distribution.
5. Electrical grounding and bonding.
6. Lighting and power branch wiring.
7. Installation of generator systems, including automatic transfer switches and temporary generator connection equipment. Packaged Generator and ATS will be supplied by Owner through Co-operative Purchasing due to lead times.
8. Digital clock systems and all required wiring.
9. Electrical connections to equipment furnished under other contracts.
10. Structural supports, hangers, sleeves and inserts for new electrical systems and components.
11. New sleeves through existing exterior walls for all electrical components.

12. Perform all starting, commissioning, testing, adjusting, balancing and training of all electrical systems and equipment in accordance with the manufacturers' recommendations and in conjunction with the Owner's Commissioning Verification and Testing Agent(s).
13. Luminaires, lighting controls and all accessories.
14. Fire detection and notification systems, including but not limited to smoke detectors, carbon monoxide detectors and horns/strobes.
15. Conduits and raceway for special systems as required.
16. Conduits and raceway for Owner Vendor systems as required.
17. Emergency lighting systems and exit signs.
18. Coordinate work with all contractors including, but not limited to plumbing, fire protection, general and HVAC contractors. Coordinate and confirm locations and rough-in for all work with all contractors. Make location adjustments as required.
19. Cable tray for all work as specified.
20. Spare site underground conduits with pull strings.
21. All rough-in including conduit, pull wire in conduit, and back boxes for all work.
22. Floor and wall boxes for all work.
23. Furnish and install all accessories, hangers, Velcro wraps, etc.
24. Provide electrical dimensions and drawings and assist HVAC Contractor in preparation of coordination drawings.
25. Firestopping of Electrical Contractor Work.
26. Furnish and install racks, patch panels, cross connect, and punch blocks.
27. Furnish and install wall jacks and face plates.
28. Provide equipment and all necessary wiring for interfacing of the following systems:
    a. HVAC equipment
    b. Temperature control
    c. Plumbing equipment
29. Coordinate utility transformer installation and all primary and secondary cable terminations with local utility.
30. Provide coordination, furnish and install conduit, duct banks, vaults, etc. for all power coming onto the site and all underground power to new transformer and electrical switchgear as shown on drawings and in compliance with Met-Ed requirements.
31. Coordinate work with all of the Owner's vendors and sub-contractors including, but not limited to Telecom, Security, and Audio Visual. Coordinate and confirm locations and rough-in for all work with all vendors and sub-contractors. Make location adjustments as required.
32. All work as shown on the Electrical drawings.
33. Site communications and security.
34. Special Electrical systems, including all conduit and pull strings for data connections.
35. High Voltage Electrical connections to equipment furnished by other contracts.
36. Receive, coordinate, install and connect Owner supplied items as identified. Electrical Connections and installations required for Owner-furnished items as noted on the plans and specifications.
37. Coordinate final connections and load bank test with Owner's vendor.
38. Coordinate electrical service to the building with Met-Ed. All work necessary to gain service to the building will be the responsibility of the EC.
39. EC to coordinate with FPC on Fire Protection. EC shall be responsible for reconnection to any boxes, wire pulls as needed. The EC shall be responsible for coordinating with the scope of the FPC as needed.

40. The EC is responsible for installing all equipment pertaining to their scope, it is the EC's responsibility for all means and methods of deliverables and to coordinate with the Manufacturer and County on mobilizing, disassembling, and reinstalling all equipment as needed. The EC shall be responsible for transporting all electrical equipment stored by the County to the site and assemble as needed.
41. EC shall be responsible for coordinating with Exeter Township, the CM and the Electrical Design Professional on the requirements of having any reassembled equipment and following the UL Certification Guidelines.
42. EC shall implement the certification schedules into the Project Schedule to prevent long lead times and any delays with startup dates.
43. EC shall lock out and tag circuit breakers and switches and shall check cables and wires to ensure they are de-energized to ground potential before Work begins.

1.15 OWNER-FURNISHED PRODUCTS

A. Owner will furnish products indicated. The Work includes providing support systems to receive Owner's equipment and making plumbing, fire protection, mechanical, and electrical connections.
   1. Owner will arrange for and deliver Shop Drawings, Product Data, and Samples to Contractor.
   2. Owner will arrange and pay for delivery of Owner-furnished and contractor installed items according to Contractor's Construction Schedule.
   3. After delivery, Owner will inspect delivered items for damage. Contractor shall be present for and assist in Owner's inspection.
   4. If Owner-furnished items are damaged, defective, or missing, Owner will arrange for replacement.
   5. Owner will arrange for manufacturer's field services and for delivery of manufacturer's warranties to Contractor.
   6. Owner will furnish Contractor the earliest possible delivery date for Owner-furnished products. Using Owner-furnished earliest possible delivery dates, Contractor shall designate delivery dates of Owner-furnished items in Contractor's Construction Schedule.
   7. Contractor shall review Shop Drawings, Product Data, and Samples and return them to Architect, noting discrepancies or anticipated problems in use of product.
   8. Contractor is responsible for receiving, unloading, and handling Owner-furnished items at Project site if identified as a Contractor installed item.
   9. Contractor is responsible for protecting Owner-furnished items from damage during storage and handling, including damage from exposure to the elements.
   10. If Owner-furnished items are damaged as a result of Contractor's operations, Contractor shall repair or replace them.
   11. Contractor shall install and otherwise incorporate Owner-furnished items into the Work.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 01 1200

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SECTION 01 2100 - ALLOWANCES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Cash allowances.

B. Contingency allowance.

C. Inspecting and testing allowances.

D. Payment and modification procedures relating to allowances.

1.2 DEFINITIONS

A. Allowance: A quantity of work or dollar amount included in the Contract, established instead of additional requirements, used to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.

1.3 CASH ALLOWANCES

A. Costs Included in Cash Allowances: Cost of product to Contractor or subcontractor, less applicable trade discounts, less cost of delivery to site, and less applicable taxes.

B. Costs Not Included in Cash Allowances: Product delivery to site and handling at the site, including unloading, uncrating, and storage; protection of products from elements and from damage; and labor for installation and finishing.

C. Architect Responsibilities:
1. Consult with Contractor for consideration and selection of product suppliers and installers.
2. Prepare Change Order.

D. Contractor Responsibilities:
1. Assist Architect in selection of products suppliers and installers.
2. Obtain proposals from suppliers and installers and offer recommendations.
3. Prepare Change Order Request based upon Architect and/or Owner selections.
4. On notification of which products have been selected and approval of Change Order, execute purchase agreement with designated supplier and installer.
5. Arrange for and process shop drawings, product data, and samples.
6. Arrange for delivery.
7. Promptly inspect products upon delivery for completeness, damage, and defects. Submit claims for transportation damage.

E. Differences in costs will be adjusted by Change Order.

1.4 CONTINGENCY ALLOWANCE

A. Contractor's costs for products, delivery, installation, labor, insurance, payroll, taxes, bonding, equipment rental, overhead and profit will be included in Change Orders authorizing expenditure of funds from a Contingency Allowance.

B. Funds will be drawn from the Contingency Allowance only by Change Order.

C. At closeout of Contract, funds remaining in Contingency Allowance will be credited to Owner by Change Order.

1.5 INSPECTING AND TESTING ALLOWANCES

A. Costs Included in Inspecting and Testing Allowances: Cost of engaging an inspecting or testing agency; execution of inspecting and tests; and reporting results.

B. Costs Not Included in the Inspecting and Testing Allowances:
1. Costs of incidental labor and facilities required to assist inspecting or testing agency.
2. Costs of testing services used by Contractor separate from Contract Document requirements.
3. Costs of retesting upon failure of previous tests as determined by Architect.

C. Payment Procedures:
1. Submit one copy of the inspecting or testing firm's invoice with next application for payment.
2. Pay invoice on approval by Architect.

D. Differences in cost will be adjusted by Change Order.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 ALLOWANCES SCHEDULE

A. Refer to the attached schedule for allowances.

END OF SECTION 01 2100

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SECTION 01 2300 - ALTERNATES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Description of Alternates.

B. Procedures for pricing Alternates.

C. Documentation of changes to Contract Sum and Contract Time.

1.2 DEFINITIONS

A. Alternate: An amount proposed by bidder(s) as stated within the bid form(s) for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if the Owner decides to accept the corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
   1. Alternates described in the "Schedule of Alternates" article of this Section shall only be a part of the Work if enumerated in the Agreement or subsequently made part of the Project by acceptable modification to the Agreement.
   2. The cost (addition) or credit (deduction) for each Alternate represents the net modification to the Contract Sum to incorporate the Work of the Alternate in to the Work of the Project.

1.3 PROCEDURES

A. Coordination: Revise, modify, or adjust affected adjacent Project Work only to the extent that is necessary to completely integrate the Work of the Alternate into the Project. Revisions, modifications, or adjustments shall not affect items intended to remain as part of the base Project Work.
   1. Include, as part of the Alternate, miscellaneous devices, accessories, and similar items incidental to or required for a complete installation, whether or not indicated as part of the Alternate description or drawings.

B. Execute accepted Alternates under the same conditions and requirements as other Work of the Contract.

1.4 ACCEPTANCE OF ALTERNATES

A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.

B. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Refer to attached schedule on the following page.

END OF SECTION 01 2300

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SECTION 01 2500 - SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Procedural and administrative requirements for proposed substitutions.

1.2 DEFINITIONS

A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
   1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
      a. Unavailability of product or material and/or required warranty terms.
      b. Regulatory changes.
   2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.
      a. Substitution requests offering advantages solely to the Contractor will not be considered.
      b. Consideration and review time by the Owner, Architect or other Owner agent or consultant of the substitution for convenience shall not be cause for delay of the Project. Substitution for Convenience requests shall be made by the Contractor with sufficient review time as to not affect the schedule or the progression of the Work. Where a response to a request for review of a substitution for convenience is not received by the Contractor from the Owner, Architect, or Owner's other agent or consultant, the Contractor shall be responsible for providing the Work required by the Contract Documents such that the Work does not delay the Project.

B. Compatibility: Compatibility of substitution shall be cause to reject the substitution proposed by the Contractor. Compatibility shall be determined by the Architect and/or Owner at the time of the substitution request. Products shall not be compatible if the products require the Owner to purchase or maintain attic stock, maintenance stock or replacement parts of two different products that perform the same function.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
   2. Agrees to provide the same warranty for the substitution as for the specified product.
   3. Agrees to provide same or equivalent maintenance service and source of replacement parts, as applicable.

4. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
5. Waives claims for additional costs or time extension that may subsequently become apparent.
6. Agrees to reimburse Owner for Owner's Consultants and agents fees for review or redesign services associated with re-approval by all authorities having jurisdiction.
7. Agrees to reimburse Owner for Owner's Consultants and agents fees for design/redesign services associated with the substitution that are apparent at the time of the substitution or become apparent after the substitution has been accepted.

B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
1. Note explicitly non-compliant characteristics.

C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
1. It is the responsibility of the substitution proposer to provide a concise substitution request with required relevant information only. Substitution requests including irrelevant and/or excessive information shall be rejected and returned without review.
2. Forms included in the Project Manual must be used for the submission of a substitution request. Where form is insufficient to provide the required information provide supplemental sheets, drawings, forms, and/or attachments indicating required information and indicate on the required form the title and location, within the substitution request packet, of additional/supplemental sheets, drawings, forms, and/or attachments.
    a. Project Information:
        1) Official project name and number, and any additional required identifiers established in Contract Documents.
        2) Owner's, Architect's, and Contractor's names.
    b. Substitution Request Information:
        1) Discrete and consecutive Substitution Request number, and descriptive subject/title.
        2) Indication of whether the substitution is for cause or convenience.
        3) Issue date.
        4) Reference to particular Contract Document(s) specification section number, title, and article/paragraph(s).
        5) Description of Substitution.
        6) Reason why the specified item cannot be provided.
            a) Where reason for substitution is in whole or in part due to lead times or availability of the specified products, provide letter on manufacturer's letter head stating the following:
                (1) Date of purchase order request or initial contact by Contractor for specified product.
                (2) Lack of availability or extent of lead time as of the date indicated above.
                (3) Reason for delivery delay.
        7) Differences between proposed substitution and specified item.
        8) Description of how proposed substitution affects other parts of work.
            a) Include list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate Contractors, including design consultants, that will be necessary to accommodate proposed substitutions.
    c. Comparative Data: Provide point-by-point, side-by-side comparison addressing essential attributes, as appropriate and relevant for the item:

1) Physical characteristics.
2) Operational and maintenance clearances.
3) In-service performance.
4) Expected durability.
5) Visual effect.
6) Sustainable design features.
7) Warranties.
8) Compatibility with other items including, but not limited to, Owner's existing and proposed equipment, products, systems, and/or assemblies.
9) Other salient features and requirements.
10) Include, as appropriate or requested, the following types of documentation:
    a) Product Data:
    b) Samples.
    c) Certificates, test, reports or similar qualification data.
    d) Drawings, when required to show impact on adjacent construction elements.

d. Impact of Substitution:
1) Cost of Substitution: Indicate the total cost of the substitution.
2) In addition to the total cost of the substitution, provide the following:
    a) Total deduct or cost savings to the contract price or the total additional cost to the contract price.
    b) Total Substitution cost shall also be broken down to indicate the following:
        (1) Material cost.
        (2) Labor cost.
        (3) Overhead and profit or fee for each contractor.
        (4) Required engineering and/or architectural design/redesign fees including but not limited to resubmission to authorities having jurisdiction for approval of permits or similar regulatory items.
3) Change of Contract Time due to accepting substitution. Indicate total deduction or addition of time to the contract including but not limited to any time for design/redesign and/or AHJ approval processes.

D. Limit each request to a single proposed substitution item.
1. Submit an electronic document, combining the request form with supporting data into single document.
    a. Electronic document shall be submitted in .pdf format and shall be bookmarked to easily navigate to each major item provided within the request.

3.2 SUBSTITUTION PROCEDURES DURING PROCUREMENT

A. Section 00 2600 - Procurement Substitution Procedures specifies procedures and administrative requirements for substitution requests made prior to the award of contract (During Procurement).

3.3 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

A. Submittal Form (after award of contract):
1. Submit substitution requests by completing 01 2501 - Substitution Request Form. See this section for additional information and instructions. Use only the form indicated; other forms of submission are unacceptable.

B. Submit request for a Substitution for Cause immediately upon discovery of need for substitution, but not later than 30 calendar days prior to time required for review and approval by Architect, in order to stay on approved project schedule.

C. Substitutions for Convenience will not be allowed unless otherwise indicated.

D. Substitutions will not be considered under one or more of the following circumstances:
   1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
   2. Without a separate written request.
   3. When acceptance will require revisions to Contract Documents.

3.4 RESOLUTION

A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner but not later then 7 calendar days from the date of the request for additional information.

B. Architect will notify Contractor in writing of decision to accept or reject request.

3.5 ACCEPTANCE

A. Accepted substitutions that change the work of the Project. They will be documented and incorporated into the Work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

END OF SECTION 01 2500

SUBSTITUTION REQUEST FORM:

Project: Exeter Township
Emergency Services Facility
To:
Re:

Substitution Request No.:
From:
Date:
Architects Project No. 25-049

Specification Title:
Description:
Section No.
Page No.
Article

Proposed Substitution:
Manufacturer:
Website URL:
Trade Name:
Model No:
Installer:
Phone No.
Differences between proposed substitution and specified product:

Provide point by point comparative data on separate sheet as attachment to this form. (This is required for review of any substitution.

Reason for not providing specified item:

Similar Installation:
Project:
Architect:
Address:
Owner:
Does proposed substitution affect other Work? [No] [Yes] (Explain)

Total Cost of Substitution:
Dollars: $
Cost change to contract: [Deduct] [Addition]
Dollars: $

Schedule Impact: [Deduct] [Addition]
days.
Does Substitution Require Redesign: [No] [Yes]

Submitting Representative Initials: _____

THE UNDERSIGNED CERTIFIES:

- The proposed substitution has been fully investigated by the General Contractor and determined to be equal or superior in all respects to the specified materials, products, assemblies, and/or equipment as may be applicable to the substitution request.
- General Contractor acknowledges that this proposed substitution must also meet the design intent expressed in the Contact Documents, as judged by the Architect and substantiated by the materials submitted herewith.
- General Contactor will furnish the same warranty for proposed substitution as for specified material, product, assembly, and/or equipment as may be applicable to the substitution request.
- General Contractor has verified that the same level of maintenance service and similar availability of replacement parts, as applicable, is available.
- General Contractor has verified that the proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Cost data as stated above and further broken out on supplemental data sheets where attached is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent will be waived by the General Contractor.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made by the General Contractor for changes to building design, including A/E design, detailing, and construction costs caused by this substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be completed by the General Contractor.

Submitted By (Printed Name): _____

Signature: _____
On Behalf of (Company Name): _____
Address: _____
E-mail Address _____

Attachments:

_____
_____
_____

ARCHITECT'S REVIEW AND ACTION

_____ Substitution Approved
_____ Substitution Approved as Noted
_____ Substitution Rejected

Architect: MW Studios, Inc.
Reviewed By: _____

Signature: _____
Date: _____

END OF SUBSTITUTION REQUEST FORM

SECTION 01 2600 - CONTRACT MODIFICATION PROCEDURES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

B. Multi Prime Contracts:
1. Site (PC)
2. General (GC)
3. Fire Protection (FP)
4. Plumbing (PC)
5. Mechanical (MC/HVAC)
6. Electrical (EC)

C. Related Sections: The following Sections contain requirements that relate to this Section.
1. Division 01 Section "Submittals" for requirements for the Prime Contractors.
2. Division 00 Section "Procurement Substitution " for administrative procedures for handling requests for substitutions made after award of the Contract.

1.3 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions."

1.4 CHANGE ORDER PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

B. Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.

C. Within twenty (20) days, when not otherwise specified after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change to the Architect for the Owner’s review.
1. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.

2. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
3. Include costs of labor and supervision directly attributable to the change.
4. Include an updated Prime Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

D. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Prime Contractor may initiate a claim by submitting a request for a change to Construction Manager/Architect.
1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Comply with requirements in Section 00 "Procurement Substitution" if the proposed change requires substitution of one product or system for product or system specified.
5. Proposal Request Form: Use AIA Document G709 for Change Order Proposal Requests.

1.5 ALLOWANCES

A. Allowance Adjustment: For allowance-cost adjustment, base each Change Order Proposal on the difference between the actual purchase amount and the allowance, multiplied by the final measurement of work-in-place. Where applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
1. Include installation costs in the purchase amount only where indicated as part of the allowance.
2. When requested, prepare explanations and documentation to substantiate the margins claimed.
3. Submit substantiation of a change in scope of work claimed in the Change Orders related to unit-cost allowances.
4. The Owner reserves the right to establish the actual quantity of work-in-place by independent quantity survey, measure, or count.
5. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or the Prime Contractor's handling, labor, installation, overhead, and profit. Submit claims within 21 days of receipt of the Change Order or Construction Change Directive authorizing work to proceed. The Owner will reject claims submitted later than 21 days.
    a. Do not include the Prime Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in Contract Documents.
    b. No change to the Prime Contractor's indirect expense is permitted for selection of higher or lower-priced materials or systems of the same scope and nature as originally indicated.

B. Unit Price Adjustment: Refer to Division 01 Section “Unit Prices” for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit price work.

1.6 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Proposal Request, Construction Manager/Architect will issue a Change Order for signatures of Owner and Prime Contractor on AIA Document G731.

1.7 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: When the Owner and Prime Contractor disagree on terms of a Proposal Request, the Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Prime Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
   1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
   1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 01 2600

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SECTION 01 2900 - PAYMENT PROCEDURES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Sections include the following:
1. Division 01 Section 012100 "Allowances" for procedural requirements governing the handling and processing of allowances.
2. Division 01 Section 012200 "Unit Prices" for administrative requirements governing the use of unit prices.
3. Division 01 Section 012600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
4. Division 01 Section 013200 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.
5. Division 01 Section 013125 “Web-Based Project Management System” for administrative requirements for use of system.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 REFERENCE STANDARDS

A. AIA G732 - Application and Certificate for Payment, Construction Manager as Adviser Edition.

1.5 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
   a. Application for Payment forms with Continuation Sheets.
   b. Submittals Schedule.
2. Submit the Schedule of Values to the Architect and Construction Manager at earliest possible date but no later than 14 days after the Notice to Proceed.

B. Format and Content: Use the Project Manual Table of Contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.
   1. Schedule of Values shall be transmitted to the Architect and Construction Manager in .xlsx (Excel) or similar format.
   2. Identification: Include the following Project identification on the Schedule of Values:
      a. Project name and location.
      b. Name of Architect.
      c. Name of Construction Manager.
      d. Contractor's name and address.
      e. Date of submittal.
   3. Prepare Schedule of Values to clearly separate the work for each phase of the project scheduled to be occupied by the Owner.
   4. Prepare Schedule of Values in compliance with costs loaded CPM schedule unless otherwise approved by Construction Manager.
   5. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
      a. Related Specification Section or Division and in compliance with cost loaded schedule.
      b. Description of the Work.
      c. Name of subcontractor.
      d. Name of manufacturer or fabricator.
      e. Name of supplier.
      f. Change Orders (numbers) that affect value.
      g. Dollar value as percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent. Round amounts to nearest whole dollar total shall equal the Contract Sum.
   6. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual Table of Contents. Provide several line items for principal subcontract amounts, where appropriate.
   7. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
      a. Differentiate between items stored on site and items stored off site. Include evidence of insurance or bonded warehousing if required per Article 9.3.2 of Section 007216, General Conditions.
   8. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
   9. Allowances: Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
   10. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
      a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
      b. Mechanical, Plumbing, and Electrical Contractors shall include a separate Schedule of Values line item for coordination drawings.
   11. Schedule Updating: Update and resubmit the Schedule of Values before the next Application for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.6 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and Construction Manager and paid for by Owner.
   1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for submission of each application for payment is the 25th day of each month. The period covered by each Application for Payment ends on the FINAL day of each month. Pencil copies of applications for payment shall be submitted in advance for review by Architect, Owner, and Construction Manager no later than the 20th day of each month. All payment applications must comply with project scheduling requirements. These dates are subject to change for the duration of the Project by the Owner prior to the first application for payment.

C. Payment Application Forms: Use AIA Documents as form for Applications for Payment. Provide certification signature lines for both the Architect and the Construction Manager. Utilize AIA G732-2019 or G732-2009, Construction Manager as Adviser Edition.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
   1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
   2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
   3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on site and items stored off site.
   1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment for stored materials.
   2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
   3. Provide summary documentation for stored materials indicating the following:
      a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
      b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
      c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

F. Transmittal: Contractor shall either be required to:
   1. Submit four (4) signed and notarized original hard copies of each Application for Payment to the Architect by a method ensuring receipt within 24 hours; or
   2. Using a method reviewed and approved by the Owner.

a. Should methods such the submission of Payment Applications through digital format be implemented, Contractors shall still provide a copy of the original notarized and signed hard copy of the Payment Application for the Owner's files prior to the release of monthly payments unless waived in writing by the Owner and Construction Manager.

3. Contractor shall transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

G. Initial Application for Payment: The following minimum administrative actions and submittals must precede the submittal of first Application for Payment:
1. List of subcontractors.
2. Schedule of Values.
3. Contractor's CPM Construction Schedule (preliminary, if not final).
4. Products list.
5. Schedule of unit prices.
6. Submittals Schedule (preliminary, if not final).
7. List of Contractor's staff assignments.
8. List of Contractor's principal consultants.
9. Copies of building permits.
10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
11. Initial progress report.
12. Report of pre-construction conferences.
13. Initial settlement survey and damage report if required.
14. Construction Waste Management Plan.
15. Construction IAQ Management Plan (preliminary if not final).
16. The first payment application will not be processed unless these, and any other items required by the Construction Manager or Architect, are processed.

H. Application(s) for Payment when reduction in retainage is requested shall be submitted along with AIA Document G707A-1994, "Consent of Surety to Reduction or Partial Release of Retainage" and surety's executed appropriate Power of Attorney.

I. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
3. Provide any other documentation including warranties, manuals, or other information requested by Architect or Construction Manager.

J. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
2. Certification of completion of final punch list items.
3. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
4. Updated final statement, accounting for final changes to the Contract Sum.
5. AIA Document G706-1994, "Contractor's Affidavit of Payment of Debts and Claims."

6. AIA Document G706A-1994, "Contractor's Affidavit of Release of Liens."
7. AIA Document G707-1994, "Consent of Surety to Final Payment."
8. Evidence that claims have been settled.
9. Final, liquidated damages settlement statement.
10. Any other waivers and releases as required.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 01 2900

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SECTION 01 3100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
   1. General project coordination procedures
   2. Submittals.
   3. Administrative and supervisory personnel.
   4. Project meetings.
   5. Web based project management system.

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.

C. Related Sections include the following:
   1. Section 011250 "Multiple Contract Summary" for a description of the division of work among separate contracts and responsibility for coordination activities not in this Section.
   2. Division 01 Section 017123 “Field Engineering” for procedures for field-engineering services, including establishment of benchmarks and control points.
   3. Division 01 Section 017700 "Execution and Closeout Requirements" for coordinating general installation and field engineering services Contract closeout.
   4. Section 019113 "General Commissioning Requirements" for coordinating the Work with Owner's Commissioning Authority.

1.3 COORDINATION

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
   1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
   2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
   3. Make adequate provisions to accommodate items scheduled for later installation.

B. If necessary, Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's Construction Schedule.
2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Pre-installation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.
9. Project closeout activities.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

E. Each Contractor shall:
1. Perform his Work as mandated by the project schedule to maintain the required sequence and the overall progress of the project.
2. Coordinate Work of his own employees and subcontractors.
3. Expedite his Work to assure compliance with approved schedules.
4. Coordinate his Work with that of other Prime Contractors and work by the Owner.

F. Modifications to the Work made necessary by a Contractor’s failure to properly coordinate the Work, shall be made by that Contractor, at no cost to the Owner.

G. Remove Work installed out of sequence that prohibits a separate Prime Contractor the ability to install Work that is dependent on their prior installation of materials or equipment. No additional compensation or time extension will be considered for the uncovering or removal of the out of sequence Work.

H. Each Prime Contractor shall coordinate space requirements and installation of mechanical and electrical work indicated diagrammatically on the Contract Drawings. Follow routing shown for pipes, ducts and conduit as closely as practicable; place runs parallel with line of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance and for repairs.

I. Where availability of space is limited, the Construction Manager and each Prime Contractor shall coordinate installation of different components with other Prime Contractors to assure maximum accessibility for required maintenance, service and repair and to meet governing code requirements.

J. Each Prime Contractor shall make adequate provisions to accommodate items scheduled for later installation.

K. Each Prime Contractor shall, in finished areas except as otherwise indicated, conceal pipes, ducts and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements provided by other Contractors.

L. Each Prime Contractor shall verify utility requirement characteristics of operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

M. Each Prime Contractor shall coordinate Testing and Inspection Services:
1. Verify required laboratory personnel are present.
2. Verify tests are made in accord with specified standards.
3. Review test reports for compliance with specified standards.
4. Recommend and administer any required retesting.
5. Submit copies to the Owner, Architect/Engineer, and Construction Manager.
6. Coordinate with Owner's Geotechnical Engineer for compaction and moisture content testing. Notify Geotechnical Engineer in advance of need for testing in accord with Project Construction Schedule.
7. Coordinate with Owner's Inspection Agency for concrete, masonry and steel testing and inspection. Notify agency in advance when testing and inspection is required.

N. Each Prime Contractor shall coordinate completion and clean-up of Work of separate sections in preparation for Substantial Completion, and for portions of Work designated for Owner's partial occupancy.

O. Each Prime Contractor shall, after Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accord with Contract Documents, to minimize disruption of Owner's activities.

1.4 SUBMITTALS

A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:
   a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
   b. Indicate required installation sequences.
   c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect/CM for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
2. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.

B. Key Personnel Names: Within 7 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.
2. Provide list to Owner, Architect, and Construction Manager.

1.5 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.
    a. Include special personnel required for coordination of operations with other contractors.

1.6 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
    1. Attendees: Authorized representatives of Owner, Architect and their consultants; Prime Contractor(s) and their superintendent; major subcontractors and other Owner pre-approved parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
    2. Agenda: Discuss items of significance that could affect progress, including the following:
        a. Tentative construction schedule.
        b. Phasing.
        c. Critical work sequencing.
        d. Designation of responsible personnel.
        e. Procedures for processing field decisions and Change Orders.
        f. Procedures for processing Applications for Payment.
        g. Distribution of the Contract Documents.
        h. Submittal procedures.
        i. Preparation of Record Documents.
        j. Use of the premises.
        k. Responsibility for temporary facilities and controls.
        l. Parking availability.
        m. Office, work, and storage areas.
        n. Equipment deliveries and priorities.
        o. First aid.
        p. Security.
        q. Progress cleaning.
        r. Working hours.
        s. Construction Waste Management Plan activities.
        t. Construction IAQ Management Plan activities.

B. Pre-installation Conferences: Conduct a pre-installation conference at Project site before each construction activity that requires coordination with other construction.
    1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect and Construction Manager of scheduled meeting dates.
    2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
        a. The Contract Documents.
        b. Options.
        c. Related requests for interpretations (RFIs).
        d. Related Change Orders.
        e. Purchases.

f. Deliveries.
g. Submittals.
h. Review of mockups.
i. Possible conflicts.
j. Compatibility problems.
k. Time schedules.
l. Weather limitations.
m. Manufacturer's written recommendations.
n. Warranty requirements.
o. Compatibility of materials.
p. Acceptability of substrates.
q. Temporary facilities and controls.
r. Space and access limitations.
s. Regulations of authorities having jurisdiction.
t. Testing and inspecting requirements.
u. Installation procedures.
v. Coordination with other work.
w. Required performance results.
x. Protection of adjacent work.
y. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

C. Progress Meetings: Conduct progress meetings at weekly intervals. Coordinate dates of meetings with preparation of payment requests.
1. Attendees: In addition to representatives of Owner, Construction Manager, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
1) Review schedule for next period.
b. Review present and future needs of each entity's present, including the following:
1) Interface requirements.
2) Sequence of operations.
3) Status of submittals.

4) Deliveries.
5) Off-site fabrication.
6) Access.
7) Site utilization.
8) Temporary facilities and controls.
9) Work hours.
10) Hazards and risks.
11) Progress cleaning.
12) Quality and work standards.
13) Status of correction of deficient items.
14) Field observations.
15) Requests for interpretations (RFIs).
16) Status of proposal requests.
17) Pending changes.
18) Status of Change Orders.
19) Pending claims and disputes.
20) Documentation of information for payment requests.

3. Reporting: The Construction Manager will distribute minutes of the meeting to each party present and to parties who should have been present. Minutes will include a brief summary, in narrative form, of progress since the previous meeting and report.
   a. The Contractor shall revise the Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting. Contractor shall provide and include a two- week look ahead schedule.

D. Weekly Superintendent Meetings: Attend weekly superintendent meetings scheduled and chaired by the General Contractor.
1. Attendees: In addition to representatives of the Owner and Construction Manager, each contractor and subcontractor responsible for work in the upcoming two weeks to be represented.
2. Agenda: Review the work planned in the next two weeks and other items that may affect work in the short-term including:
   a. Deliveries.
   b. Site traffic patterns.
   c. Subcontractors working at the site.
   d. Maintenance of erosion and sediment control features.
   e. Site cleanliness.
   f. Planned work hours.
   g. Coordination items .
3. At each coordination meeting, the following shall occur:
   a. GC shall provide a two-week look-ahead schedule from the current overall CPM schedule listing the tasks start, finish, and total float for the next two weeks.
   b. Each prime contractor superintendent shall be prepared to address the two-week list of tasks and provide their plan for executing each task as per the schedule.
   c. If any task is not going to be met, contractors shall then provide immediate recovery plan which will be incorporated into the overall schedule update.
4. At each coordination meeting, each Prime Contractor is to provide a written two-week look ahead schedule to the General Contractor and Construction Manager for review and comment.

5. The General Contractor shall write meeting minutes for each coordination meeting and distribute them to each Prime Contractor and to the Construction Manager for review within two days after the meeting.

1.7 WEB BASED PROJECT MANAGEMENT

A. Refer to Section 013125 – Web Based Project Management System.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01 3100

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SECTION 01 3125 - WEB-BASED PROJECT MANAGEMENT SYSTEM

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section contains general information that applies to all work performed under the Contract Documents.

B. Prime Contractors shall use Internet/Web-based project management software to transmit documents, track, and otherwise manage this project.

C. Use of this project management software will not change any contractual responsibilities of the construction team members.

D. Related Sections include the following:
1. Division 01 Section 013300 “Submittal Procedures”.
2. Division 01 Section 012900 “Application for Payment”.

1.3 DEFINITIONS

A. System: A real time Web-based software that shares data, translates data, organizes data, facilitates communication, archives actions, and offers scheduling prompts to identified Users.

B. Users: Participants of this project will be invited to Procore and will each create their own password to access the system to view/upload/download data. Owner, Construction Manager, Architect, Engineers and the Prime Contractors are all Users. Other Users may be added as necessary.

C. Contacts: Entities identified to automatically receive specific transmissions or entities selected to receive specific information sent by the system through to an e-mail address.

1.4 USE OF SYSTEM

A. The use of the Construction Manager’s Web-based system is mandatory for the documentation of the transmittal of all non-oral information, even if the actual transmission of the information is by another means.

B. The use of the system will be mandatory by the Prime Contractors to send, retrieve, and respond to data.

C. Where written notification is required by the Contract Documents, an unofficial notification may be sent via the Web-based project management system, but the notification will not be considered received and the timelines will not commence until a paper copy with written signature is received as described in the Conditions of the Contract.

D. Electronic drawings for the project on Procore will be managed by the CM and available for discussion and information in the field office.

1.5 QUALITY ASSURANCE

A. One (1) two-hour training session in the use of the software for this project will be offered by the Construction Manager at a location convenient to the project site. Attendance by one member of each Prime Contractor's organization is mandatory. Each Prime Contractor may enroll up to four (4) additional attendees. All attendees must have a working knowledge of computers and Windows Explorer.

B. Technical assistance will be provided by telephone for all licensed Users throughout the life of the project by the Construction Manager. A total of two (2) hours per contractor will be provided free of charge dispensed in 15-minute intervals.

1.6 SUBMITTALS

A. Submit to the Construction Manager, within 10 days following the Intent to Award, in an electronic template furnished by the Construction Manager, the following:
   1. Name of organization.
   2. Names, mailing addresses, electronic addresses, telephone numbers, and fax numbers of its Users and Contacts, up to a maximum of two (2) users.
   3. Designation of each User into a communication category.

1.7 SOFTWARE AND HARDWARE REQUIREMENTS

A. Each User shall provide and maintain a compatible workstation. Workstation shall have a 32-bit operating system (Windows 7 higher), a high-speed internet browser and a high-speed cable Internet access, high speed DSL or T1 line, and Adobe Acrobat or similar.

B. In addition to any other locations he may select, the General Contractor is required to provide, at the project site, high speed internet connection for his use and a 128K ISDN line for the Architect's and Construction Manager's use during work hours in the Construction Manager's construction trailer. Cost for these items shall be borne by the General Contractor.

PART 2 PRODUCTS

2.1 GENERAL DESCRIPTION

A. The Web-based project management system is a "secure, real-time, interactive, centralized database" specifically established and maintained for the management of this construction project. The product is designed to facilitate communication and improve the time management of its users by facilitating the sharing of information. Information will be available 24/7, from any computer meeting the specifications listed above. The information is fully protected, backed up daily, and archived. The electronic platform allows information to be transmitted across the Internet reducing printing and postage costs and the time associated with such activities.

B. The system contains a directory of the project participants.

C. The system includes templates, with the User's letterhead, for each document created inside the system. The template allows the use of "pull down" menus to complete significant portions of each document.

D. The system allows the templates (and attached documents created outside the system) to be distributed to Users and Contacts.

E. The System contains "translation software" to permit the viewing (and marking) of documents created outside the system. The system can view documents created by different software programs and can deliver images of its translation to any computer meeting the criteria listed above.

F. The system can be personalized by each User to automatically send e-mail notices upon issuance of certain documents if such a practice facilitates the User's business needs.

G. The system is the product of Procore (procore.com).

H. The Construction Manager will administer the Procore user account for this Project.

2.2 DOCUMENTS CREATED INSIDE THE SYSTEM

A. The following documents shall be created on templates inside the system.
1. Submittal Log: The Construction Manager will maintain submittal log after it is initialized.
2. Meeting Agenda & Minutes: ("Action Items" may also be tracked by the system).
3. RFI (Requests for Information)
4. RFP (Requests for Proposal)
5. ASI (Architect's Supplemental Instructions)
6. CCD (Construction Change Directives)
7. Daily reports.
8. Project Record Documents.
9. Construction Manager will use it for Daily Report Software.

B. The following documents may, at each Users option, be created on the system.
1. Messages:
2. E-mails: Contacts that do not have access to the system may be sent information from the system, by the system.
3. Reports generated from information on the system.
4. Project Notices: "Broadcast" messages can be sent to other Users system entry screen.
5. Threaded discussions can be created on the system.

C. The Construction Manager will configure the system so all of the above documents are date/time stamped, project specific, and the author(s) identified.

2.3 DOCUMENTS CREATED OUTSIDE THE SYSTEM AND DISTRIBUTED BY THE SYSTEM

A. The following documents are expected to be created outside the system and distributed through the system. The actual documents may be scanned, faxed, or electronically attached to the transmittal.
1. Technical Submittals: Shop drawings, product data, testing reports, certifications, installation instructions, all will be submitted and distributed by the system. The Architect will return all submissions through the system electronically. Contractor(s) may distribute submittals (after Architect's action) electronically, or elect to print paper copies for distribution, or both. Contractor must keep relevant copies for O&M manuals to be furnished at end of project.

2. Photographs: Digital photographs, digital video, and scanned film images can be loaded onto the system and shared.
3. Field Notes, pencil sketches, manifests, and similar paper-based data may be scanned or faxed into the data base.
4. AIA documents used on the project may be signed electronically except for the following documents where the record copy requires a “wet” signature on paper.
    a. Schedule of Values/ Payment Applications: (The “pencil” review of these documents will occur inside the system).
    b. Change Orders: (The “pencil” review of these documents can occur inside the system.)
    c. Construction Manager, with acceptance of Owner, may also implement a DocuSign process to expedite all approvals and signatures for Project documents.
5. Schedules: The schedule document(s) will be available for review on the system.
6. Correspondence or Data created in other software may be uploaded to the system electronically.

2.4 DOCUMENTS CREATED OUTSIDE THE SYSTEM AND DISTRIBUTED OUTSIDE THE SYSTEM

A. Product samples, color samples, and those documents listed above requiring a “wet” signature will be distributed outside the system; however, the transmittal documenting the distribution shall be done inside the system and submitted electronically and printed to accompany the actual submission.

B. Color selections will not be made from Web-based management system a color sample is required for color selections.

2.5 ADMINISTRATION OF THE SYSTEM

A. Construction Manager shall regularly review the use of the system and provide direction to correct or increase the ability of the team to collaborate. Users must comply with Construction Manager’s direction. If Construction Manager’s direction is not followed, the Owner will have the right to increase contract retainage until corrections are made.

B. Upkeep of System: The provider of the software platform has been making continuous improvements to its functionality and processing features. These improvements are expected to continue for the life of this project and Users will be required to stay current by means of the information provided on the web site.

C. Storage and Archiving of Data:
1. Users do not have the ability to delete any data in the system.
2. Data is stored, simultaneously in multiple, secure, remote locations.
3. Following final completion of the project, an electronic copy of the User’s data will be made available in a format not dependent on accessing the web site.

D. Username and password are to be used only by the person licensed by the Construction Manager. Any person who does not comply with requirements is subject to a fee equal to the damages that Construction Manager determines is appropriate. Such damages will be deducted from payment application.

PART 3 EXECUTION (NOT USED)

END OF SECTION 01 3125

SECTION 01 3219 - SUBMITTAL SCHEDULE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. General administrative requirements.

B. Submittal Register.

C. Submittal Schedule.

1.2 SUBMITTAL REGISTER

A. Submit the Submittal Register concurrently with the preliminary Submittal Schedule as indicated below for review by the Architect and the Owner.

B. The Submittal Register includes specification sections and drawing references in which the Contractor is required to submit one or more of the following: product data, shop drawings, samples, or close-out submittals.

C. Format:
1. Use the Owner's preferred electronic database format.
2. Arrange in matrix form. Include the following:
    a. Specification Section number and Title.
    b. Drawing number/reference.
    c. Submittal description/title.
    d. Submittal type; Action, Information, Maintenance Materials, or Closeout.(Action/Information), Long-lead indicator, Date required for review, Date Submitted, Review Result, Date returned, Resubmittal count, Final Status.
    e. Long-lead indicator.
    f. Date required for review.
    g. Date Submitted.
    h. Review Result.
    i. Date returned.
    j. Resubmittal count.
    k. Final Status.
3. Provide separate line entry for each distinct submittal item or grouping as required by the Contract Documents.
4. Coordinate with the Submittal Schedule and overall project schedule. Maintain and update the Submittal Register periodically, at least monthly, and submit updated versions to the Architect and Owner with monthly pay application.
    a. Submittal Register shall indicate status of submittals.
5. Upon Architect/Owner review, Contractor shall commence approval, fabrication, procurement, and installation activities only after the required submittal has been reviewed and approved unless otherwise authorized in writing by the Architect.

1.3 SUBMITTAL SCHEDULE

A. Submit to Architect for review a schedule for submittals in tabular format arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.

B. Submit preliminary Submittal Schedule at the same time as the preliminary schedule specified in Section - 01 3216 - Construction Progress Schedule.
   1. Indicate submittals required during the first 30 days of construction and submittals with long lead times for manufacturing, fabrication, delivery, and preparation.

C. Submit Complete Submittal Schedule at the same time as the Complete Project Construction Schedule is required. See Section 01 3216 - Construction Progress Schedule.

D. Coordinate with Contractor's construction schedule and schedule of values.

E. Format schedule to allow tracking of status of submittals throughout duration of construction.

F. Arrange information to include scheduled date for initial submittal, specification number and title, submittal category (for review or for information), description of item of work covered, and role and name of subcontractor.

G. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates. Approval of submittals shall be required 15 calendar days prior to release for fabrication, manufacturing, and or purchase of materials/products. Late submittals, incorrect submittals, submittals requiring revision prior to approval that affect the project schedule shall constitute a non-excused delay to the project schedule.
   1. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.
   2. Where Work has been split between multiple subcontractors, suppliers, installers, coordinate and combine the submission of submittals for systems and/or portions of systems such that the Architect can review each portion with its related components. The Architect will notify Contractor if additional information or additional submittals are required and when the submittal(s) received was/were not properly coordinated or if it was received with insufficient information to complete a review.
      a. Submittal review time shall not start until a coordinated and complete submission of submittals is received by the Architect.
   3. Submittals requiring selection of colors will not be fully reviewed until related items requiring color selection are submitted respectively. Furthermore, no colors shall be selected until the Owner has selected a color scheme based upon the submitted samples of finishes.
      a. For example: No exterior color selections shall be made until samples of exposed materials on the exterior of the building have been submitted, color boards presented to the Owner and the Owner has selected/approved the finish selections presented on the color board(s).

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 01 3219

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SECTION 01 3300 - SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Submittal schedule requirements.
2. Administrative and procedural requirements for submittals.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's and Construction Manager's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's and Construction Manager's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

1.3 REFERENCE STANDARDS

A. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification.

1.4 GENERAL ADMINISTRATIVE REQUIREMENTS

A. Make the following types of submittals to Architect:
1. Requests for Information (RFI). Refer to Section 01 3000 - Administrative Requirements.
2. Requests for substitution.
3. Shop drawings, product data, and samples.
4. Test and inspection reports.
5. Design data.
6. Delegated Designs; signed and sealed.
7. Manufacturer's instructions and field reports.
8. Applications for payment and change order requests.
9. Progress schedules.
10. Coordination drawings.
11. Correction Punch List and Final Correction Punch List for Substantial Completion.
12. Closeout submittals.

1.5 SUBMITTALS FOR REVIEW

A. Written and graphic information and physical samples that require Architect's response action. Action submittals are those submittals indicated in individual Specification Sections as "Action Submittals" or "Submittals for Review".

B. When the following are specified in individual sections, submit them for review:
   1. Product data.
   2. Design data.
   3. Delegated Design Data
      a. Signed and sealed documents, drawings, and calculations.
   4. Shop drawings.
   5. Samples for selection.
   6. Samples for verification.

C. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.

D. Samples will be reviewed for aesthetic, color, or finish selection and texture.

E. After review, provide copies and distribute in accordance with this Section and for record documents purposes described in Section 01 7800 - Closeout Submittals.

1.6 SUBMITTALS FOR INFORMATION

A. Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Information submittals are those submittals indicated in individual Specification Sections as "Information Submittals" or "Submittals for Information".

B. When the following are specified in individual sections, submit them for information:
   1. Design data.
   2. Certificates.
   3. Test reports.
   4. Inspection reports.
   5. Manufacturer's instructions.
   6. Manufacturer's field reports.
   7. Field engineering daily reports.
   8. Other types indicated.

C. Submit for Architect's knowledge as contract administrator or for Owner.

1.7 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit Correction Punch List for Substantial Completion.

B. Submit Final Correction Punch List for Substantial Completion.

C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 7800 - Closeout Submittals:

1. Project record documents.
2. Operation and maintenance data.
3. Warranties.
4. Bonds.
5. Other types as indicated within individual Technical Sections.

D. Final Property Survey.

E. Submit for Owner's benefit during and after project completion.

1.8 SUBMITTAL FORMATS

A. General Requirements:
1. Unless otherwise discussed and approved by the Architect and the Owner at the PreConstruction Meeting, use a separate transmittal for each item of a Specification Section.
2. Unless otherwise discussed and approved by the Architect and the Owner at the PreConstruction Meeting, submit separate packages of Submittals for Review and Submittals for Information, when included in the same specification section.
3. Transmit using approved form.
   a. Use form generated by Electronic Document Submittal Service software. Where no form is generated by the Electronic Document Submittal Service or Document Management Service, use Contractor's form, subject to prior approval by Architect.
   b. Transmittal shall indicate at a minimum, the following information:
      1) Official Project name and number, and any additional required identifiers established in Contract Documents.
      2) Owner's, Architect's, and Contractor's names.
      3) Category and Type of Submittal
         a) Category: Submittal for Review or Submittal for Information
         b) Type: Product Data, Shop Drawings, Samples, Warranty Information, Design Data, etc.
      4) Submittal Number; Multi-Prime Contract Package Number, Division Number, Specification Number, Sequential Item Number, Sequential Submission Number.
   c. Provide space for Contractor and Architect review stamps.
   d. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
      1) Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
4. Submittal Numbering:
   a. Submittal Number; Multi-Prime Contract Package Number, Division Number, Specification Number, Sequential Item Number, Sequential Submission Number.
      1) Multi-Prime Contract Package #: **01**-06-1000.01.01.
      2) Division Number: 01-**06**-1000.01.01.
      3) Specification Number: 01-06-**1000**.01.01.
      4) Sequential Item Number: 01-06-1000.**01**.01.
      5) Sequential Submission Number: 01-06-1000.01.**01.**
   b. For Multi-Prime projects begin the Submittal number with the 2-digit contract package number.
      1) Example Submittal Number:

a) For a Multi-Prime General Construction package, all submittals shall begin with **01**. Resulting in a submittal number thus: **01**-06-1000.01.01.
b) For a Multi-Prime Plumbing package, all submittals shall begin with **22**. Resulting in a submittal number thus: **22**-06-1000.01.01.

B. Identify by highlighting or other identification method, relevant product data including but not limited to, options, specific model information and other relevant information where various non-relevant information exits within the submitted materials. Submittal will be returned without action where relevant information is not identified.
1. When revised for resubmission, identify all changes made since previous submission.

C. Options: Identify options requiring selection by Architect.

D. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect and Construction Manager on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.

E. Electronic Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.
1. An electronically-marked up file of the Contract Documents is not acceptable and will be returned unless specifically noted otherwise.
2. Create PDFs at native size and right-side up; illegible files will be rejected.

F. Submittals Utilizing Web-Based Project Software: Prepare submittals as PDF files or other format indicated by Project management software.

1.9 SUBMITTAL PROCEDURES

A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
1. Email: Prepare submittals as PDF package and transmit to Architect by sending via email. Include PDF transmittal form. Include information in email subject line as requested by Architect.
a. Architect, through Construction Manager, will return annotated file. Annotate and retain one copy of file as a digital Project Record Document file.
2. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project management software website. Enter required data in web-based software site to fully identify submittal.
3. Paper: Prepare submittals in paper form and deliver to Architect.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections, so processing will not be delayed because of need to review submittals concurrently for coordination.

a. Architect and Construction Manager reserve the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
b. Architect will notify the Contractor if additional information or additional submittals are required and when the submittal(s) received was/were not properly coordinated or if it was received with insufficient information to complete a review.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Construction Manager's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 15 business days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Construction Manager will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 7 calendar days for review of each resubmittal.
4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 7 calendar days for initial review of each submittal.
5. For sequential reviews involving approval from authorities having jurisdiction (AHJ), in addition to Architect's approval, allow an additional 30 calendar days.
6. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 business days for review of each submittal. Submittal will be returned to Construction Manager, through Architect, before being returned to Contractor.
   a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect and Construction Manager.
7. Schedule submittals to expedite the Project, and coordinate submission of related items. The following submittal processing times are estimated processing times. The Architect will attempt to provide submittal reviews within the time frame indicated however additional time may be necessary to review complex, large, or simultaneously provided submittal packages. The Architect will notify the Contractor if the Architect believes the submittal review will extend beyond the time frames indicated below. Submittal review time beyond the time frames indicated below will not be cause for extension to the Contract Time or the Contract Sum. It is the Contractor's responsibility to coordinate submittal submissions to allow for processing time.
8. Submittals requiring selection of colors will not be fully reviewed until related items requiring color selection are submitted respectively. Furthermore, no colors shall be selected until the Owner has selected a color scheme based upon the submitted samples of finishes.
   a. Exterior material color selections: submit samples of exposed materials on the exterior of the building. Submitted samples will be assembled, by Architect, as color boards and will be presented and approved by Owner.
   b. Interior material color selections: submit samples of exposed materials on the interior of the building. Submitted samples will be assembled, by Architect, as color boards and will be presented and approved by Owner.

D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Make revisions as necessary to comply with the requirements of the Contract Documents and the comments of the previous submittal review.
2. Number resubmittal sequentially by modifying the last 2 digits of the submittal number to the next highest number.

3. Note date and content of previous submittal.
4. Note date and content of revision in label or title block, and clearly indicate extent of revision.
5. If a submittal is resubmitted without modification from the original submittal or without the requested information or compliance with the review comments of the previous submittal, the submittal will be returned without action. Where more than 2 non-compliant resubmittals are received and returned without action due to non-compliance with the Contract Documents, or the comments of the previously submitted and returned submittals, the Contractor shall be required to compensate the Owner for additional services for multiple reviews of non-compliant submittals.
6. Resubmit submittals until they are marked with approval notation from Architect's and Construction Manager's action stamp.

E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's and Construction Manager's action stamp.

G. Digital Data Files:
1. Digital data files may be procured from the Design Team as a convenience to the Contractor, are not guaranteed, and are only available for conditional use as stipulated by the "Release For Transmission of Digital Data".
2. Digital data files including, but not limited to, CAD (.dwg) or Revit (.rvt) may be purchased from the Design Team directly at a cost of One Hundred Dollars ($100.00) per sheet or drawing. The following stipulations apply to the transmission of digital data files and shall be accepted by the purchaser as conditional use of the files.
    a. Release For Transmission of Digital Data: The digital data furnished is solely for the exclusive and limited use of the purchaser receiving the data, and solely in direct connection with the Project. The data has been generated by MW Studios. and/or the consultants of MW Studios, Inc.; the details and design intent in the data is the intellectual property of the entity who generated the data. Use of this data in any way for any other project or application represents infringement of MW Studios copyright. The party (the purchaser) receiving the data shall, to the fullest extent permitted by law, indemnify and hold harmless MW Studios, its consultants and the Project Owner from all claims, damages, losses, liability, and expenses, including attorney's fees arising out of or resulting from the use of the data. The recipient (purchaser) acknowledges that any use of this digital data represents full acceptance of and agreement with the terms of this release. MW Studios and its consultants make no warranty or guarantee, either assumed or implied, as to the accuracy of this data. The purchaser accepts that the use of the transmitted data is at the sole risk of the purchaser. The recipient (purchaser) of the digital data shall not transmit the digital data, or materials prepared from this digital data to other entities/parties without first obtaining acceptance in writing from the other entity/party a Release For Transmission of Digital Data including all the stipulations of this Release For Transmission of Digital Data.

1.10 SUBMITTAL REQUIREMENTS

A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:
    a. Manufacturer's catalog cuts.
    b. Manufacturer's product specifications.
    c. Standard color charts.
    d. Statement of compliance with specified referenced standards.
    e. Testing by recognized testing agency.
    f. Application of testing agency labels and seals.
    g. Notation of coordination requirements.
    h. Availability and delivery time information.
4. For equipment, include the following in addition to the above, as applicable:
    a. Wiring diagrams that show factory-installed wiring.
    b. Printed performance curves.
    c. Operational range diagrams.
    d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
5. Submit Product Data concurrently with Shop Drawings, and before or concurrently with Samples.
6. Do not submit Material Safety Data Sheets (MSDS) for materials or products.

B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data unless submittal based on Architect's digital data drawing files is otherwise permitted.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    a. Identification of products.
    b. Schedules.
    c. Compliance with specified standards.
    d. Notation of coordination requirements.
    e. Notation of dimensions established by field measurement.
    f. Relationship and attachment to adjoining construction clearly indicated.
    g. Seal and signature of professional engineer if specified.
2. Paper Sheet Size: Except for templates, patterns, and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.
3. BIM Incorporation: Develop and incorporate Shop Drawing files into BIM established for Project.
4. Do not reproduce Contract Documents to create shop drawings.
5. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

C. Samples: Submit Samples for review of type, color, pattern, and texture for a check of these characteristics with other materials.
1. Transmit Samples that contain multiple, related components, such as accessories together in one submittal package.
2. Identification: Permanently attach label on unexposed side of Samples that includes the following:
    a. Project name and submittal number.
    b. Generic description of Sample.
    c. Product name and name of manufacturer.
    d. Sample source.

e. Number and title of applicable Specification Section.
f. Specification paragraph number and generic name of each item.

3. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.
4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
   a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
   b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units, showing the full range of colors, textures, and patterns available.
   a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect, through Construction Manager, will return submittal with options selected.
6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
   a. Number of Samples: Submit three sets of Samples. Architect and Construction Manager will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record Sample.
      1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
      2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
   1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
   2. Manufacturer and product name, and model number if applicable.
   3. Number and name of room or space.
   4. Location within room or space.

E. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.

G. Certificates:
1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.
2. Installer Certificates: Submit written statements on manufacturer's letterhead, certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead, certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
4. Material Certificates: Submit written statements on manufacturer's letterhead, certifying that material complies with requirements in the Contract Documents.
5. Product Certificates: Submit written statements on manufacturer's letterhead, certifying that product complies with requirements in the Contract Documents.
6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of AWS B2.1/B2.1M on AWS forms. Include names of firms and personnel certified.

H. Test and Research Reports:
1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for substrate preparation and primers required.
2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
    a. Name of evaluation organization.
    b. Date of evaluation.
    c. Time period when report is in effect.
    d. Product and manufacturers' names.
    e. Description of product.

f. Test procedures and results.
g. Limitations of use.

1.11 DELEGATED DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file and three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

C. BIM Incorporation: Incorporate delegated design drawing and data files into BIM established for Project.
1. Prepare delegated design drawings in the following format: Same digital data software program, version, and operating system as original Drawings.

1.12 CONTRACTOR'S REVIEW

A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect and Construction Manager.

B. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
1. Architect and Construction Manager will not review submittals received from Contractor that do not have Contractor's review and approval.
2. Submittals received by the Architect that has not been reviewed by the Contractor, in the opinion of the Architect, represents a blatant disregard of the Contractors responsibilities to review the submittal for compliance, and will be returned to the Contractor without action. Multiple submissions of a submittal representing a blatant disregard for the Contractors responsibility shall be cause for the Contractor to reimburse the Owner for the additional services of the Architect and the Architect's consultants. In addition, the Contractor may be liable for damages owed to the Owner for project delays or other costs resulting from multiple reviews of non-compliant submittals.

1.13 ARCHITECT'S AND CONSTRUCTION MANAGER'S REVIEW

A. Architects review is only for the general conformance with the design concept of the Project and general compliance with the information given in the Contract Documents. Corrections or comments made on the Submittal during this review doenot relieve the Contractor from complying with the requirements of the Contract Documents or any AHJ (Authority Having Jurisdiction). Review of a specific item shall not be deemed a review of the assembly of which the item is a component. The Contractor is responsible for (1) confirmation and correlation of all quantities and dimensions at the job site, (2) information that pertains solely to the fabrication processes or to the means, methods, techniques, sequences, and procedures of construction, (3) the coordination of work with all other trades (4) for performing work in a safe and satisfactory manner, and (5) coordinating substrates and attachments to substrates/supporting materials.

B. Action Submittals: Architect and Construction Manager will review each submittal, indicate corrections or revisions required, and return.

C. Architect to return submittal with own Transmittal cover. For reference Transmittals is as attached at the end of the Section.

D. Architect's Actions Definitions:
1. "Approved": Submittal conforms with information given and the design concept in the Contract Documents.
2. "Approved, Comments Noted": Submittal conforms with information given and the design concept expressed in the Contract Documents except as noted. Contractor shall coordinate and/or adjust submittal information/Contractor work plan to conform to the information given and the design concept expressed in the Contract Documents. Do not resubmit unless noted otherwise.
    a. Comments may include the statement to "revise and resubmit for record". Where the statement "revise and resubmit for record" is part of the comments, the Contractor shall resolve or incorporate the comments as may be applicable, shall proceed with the work dependent upon the submittal and also revise and resubmit the submittal for record purposes. Submittals received for record purposes will not be returned.
3. "Revise and Resubmit": Submittal does not conform with information given and/or the design concept expressed in the Contract Documents. Contractor shall coordinate and/or adjust submittal information/Contractors work plan to conform to the information given and the design concept expressed in the Contract Documents and resubmit the submittal.
4. "Rejected": The submittal is non-compliant. The Architect shall provide a reason for noncompliance. Contractor is responsible for providing a compliant submittal.
5. "Returned without Action": Submittal is defined within the Contract Documents as a submittal that does not get a review or response from the Architect. The Architect may provide comments to submittals returned without action.

E. Informational Submittals: Architect and Construction Manager will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect and Construction Manager will forward each submittal to appropriate party.

F. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect and Construction Manager.

G. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

H. Architect and Construction Manager will return without review submittals received from sources other than Contractor.

I. Submittals not required by the Contract Documents will be returned by Architect without action.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

3.1 ATTACHMENTS

A. MW Studios Submittal Review and Transmittal Template.

END OF SECTION 01 3300

STUDIOS
ARCHITECTURE
MASTER PLANNING

410.344.1460
8098 Sandpiper Cir Suite H
Nottingham, MD 21236

SUBMITTAL REVIEW AND TRANSMITTAL

Project:	Owner:
Project Name Address 1 Address 2 Address 3	Owner Representatives Name Owner Company Name Address 1 Address 2

Contractor:	Architect:	
Contractor Representative Contracting Company Name Address 1 Address 2	Reviewer Name MW Studios 8098 Sandpiper Cir, Suite H Nottingham, MD 21236	Project Number: xx-xxx

SUBMITTAL

Submittal Number - Name

Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work. The purpose is to demonstrate the way by which the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents.

ARCHITECTS ACTION

By: Reviewer Name
Date: 01/01/1234

The following indicated "ACTION" is the appropriate deemed "ACTION" for the above indicated "SUBMITTAL". The "ACTION" indicated below is based upon a review of the Contractors "SUBMITTAL" but is only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. Review of such "SUBMITTAL" is not conducted for the purpose of determining the accuracy and completeness of the other details such as dimensions and quantities, or for substantiating instructions for installation; All of which remains the responsibility of the Contractor. The Contractor shall not be relieved of responsibility for deviating from requirements of the Contract Documents by the Architects "Approval" of Shop Drawings. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar Submittals by the Architects "Approval" thereof.

☐ **Approved**	Submittal conforms with information given and the design concept expressed in the Contract Documents
☐ **Approved, Comments Noted**	Submittal conforms with information given and the design concept expressed in the Contract Documents EXCEPT AS NOTED. Contractor shall coordinate and/or adjust submittal information/Contractors work plan to conform to the information given and the design concept expressed in the Contract Documents. DO NOT RESUBMIT unless noted otherwise.
☐ **Revise and Resubmit**	Submittal does not conform with information given and the design concept expressed in the Contract Documents. Contractor shall coordinate and/or adjust submittal information/Contractors work plan to conform to the information given and the design concept expressed in the Contract Documents. RESUBMIT.
☐ **Rejected**	
☐ **Returned without Action.** See comments.	

01/01/1234
Submittal Number - Name

COMMENTS:
1. See ARCHITECTS ACTIONS
2. Contractor shall coordinate submittal information and schedule of the Work with all trades.
3. Dimensional and quantity mark-ups are intended to convey conformance with design concept expressed in the Contract Documents. Contractor remains responsible for given information provided within the Contract Documents and the coordination of all quantities and dimensions with the Work and the existing conditions.

ADDITIONAL COMMENTS:
4.

SECTION 01 4000 - QUALITY REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Quality assurance.

B. Testing and inspection agencies and services.

C. Contractor's construction-related professional design services.

D. Contractor's design-related professional design services.

E. Control of installation.

F. Mock-ups.

G. Tolerances.

H. Manufacturers' field services.

I. Defect Assessment.

1.2 REFERENCE STANDARDS

A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants.

B. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation.

C. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry.

D. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in Testing of Soil and Rock as Used in Engineering Design and Construction.

E. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.

F. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing.

G. ASTM E699 - Standard Specification for Agencies Involved in Testing, Quality Assurance, and Evaluating of Manufactured Building Components.

H. IAS AC89 - Accreditation Criteria for Testing Laboratories.

1.3 DEFINITIONS

A. Experienced: When used with an entity or individual, "experienced," unless otherwise further described, means having successfully completed a minimum of 5 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.

B. Field Quality-Control Tests and Inspections: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

C. 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, assembly, and similar operations.

D. Contractor's Quality Control Plan: Contractor's management plan for executing the Contract for Construction.

E. Contractor's Professional Design Services: Design of some aspect or portion of the project by party other than the design professional of record. Provide these services as part of the Contract for Construction.
   1. Design Services Types Required:
      a. Construction-Related: Services Contractor needs to provide in order to carry out the Contractor’s sole responsibilities for construction means, methods, techniques, sequences, and procedures.
      b. Design-Related, Delegated Design: Design services for Delegated Design services explicitly required to be performed by another design professional for a specific, specialized, or highly technical portion of the project. Services primarily involve engineering analysis, calculations, and design, and are not intended to alter the aesthetic aspects of the design. Design services for Delegated Design requires services to be performed by an engineer licensed within the state and/or jurisdiction in which the project is located unless otherwise noted.

F. Design Data: Design-related, signed and sealed drawings, calculations, specifications, certifications, shop drawings and other submittals provided by Contractor, and prepared directly by, or under direct supervision of, appropriately licensed design professional.

G. 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, assembly, and similar operations.
   1. Use of trade-specific terminology in referring to a Work result does not require that certain construction activities specified apply exclusively to specific trade(s).

H. Mock-ups: Physical assemblies of portions of the Work constructed to establish the standard by which the Work will be judged. Mockups are not Samples.
   1. Mockups are used for one or more of the following:
      a. Verify selections made under Sample submittals.
      b. Demonstrate aesthetic effects.
      c. Demonstrate the qualities of products and workmanship.
      d. Demonstrate successful installation of interfaces between components and systems.
      e. Perform preconstruction testing to determine system performance.
   2. Product Mockups: Mockups that may include multiple products, materials, or systems specified in a single Section.

3. In-Place Mockups: Mockups constructed on-site in their actual final location as part of permanent construction.
4. Sample Panel Mockup: Mockups constructed on-site apart from the building, in a location coordinated with the Owner and Architect, to demonstrate aesthetic effects of Sample submittal selection. Disassemble and remove traces of sample panel mockup once scope of work is completed.
5. Field testing may be performed on in-place mockups, exterior envelope mockups, or sample panel mockups. Do not disassemble mockups until after testing and acceptance is completed.

I. 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. Unless otherwise indicated, copies of reports of tests or inspections performed for other than the Project do not meet this definition.

J. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) in accordance with 29 CFR 1910.7, by a testing agency accredited in accordance with NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

K. Source Quality-Control Tests and Inspections: Tests and inspections that are performed at the source (e.g., plant, mill, factory, or shop).

L. Testing Agency: An entity engaged to perform specific tests, inspections, or both. The term "testing laboratory" has the same meaning as the term "testing agency."

M. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work, to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

N. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work, to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Architect.

1.4 CONTRACTOR'S CONSTRUCTION-RELATED PROFESSIONAL DESIGN SERVICES

A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.

B. Provide engineering design services as may be necessary to plan and safely conduct certain construction operations, pertaining to, but not limited to the following:
1. Temporary sheeting, shoring, or supports.
2. Temporary scaffolding.
3. Temporary pedestrian protection structures, walkways, and barriers, or other similar protective measures.
4. Temporary bracing.
5. Temporary falsework for support of spanning or arched structures.
6. Temporary foundation underpinning.
7. Temporary stairs or steps required for construction access only.
8. Temporary hoist(s) and rigging.

9. Investigation of soil conditions to support construction equipment.

1.5 CONTRACTOR'S DESIGN-RELATED PROFESSIONAL DESIGN SERVICES

A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.

B. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

C. Delegated Design Services Statement: Submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

D. Base design on performance and/or design criteria indicated in individual specification sections.
1. Submit a Request for Information to Architect if the criteria indicated are not sufficient to perform required design services.

E. Scope of Contractor's Professional Design Services: Refer to individual technical sections for items of work.

1.6 ACTION SUBMITTALS

A. Mockup Shop Drawings:
1. Include plans, sections, elevations, and details, indicating materials and size of mockup construction.
2. Indicate manufacturer and model number of individual components.
3. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

1.7 INFORMATIONAL SUBMITTALS

A. Contractor's Quality Control (CQC) Plan: For quality-assurance and quality-control activities and responsibilities.

B. Designer's Qualification Statement: Submit for Architect's knowledge as contract administrator, or for Owner's information.
1. Include information for each individual professional responsible for producing, or supervising production of, design-related professional services provided by Contractor.
a. Full name.
b. Professional licensure information.
c. Statement addressing extent and depth of experience specifically relevant to design of items assigned to Contractor.

C. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
   1. Include calculations that have been used to demonstrate compliance to performance and regulatory criteria provided, and to determine design solutions.
   2. Include required product data and shop drawings.
   3. Include a statement or certification attesting that design data complies with criteria indicated, including building codes, loads, functional, and similar engineering requirements.
   4. Include signature and seal of design professional responsible for allocated design services on calculations and drawings.

D. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
   1. Specification Section number and title.
   2. Entity responsible for performing tests and inspections.
   3. Description of test and inspection.
   4. Identification of applicable standards.
   5. Identification of test and inspection methods.
   6. Number of tests and inspections required.
   7. Time schedule or time span for tests and inspections.
   8. Requirements for obtaining samples.
   9. Unique characteristics of each quality-control service.

E. Test and Inspection Reports: After each test/inspection, promptly submit signed copies of report to Architect, Owner, and Contractor.
   1. Include:
      a. Date issued.
      b. Project title and number.
      c. Name and of personnel conducting test and/or inspection.
      d. Date, time, and site conditions at time of sampling or inspection.
      e. Identification of product and specifications section.
      f. Location of test and/or inspection within the Project.
      g. Type of test/inspection and description of test and/or inspection method.
      h. Date of test/inspection.
      i. Results of test/inspection including all data collected.
      j. Statement indicating compliance of results with Contract Documents. Include recommendations for retesting and reinspecting.
      k. Provide interpretation of results.
   2. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.

F. Test and Inspection Log:
   1. Prepare a record of tests and inspections. Include the following:
      a. Date the test or inspection was performed.
      b. Description of the Work tested or inspected.
      c. Specification Section number and title.
      d. Date test or inspection report was transmitted to Architect.
      e. Identification of testing agency or special inspector conducting the test or inspection.

f. Compliance or non-compliance with requirements.
g. Whether or not corrective action was taken or recommended.

2. Post changes and revisions to the log as they occur. Provide access to Architect and Owner for reference and information.

G. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.

H. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing for information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

I. Manufacturer's Field Reports: Submit report documenting manufacturer's technical representatives observations, testing results, and inspection results.
1. Submit report within 7 calendar days of performance of observations, testing, and inspection to Architect for information.
2. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.
3. Include within the report the following information:
a. Name and signature of technical representative who performed observations, tests, inspections and making report.
b. Statement indicating suitability of conditions of substrates and surfaces.
c. Statement that products/equipment at Project site comply with requirements of Contract Documents.
d. Summary of installation procedures being followed/performed, whether they comply with requirements and, if not, what corrective action was taken.
e. Results of operational and other tests and a statement of whether observed performance complies with requirements.
f. Statement indicating whether conditions, products, and installation will affect warranty.
g. Other items indicated within individual Specification Sections.

J. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for Owner.
1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.

K. Permits, Licenses, and Certificates: For Owner's record, 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.

1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications:

1. Prior to start of work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of deficiencies reported by the inspection.
3. Qualification Statement: Provide documentation showing testing laboratory is accredited under IAS AC89.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Designer Qualifications: Where professional engineering design services and design data submittals are specifically required of Contractor by Contract Documents, provide services of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

F. Highest Quantity and/or Highest Quality: Should the Contract Documents establish different or conflicting requirements for minimum quantities or quality levels, the Contractor shall include within the Contract Sum and account for in the Contract Time the furnishing and installation of the most stringent requirement, the higher quantity, and the higher quality. The Contractor shall submit a Request for Information to clarify the differing or conflicting requirements prior to initiating the Work of the differing or conflicting requirements

G. 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.

H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect, demonstrate, repair, and perform service on installations of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Specialists: Certain Specification Sections require that specific construction activities be performed by entities who are recognized experts in those operations. Specialists will satisfy qualification requirements indicated and engage in the activities indicated.
1. Requirements of authorities having jurisdiction supersede requirements for specialists.

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's Responsibilities:
    a. Provide test specimens 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.

2. Build site-assembled test assemblies and mockups, using installers who will perform same tasks for Project.
3. When testing is complete, remove test specimens and test assemblies[, and mockups]; do not reuse products on Project.
4. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect[and Commissioning Authority][, through Construction Manager], 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.

1.9 CONTRACTOR'S QUALITY CONTROL (CQC) PLAN

A. Prior to start of work, submit a comprehensive plan describing how contract deliverables will be produced. Tailor CQC plan to specific requirements of the project. Include the following information:
1. Management Structure: Identify personnel responsible for quality. Include a chart showing lines of authority.
a. Include qualifications (in resume form), duties, responsibilities of each person assigned to CQC function.
2. Management Approach: Define, describe, and include in the plan specific methodologies used in executing the work.
a. Management and control of documents and records relating to quality.
b. Communications.
c. Coordination procedures.
d. Resource management.
e. Process control.
f. Inspection and testing procedures and scheduling.
g. Control of noncomplying work.
h. Tracking deficiencies from identification, through acceptable corrective action, and verification.
i. Control of testing and measuring equipment.
j. Project materials certification.
k. Managerial continuity and flexibility.
3. Owner will not make a separate payment for providing and maintaining a Quality Control Plan. Include associated costs in Bid price.
4. Acceptance of the plan is required prior to start of construction activities not including mobilization work. Owner's acceptance of the plan will be conditional and predicated on continuing satisfactory adherence to the plan. Owner reserves the right to require Contractor to make changes to the plan and operations, including removal of personnel, as necessary, to obtain specified quality of work results.

B. Quality-Control Personnel Qualifications. Engage a person with requisite training and experience to implement and manage quality assurance (QA) and quality control (QC) for the project.
1. Quality control personnel managing the CQC shall have prior experience performing similar duties within the jurisdiction that the Work is being performed. Additionally, the manager of the plan shall have successfully completed the management of a CQC for a project with similar scope and work tasks as the Project.

C. 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 the Work into compliance with standards of workmanship established by Contract requirements and approved mockups.

D. 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.

1.10 TESTING AND INSPECTION AGENCIES AND SERVICES

A. Owner will employ the services of an independent testing agency to perform testing and inspections as specified within the Contract Documents and may be required by Authority Having Jurisdiction over the Project.

B. As indicated in individual specification sections, Owner shall employ and pay for services of an independent testing agency to perform specified testing and inspections.

C. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

D. Contractor Employed Agency:
1. Testing/Inspection agency: An NRTL, and NVLAP, or an independent agency with experience and capability to conduct testing and/or inspecting services indicated, as documented according to and complying with requirements of ASTM E329, ASTM E543, ASTM E699, ASTM C1021, ASTM C1077, ASTM C1093, and ASTM D3740 as may be applicable; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction; and that is acceptable to authorities having jurisdiction.
2. Laboratory Qualifications: Accredited by IAS according to IAS AC89.
3. Laboratory: Authorized to operate in the State in which the Project is located.
4. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.
5. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have work performed by persons qualified to produce required and specified quality.

F. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

G. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

H. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.2 MOCK-UPS

A. Before installing portions of the Work where mock-ups are required, construct mock-ups in location and size indicated for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects, technical performance, and quality of installation.

B. Accepted mock-ups establish the standard of quality the Architect will use to judge the Work.

C. Integrated Exterior Mockups: Construct integrated exterior mockup as indicated within Specifications. Coordinate installation of exterior envelope materials and products as required in individual Specification Sections. Provide supporting structure for mock-up materials.
   1. Mockups to include at minimum, transitions between different materials, corners and terminations, sill and jamb assemblies,
   2. Components include, but are not limited to, the following:
      a. Structure and framing.
      b. Waterproofing.
      c. Water and Air Barrier membrane, including associated flashing and sealants.
      d. Insulation.
      e. Expansion joints.
      f. Cladding materials.
      g. Glazed assemblies.
   3. Refer to Drawing for locations of mockups.

D. Notify Architect and Owner seven (7) calendar days in advance of dates and times when mock-ups will be constructed.

E. Provide supervisory personnel who will oversee mock-up construction. Provide workers that will be employed during the construction at Project.

F. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.

G. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

H. Obtain Architect's approval of mock-ups before starting work, fabrication, or construction.

1. Architect will issue written comments within seven (7) calendar days of initial review and each subsequent follow up review of each mock-up.
2. Make corrections as necessary until Architect's approval is issued.

I. Architect will use accepted mock-ups as a comparison standard for the remaining Work.

J. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Architect.

K. Where possible salvage and recycle the demolished mock-up materials.

3.3 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

3.4 TESTING AND INSPECTION

A. See individual specification sections for testing and inspection required.

B. Testing Agency Duties:
1. Test samples of mixes submitted by Contractor.
2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
3. Perform specified sampling and testing of products in accordance with specified standards.
4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
5. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
6. Perform additional tests and inspections required by Architect.
7. Attend preinstallation meetings and upon request of the Architect attend progress meetings.
8. Submit reports of tests/inspections specified.

C. Limits on Testing/Inspection Agency Authority:
1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
2. Agency may not approve or accept any portion of the Work.
3. Agency may not assume duties of Contractor.
4. Agency has no authority to stop the Work.

D. 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 types of testing and inspection they are engaged to perform.

2. 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.

E. Contractor Responsibilities:
1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
3. Provide incidental labor and facilities:
   a. To provide access to Work to be tested/inspected.
   b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
   c. To facilitate tests/inspections.
   d. To provide storage and curing of test samples.
4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

F. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.

G. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.5 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to attend preinstallation meetings, observe, inspect, and test site conditions, conditions of surfaces and installation of substrates, installation of products, quality of workmanship, start-up of equipment, test, adjust, and balance equipment as applicable, and to report unsatisfactory conditions, and to initiate instructions for repairs when necessary.

B. Submit qualifications of manufacturer's technical representative to Architect 30 days in advance of required observations/services.
1. Manufacturer's technical representative subject to approval of Architect and Owner.

C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.6 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not complying with specified requirements.

B. If, in the opinion of Architect and Owner, it is not practical to remove and replace the work, Architect and Owner will direct an appropriate remedy or adjust payment.

3.7 REPAIR AND PROTECTION

A. Contractor shall, 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 Contract Document requirements for cutting and patching in Section 01 7000 - Execution and Closeout Requirements.

B. Protect existing adjacent surfaces to remain from damage or deterioration due to testing and inspection procedures or repair required by or as a result of testing and inspection procedures.

END OF SECTION 01 4000

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SECTION 01 4216 - DEFINITIONS

PART 1 GENERAL

1.1 SUMMARY

A. This section supplements the definitions contained in the General Conditions.

B. Other definitions are included in individual specification sections.

1.2 DEFINITIONS

A. Calendar Days: Every day of the week, including Saturday, Sunday, and holidays, from midnight to midnight.

B. Business Days: Monday through Friday, 9:00 a.m. to 5:00 p.m., excluding weekends and public holidays.

C. Furnish: To supply, deliver, unload, and inspect for damage.

D. Install: To unpack, assemble, erect, apply, place, finish, cure, protect, clean, start up, and make ready for use.

E. Product: Material, machinery, components, equipment, fixtures, and systems forming the work result. Not materials or equipment used for preparation, fabrication, conveying, or erection and not incorporated into the work result. Products may be new, never before used, or re-used materials or equipment.

F. Project Manual: The book-sized volume that includes the procurement requirements, the contracting requirements, and the specifications.

G. Provide: To furnish and install.

H. Supply: Same as Furnish.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 01 4216

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SECTION 01 4219 - REFERENCE STANDARDS

PART 1 GENERAL

1.1 INDUSTRY STANDARDS

A. Applicability of Standards: Unless 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 to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
   1. For standards referenced by applicable building codes, comply with dates of standards as listed in building codes.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
   1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.2 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they are to mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 01 4219

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SECTION 01 4533 - CODE-REQUIRED SPECIAL INSPECTIONS AND PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Code-required special inspections.

B. Testing services incidental to special inspections.

C. Submittals.

D. Manufacturers' field services.

E. Fabricators' field services.

1.2 DEFINITIONS

A. Code or Building Code: ICC (IBC), International Building Code, edition adopted by authority having jurisdiction at the time the Project was permitted, including applicable amendments and supplements without limitation, and specifically Chapter 17 - Special Inspections and Tests.

B. Authority Having Jurisdiction (AHJ): Agency or individual officially empowered to enforce site development, zoning, environmental, material, occupational, health, building, fire, and life safety code requirements of the permitting jurisdiction in which the Project is located.

C. NIST: National Institute of Standards and Technology.

D. Special Inspections and Tests: Inspections and testing of materials, installation, fabrication, erection, or placement of components and connections mandated by Building Code to safeguard public welfare.
   1. Special inspections and tests are separate from and independent of tests and inspections conducted by Owner or Contractor for purposes of quality assurance and contract administration.

1.3 REFERENCE STANDARDS

A. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.

B. IAS AC89 - Accreditation Criteria for Testing Laboratories.

C. IAS AC291 - Accreditation Criteria for Special Inspection Agencies AC291.

D. ICC (IBC) - International Building Code.

1.4 INFORMATIONAL SUBMITTALS

A. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems:

1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.
2. Primary wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.

B. Special Inspection Agency Qualifications: Prior to start of work, Special Inspection Agency is required to:
1. Submit agency name, address, and telephone number, names of full time registered Engineer and responsible officer.
2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of deficiencies reported by the inspection.
3. Submit certification that Special Inspection Agency is acceptable to AHJ.
4. Submit documentation that Special Inspection Agency is accredited by IAS according to IAS AC291.

C. Testing Agency Qualifications: Prior to start of work, Testing Agency is required to:
1. Submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of deficiencies reported by the inspection.
3. Submit certification that Testing Agency is acceptable to AHJ.
4. Submit documentation that Testing Agency is accredited by IAS according to IAS AC89.

D. Smoke Control Testing Agency Qualifications: Submit prior to the start of work.
1. Submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
2. Submit documentary evidence that agency has appropriate credentials and documented experience in fire protection engineering, mechanical engineering and HVAC air balancing.
3. Submit certification that Testing Agency is acceptable to AHJ.
4. Submit documentation that Testing Agency is accredited by IAS according to IAS AC89.

E. Manufacturer's Qualification Statement: When required by AHJ, submit documentation of manufacturing capability and quality control procedures. Include documentation of AHJ approval.

F. Fabricator's Qualification Statement: When required by AHJ, submit documentation of fabrication facilities and methods and quality control procedures. Include documentation of AHJ approval.

G. Special Inspection Reports: After each special inspection, Special Inspector is required to submit at least two copies of report; one to Architect and one to AHJ.
1. Include:
    a. Date issued.
    b. Project title and number.
    c. Name of Special Inspector.
    d. Date and time of special inspection.
    e. Identification of product and specifications section.
    f. Location in the Project.
    g. Type of special inspection.
    h. Date of special inspection.
    i. Results of special inspection.
    j. Compliance with contract documents.

2. Final Special Inspection Report: Document special inspections and correction of discrepancies prior to the start of the work.

H. Fabricator Special Inspection Reports: After each special inspection of fabricated items at fabricator's facility, Special Inspector is required to submit report to Architect and to AHJ.
   1. Include:
      a. Date issued.
      b. Project title and number.
      c. Name of Special Inspector.
      d. Date and time of special inspection.
      e. Identification of fabricated item and specification section.
      f. Location in the Project.
      g. Results of special inspection.
      h. Verification of fabrication and quality control procedures.
      i. Compliance with contract documents.
      j. Compliance with referenced standards.

I. Test Reports: After each test or inspection, Testing Agency is required to submit report to Architect and to AHJ.
   1. Include:
      a. Date issued.
      b. Project title and number.
      c. Name of inspector.
      d. Date and time of sampling or inspection.
      e. Identification of product and specifications section.
      f. Location in the Project.
      g. Type of test or inspection.
      h. Date of test or inspection.
      i. Results of test or inspection.
      j. Compliance with contract documents.

J. Certificates: When required by AHJ, Special Inspector will submit certification by manufacturer, fabricator, and installation subcontractor to Architect and AHJ.
   1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
   2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect and AHJ.

K. Fabricator's Inspection Reports: When required by AHJ, submit reports to Architect and AHJ.
   1. Submit report in duplicate within 30 days of observation to Architect for information.

1.5 SPECIAL INSPECTION AND TESTING AGENCY

A. Contractor to employ services of Special Inspection Agency to perform inspections and associated testing and sampling in accordance with ASTM E329 and required by building code.

B. Special Inspection Agency may delegate to independent testing agency to perform testing and sampling associated with special inspections and required by building code.

C. Employment of agency in no way relieves Contractor of obligation to perform work in accordance with requirements of contract documents.

1.6 QUALITY ASSURANCE

A. Special Inspection Agency Qualifications:
   1. Independent firm specializing in performing testing and inspections of the type specified in this section.
   2. Accredited by IAS according to IAS AC291.

B. Testing Agency Qualifications:
   1. Independent firm specializing in performing testing and inspections of the type specified in this section.
   2. Accredited by IAS according to IAS AC89.

C. Copies of Documents at Project Site: Maintain at the project site a copy of each referenced document.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 SPECIAL INSPECTIONS AND TESTING

A. The Code requires special inspections and testing of certain materials, components, assemblies, and connections used in constructing the project. Special inspections and testing will be performed in accordance with the Code.

B. Special inspections and testing will be performed in accordance with the Code for the following materials and project components:
   1. Steel.
   2. Concrete.
   3. Masonry.
   4. Wood.
   5. Soils.
   6. Driven deep foundations.
   7. Cast-in-place deep foundations.
   8. Helical pile foundations.
   9. Vertical masonry foundation elements.
   10. Fabricated items.
   11. Mastic and intumescent fire-resistant coatings.
   12. Exterior insulation and finish systems (EIFS).
   13. Fire-resistant penetrations and joints.
   14. Smoke control testing.
   15. Seismic resistance.
   16. Wind resistance.
   17. Structural observations required by ICC (IBC) section 1704.6.
   18. Special cases as determined by building official and required by ICC (IBC) section 1705.1.

3.2 SPECIAL INSPECTION AGENCY DUTIES AND RESPONSIBILITIES

A. Special Inspection Agency shall:
1. Verify samples submitted by Contractor comply with the referenced standards and the approved Contract Documents.
2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
3. Perform specified sampling and testing of products in accordance with specified reference standards.
4. Ascertain compliance of materials and products with requirements of Contract Documents.
5. Promptly notify Architect and Contractor of observed irregularities or non-compliance of work or products.
6. Perform additional tests and inspections required by Architect.
7. Attend preconstruction meetings and progress meetings.
8. Submit reports of tests or inspections specified.

B. Limits on Special Inspection Agency Authority:
1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
2. Agency may not approve or accept any portion of the work.
3. Agency may not assume duties of Contractor.
4. Agency has no authority to stop the work.

C. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.

D. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.3 TESTING AGENCY DUTIES AND RESPONSIBILITIES

A. Testing Agency Duties:
1. Test samples submitted by Contractor.
2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
3. Perform specified sampling and testing of products in accordance with specified standards.
4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
5. Promptly notify Architect and Contractor of observed irregularities or non-compliance of work or products.
6. Perform additional tests and inspections required by Architect.
7. Attend preconstruction meetings and progress meetings.
8. Submit reports of tests or inspections specified.

B. Limits on Testing or Inspection Agency Authority:
1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
2. Agency may not approve or accept any portion of the work.
3. Agency may not assume duties of Contractor.
4. Agency has no authority to stop the work.

C. On instructions by Architect, perform re-testing required because of non-compliance with specified requirements, using the same agency.

D. Contractor will pay for re-testing required because of non-compliance with specified requirements.

3.4 CONTRACTOR DUTIES AND RESPONSIBILITIES

A. Contractor Responsibilities, General:
1. Deliver to agency at designated location, adequate samples of materials for special inspections that require material verification.
2. Cooperate with agency and laboratory personnel; provide access to approved documents at project site, to the work, to manufacturers' facilities, and to fabricators' facilities.
3. Provide incidental labor and facilities:
   a. To provide access to work to be tested or inspected.
   b. To obtain and handle samples at the site or at source of Products to be tested or inspected.
   c. To facilitate tests or inspections.
   d. To provide storage and curing of test samples.
4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing or inspection services.
5. Retain special inspection records.

B. Contractor Responsibilities, Seismic Force-Resisting System, Designated Seismic System, and Seismic Force-Resisting Component: Submit written statement of responsibility for each item listed in the Statement of Special Inspections to AHJ and Owner prior to starting work. Statement of responsibility shall acknowledge awareness of special construction requirements and other requirements listed.

C. Contractor Responsibilities, Wind Force-Resisting System and Wind Force-Resisting Component: Submit written statement of responsibility for each item listed in the Statement of Special Inspections to AHJ and Owner prior to starting work. Statement of responsibility shall acknowledge awareness of special construction requirements and other requirements listed.

3.5 FABRICATORS' FIELD SERVICES

A. When required by AHJ or specified in individual specification sections, require fabricators to provide qualified staff personnel to observe site conditions, installation conditions, quality of workmanship, and start-up of equipment and systems and to initiate instructions when necessary.

B. Submit qualifications of observer to Architect 30 days in advance of required observations.
1. Observer subject to approval of Architect.

C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

END OF SECTION 01 4533

SECTION 01 5000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes requirements for temporary facilities and controls, including temporary utilities, support facilities, and security and protection facilities.

B. Temporary utilities include, but are not limited to, the following:
1. Sewers and drainage.
2. Water service and distribution.
3. Sanitary facilities, including toilets, wash facilities, and drinking-water facilities.
4. Heating, ventilation and cooling facilities.
5. Electric power service.
6. Lighting.
7. Internet service.

C. Support facilities include, but are not limited to, the following:
1. Project identification and temporary signs.
2. Waste disposal facilities.
3. Field offices.
4. Storage and fabrication sheds.
5. Lifts and hoists.
6. Construction aids and miscellaneous services and facilities.
7. Temporary Stairs
8. Dewatering facilities and drains.
9. Snow removal of construction site.
10. Weed trimming and grass cutting of construction site.

D. Security and protection facilities include, but are not limited to, the following:
1. Environmental protection.
2. Stormwater control.
3. Tree and plant protection.
4. Pest control.
5. Site enclosure fence.
6. Security enclosure and lockup.
7. Barricades, warning signs, and lights.
8. Temporary enclosures.
9. Temporary partitions.
10. Fire protection.

11. Site security lighting.
12. Temporary signage including pedestrian and traffic signage.
13. Temporary line striping and directional markings.

E. Related Sections include the following: List below only products, construction, and equipment that the reader might expect to find in this Section but are specified elsewhere.
1. Section 011250 "Multiple Contract Summary".
2. Section 013300 "Submittal Procedures" for procedures for submitting copies of implementation and termination schedule and utility reports.
3. Section 017000 "Execution and Closeout Requirements" for progress cleaning and closeout requirements.
4. Section 019113 “General Commissioning Requirements” for additional information and procedures.
5. Divisions 23 through 28 for temporary heat, ventilation, and humidity requirements for products in those Sections.
6. Division 32 Sections for construction and maintenance of asphalt paving and cement concrete pavement for temporary roads and paved areas.

1.3 DEFINITIONS

A. Permanent Enclosure: As determined by Architect and Construction Manager, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

1.4 REFERENCE STANDARDS

A. 29 CFR 1926 - Safety and Health Regulations for Construction.

B. NFPA 10 - Standard for Portable Fire Extinguishers.

C. NFPA 70 - National Electrical Code.

D. NFPA 101 - Life Safety Code.

E. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.

F. NFPA 601 - Standard for Security Services in Fire Loss Prevention.

1.5 DIVISION OF RESPONSIBILITIES

A. General: Each Prime Contractor is assigned specific responsibilities for certain temporary services and facilities used by other prime Contractors, and other entities at the site. The Contractor for General Construction is responsible for providing temporary services and facilities that are not normal construction activities of other prime Contractors and are not specifically assigned otherwise. All contractors must review this entire Specification for temporary requirements in each Contract.

B. EACH PRIME CONTRACTOR is responsible for:
1. Installation, operation, maintenance and removal of each temporary service or facility usually considered at its own normal construction activity, as well as the costs and use charges associated with each such service or facility.

2. All locations for Temporary Facilities on the construction site to be coordinated with Construction Manager.
3. Plug-in electric power cords and extension cords, and supplementary plug-in task lighting and special lighting necessary exclusively for its own activities.
4. Its own field office, complete with necessary furniture, utilities and internet service.
5. Its own storage and fabrication sheds.
6. Heat, ventilation, humidity control and enclosure of the building where these utilities are necessary exclusively for its own activities.
7. Temporary heat as required over the supplied 60 degree F.
8. General hoisting facilities and all hoisting requirements, including hoisting loads in excess of 2-ton, hoisting material or equipment into spaces below grade, and hoisting requirements outside the building enclosure.
9. Collection and disposal of its own hazardous, dangerous, unsanitary or other harmful waste material.
10. Secure lockup of its own tools, materials and equipment.
11. Construction aids and miscellaneous services and facilities necessary exclusively for its own construction activities.
12. Collection and disposal of fluid wastes, including any water containing effluents with or without solids until permanent sewer systems are functional and if permanent systems are equipped and/or permitted to accept such effluents.
13. Separation and disposal of solids prior to release into permanent sewer system.
14. Contractor's responsibility is to perform regular clean up and place construction debris in designated container. Refer to Waste Disposal and Clean Up, Article 3.4.D.
15. Each Prime Contractor is responsible for removal of their respective waste from new building construction, existing building selective demolition, sitework demolition and all site work related activities and shall follow procedures to direct as much waste as possible from the landfill.
16. Each Prime Contractor shall perform regular cleanup of construction waste to keep a clean and safe construction site. Construction Manager will re-assign clean up to other contractors and charge the contractor who is not performing the regular cleanup.
17. Waste disposal support as per Article 3.4D.
18. Staging and scaffolding for its own construction activities.

C. The Contractor for Site Construction is responsible for:
1. Temporary facilities and controls that are not otherwise specifically assigned to the General Contract, Fire Protection Contract, Plumbing Contract, Mechanical Contract and Electrical Contract.
2. Unpiped sewers and drainage, including drainage ditches, dry wells, stabilization ponds, and containers.
3. Stormwater control.
4. Temporary roads and paving.
5. Temporary signage including Pedestrian and traffic, Barricades, warning signs and lights.
6. Site enclosure fences for the project site including around all Contractor parking and storage areas as identified on the Site Logistics Plan.
7. Site security including but not limited to:
    a. Lockup and storage of contractors tools, materials, and equipment.
    b. Construction gates and entrances.
8. Environmental protection.
9. Dewatering facilities and drains for all site areas until permanent systems are installed.
10. Temporary sewers and drainage.
11. Traffic controls for all deliveries and scope of work that affects normal traffic patterns.

12. Weekly and as-needed street sweeping as directed by CM due to the accumulation of dirt and debris.
13. Maintenance of all erosion and sediment controls per the erosion and sediment drawings. The County Conservation District has final decision in all related E&S requirements and maintenance needs.
14. Trimming and clearing of all weeds and grass cutting in the construction site to maintain a clean, organized site at all times.

D. The Contractor for General Construction is responsible for:
1. Temporary facilities and controls that are not otherwise specifically assigned to the Site Contract, Fire Protection Contract, Plumbing Contract, Mechanical Contract and Electrical Contract.
2. Unpiped temporary toilet fixtures, wash facilities, and drinking water facilities, including disposable supplies.
3. Temporary field offices for the Construction Manager (CM) and project meeting office.
4. Temporary toilets and wash facilities, including disposable supplies for all Construction personnel utilization during Construction.
5. Containerized bottled-water type drinking water units for the CM field office.
6. Temporary enclosure of the building.
7. Temporary partitions.
8. Temporary fire protection and temporary fire extinguishers.
9. Temporary heating, ventilation and air conditioning (HVAC) and humidity control from the Notice to Proceed date to NINETY (90) days prior to scheduled Substantial Completion for all phases of the Project.
10. Rodent and pest control.
11. Site security including but not limited to:
    a. Lockup and storage of contractors tools, materials, and equipment.
    b. Construction gates and entrances. GC is responsible for providing chains and locks required for all construction fence lockup. GC is responsible for lockup of the all construction fence areas at the end of each working day.
12. Site temporary water service, water trucks, and site water systems until new water service or temporary water service provided by Plumbing Contractor is installed.
13. Dewatering facilities and drains for all building areas until permanent systems are installed.
14. Temporary stairs for construction worker access.
15. Project identification sign, temporary signs and traffic controls.
16. Control and coordination of fire watch activities.
17. Protection of existing finishes to remain.
18. Snow and ice removal and clearing of the site to provide access to all construction work areas, construction parking, and staging areas at all times.

E. The Fire Protection Contractor is responsible for:
1. Fire Protection connections to existing systems and temporary facilities and controls furnished by the Site Contract, General Contract, Fire Protection Contract, Plumbing Contract, Mechanical Contract, and Electrical Contract.
2. Site security including but not limited to:
    a. Lockup and storage of contractors tools, materials, and equipment.
    b. Construction gates and entrances.

F. The Plumbing Contractor is responsible for:
1. Piped temporary or permanent water service.
2. Dewatering facilities and drains for all work that is Plumbing Contractors responsibilities and once permanent construction is installed (e.g. once permanent deck or waterproof decking is installed).

3. Site security including but not limited to:
   a. Lockup and storage of contractors tools, materials, and equipment.
   b. Construction gates and entrances.
4. Piped storm water from roof sections as schedule dictates.
5. Plumbing connections to existing systems and temporary facilities and controls furnished by the Site Contract, General Contract, Fire Protection Contract, Plumbing Contract, Mechanical Contract, and Electrical Contract.

G. The Mechanical (Heating, Ventilating and Air-Conditioning (HVAC)) Contractor is responsible for:
1. Temporary gas service for heating requirements of HVAC Contractor only.
2. Permanent and/or temporary heating, ventilation and air conditioning (HVAC) from NINETY (90) days prior to Substantial Completion for each area until after Owner occupancy.
3. Site security including but not limited to:
   a. Lockup and storage of contractors tools, materials, and equipment.
   b. Construction gates and entrances.
4. Dewatering and drainage for Work under scope.
5. Mechanical connections to existing systems and temporary facilities and controls furnished by the Site Contract, General Contract, Fire Protection Contract, Plumbing Contract, Mechanical Contract, and Electrical Contract.

H. The Electrical Contractor is responsible for:
1. Temporary electric power service and distribution for project. This includes office trailer services and distribution for each of the Prime Contractors and the Construction Manager. Coordinate temporary service requirements with the Construction Manager and the Energy Company to include any and all required permits associated with the temporary electrical service.
2. Temporary lighting for building and site.
3. Site security including but not limited to:
   a. Lockup and storage of contractors tools, materials, and equipment.
   b. Construction gates and entrances
4. Dewatering and drainage for work under scope.
5. Electrical connections to existing systems and temporary facilities and controls furnished by the Site Contract, General Contract, Fire Protection Contract, Plumbing Contract, Mechanical Contract and Electrical Contract.

1.6 USE CHARGES AND OUTLINE REQUIREMENTS

A. General: Cost or use charges for required temporary facilities shall be included in the total Contract Sum are not chargeable to Owner, Construction Manager, or Architect as extra costs. Allow other entities to use temporary services and facilities without cost, including, but not limited to, the following:
1. Owner's construction forces.
2. Occupants of Project.
3. Architect and Construction Manager (CM).
4. Testing agencies.
5. Personnel of authorities having jurisdiction.

B. Water Service: General Contractor shall be responsible for all water needs on project, from a water truck or any source provided, from Notice to Proceed and until temporary or new permanent water service is installed and metered to building site. Owner will pay for metered use charges for the Project once the permanent system is installed, tested and accepted by Water Authority.

C. Sewer Service: Each individual Contractor shall be responsible for collecting and disposing of any water containing solids or other effluents with or without solids that are to be disposed of as a function of their work until the permanent septic or sewer system is fully functional and operational. Any effluents not permitted to be discharged into sewer or septic system shall be collected and disposed of by each Contractor responsible for generating the discharge.

D. Electric Service: Electrical Contractor shall furnish and install temporary power service for construction activities. Owner shall pay for all metered use charges from temporary service. Once permanent service is active, Owner will pay for use charges for permanent service.

E. Electrical Contractor shall provide power to site monitoring camera and video storage system as specified. (Verify with Township)

F. HVAC System:
1. Utility costs for permanent HVAC system use will be paid by Owner. Utility costs for any approved temporary HVAC system provided by HVAC contractor in the ninety (90) day prior to Substantial Completion period shall be paid by the Owner provided that the temporary HVAC equipment is connected to the permanent HVAC system. HVAC Contractor shall be responsible for utility costs for temporary HVAC systems not connected to the permanent HVAC system.
2. General Contractor is responsible for providing any supplemental HVAC equipment, including humidification and/or dehumidification equipment, that is necessary for the installation of new construction and finishes and maintaining equipment in place until Substantial Completion.
3. HVAC Contractor must maintain, operate and extend equipment warranties as required to provide the Owner with a new, clean system with all warranty periods in effect as required by the Contract Documents.
4. HVAC Contractor shall provide a filter change for all units after the date of Certificate of Occupancy.
5. HVAC Contractor shall provide all necessary controls for safety requirements including smoke or fire monitoring, and with all necessary shutdown features to run and operate temporary or permanent HVAC systems.

G. Clarification of Utility Use Charges:
1. The Owner will pay for utility company metered electrical usage for construction activities and for one job trailer for each prime contractor.
2. Each Prime Contractor shall pay for their communication usage.

1.7 QUALITY ASSURANCE

A. Regulations: Prime contractor shall comply with industry standards and with applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following:
1. Building code requirements.
2. Health and safety regulations.
3. Utility company regulations.
4. Police, fire department and rescue squad rules.
5. Environmental protection regulations.

B. Standards: Comply with ANSI A10.6, NECA's "Temporary Electrical Facilities," and NFPA 241.
1. Trade Jurisdictions: Assigned responsibilities for installation and operation of temporary utilities are not intended to interfere with trade regulations and union jurisdictions.
2. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

C. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.8 PROJECT CONDITIONS AND OPERATION

A. Temporary Use of Permanent Facilities: Installer of each permanent system and service shall assume responsibility for operation, maintenance, and protection of each permanent system and service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

B. Conditions of Use: The following conditions apply to use of temporary services and facilities by all parties engaged in the Work:
   1. Keep temporary services and facilities clean and neat.
   2. Relocate temporary services and facilities as required by progress of the Work.

PART 2 PRODUCTS

2.1 MATERIALS

A. General: Undamaged, previously used materials in serviceable condition may be used if approved by Construction Manager. Provide materials suitable for use intended.

B. Provide materials suitable for use intended.

C. Portable Chain-Link Fencing: The Site Contractor shall provide temporary, post-driven galvanized steel chain link fence, 6'-0" high, 11-gauge wire in a 2" (50-mm) mesh.

D. Fencing Windscreen Privacy Screen: Coordinate any scrim graphics with Owner and Construction Manager.

E. Tarpaulins: Fire-resistive labeled with flame-spread rating of 15 or less. For temporary enclosures, provide translucent, nylon-reinforced, laminated polyethylene or polyvinyl chloride, fire-retardant tarpaulins.

F. Water: Potable.

G. Pavement and Concrete: Comply with requirements of Division 03 and 32 Sections.

H. Lumber and Plywood: Comply with requirements of Division 06 Section "Rough Carpentry".

I. Gypsum Wallboard: Provide gypsum wallboard on interior walls of temporary offices.

2.2 TEMPORARY FACILITIES

A. General: Provide equipment suitable for use intended.

B. Field Offices:
   1. Mobile units with lockable entrances, operable windows, and serviceable finishes; heated and air-conditioned; on foundations adequate for normal loading.

2. Field Office for Construction Manager: The Contractor for General Construction shall provide, within one month of Notice to Proceed, a new or like-new insulated, weather-tight, prefabricated or mobile office units or similar job-built construction with lockable entrances, operable windows and serviceable finishes. Provide units with windows and lockable door on foundations adequate for office loading. Space shall include a 12' x 60' trailer with the following:
    a. Heating and cooling equipment appropriately sized for the space.
    b. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.
    c. Two offices furnished with drawing table, work desk with storage drawers and rolling office chair, two (2) four-drawer filing cabinets and drawing rack.
    d. A room not less than 400 sq. ft. for project meetings furnished with a conference table, 25 folding chairs, 50" monitor mounted, 4' x 8' white markerboard, and a 4' x 4' tackboard.
    e. Closet with coat rod and hangers
    f. Class B First Aid Kit to be kept in the Construction Managers trailer at all times.
    g. GC shall maintain the CM trailer in a clean condition. Trailer to be cleaned bi-weekly by GC.

C. Storage and Containers: Provide appropriately sized, furnished, and equipped to accommodate materials and equipment for construction operations.
1. Store combustible materials apart from building.

2.3 EQUIPMENT

A. General: The Prime Contractor shall provide new equipment. If acceptable to the Architect, undamaged, previously used equipment in serviceable condition may be used. Provide equipment suitable for use intended.

B. Fire Extinguishers: Hand carried, portable, UL rated. Provide class and extinguishing agent as indicated or a combination of extinguishers of NFPA-recommended classes for exposures.
1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.
2. Extinguisher shall have a valid inspection tag.

C. Self-Contained Toilet Units: Single-occupant units of chemical, aerated recirculation, or combustion type; vented; fully enclosed with a glass-fiber-reinforced polyester shell or similar non-absorbent material.

D. Drinking-Water Fixtures: Containerized, tap-dispenser, bottled-water drinking-water units with both hot and cold water, including paper cup supply.

E. Temporary HVAC Equipment: Unless Owner authorizes use of permanent heating system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating, Cooling, and Dehumidifying Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction and marked for intended location and application.
3. Temporary Dehumidifying Equipment: Provide system engineered by temporary equipment supplier for expected conditions and interior environment requirements specified. Provide self-contained, recirculating refrigeration units with water collection and filtration capabilities.
    a. Equipment shall be sized with sufficient moisture extraction capabilities to maintain ambient interior air within specified relative humidity range.

b. Provide collection and/or drainage capabilities to prevent condensate from re-evaporating in conditioned space or from spilling on floors.

F. Generators: Provide generators sized to power equipment where temporary electric service is of insufficient capacity.

G. Electrical Power Cords: Provide grounded extension cords. Use hard-service cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ration.

H. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages of tempered-glass enclosures, where exposed to breakage. Provide exterior fixtures where exposed to moisture.

I. Electrical Outlets: Properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-V plugs into higher-voltage outlets; equipped with ground-fault circuit interrupters, reset button, and pilot light.

J. Power Distribution System Circuits: Where permitted and overhead and exposed for surveillance, wiring circuits, not exceeding 125-V ac, 20-A rating, and lighting circuits may be nonmetallic sheathed cable.

K. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

L. Field Offices: Mobile units sized and equipped at the discretion of the Contractor. Units shall be kept clean, orderly and in good services.
1. Contractor shall equip and maintain its own field office with the following:
    a. a. Telephone service with automated answering capabilities. Superintendents cellular phone service may serve this purpose.
    b. b. Internal electrical distribution system terminating at an exterior mounted weatherproof heavy duty NEMA 3R disconnect.

PART 3 EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials.

3.2 INSTALLATION, GENERAL

A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

B. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

C. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.3 TEMPORARY UTILITY INSTALLATION AND REQUIREMENTS

A. General: Engage appropriate local utility company to install temporary service or connect to existing service. Where utility company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with utility company recommendations.
   1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
   2. Provide adequate capacity at each stage of construction. Before temporary utility is available, provide trucked-in services.
   3. Obtain easements to bring temporary utilities to Project site where Owner's easements cannot be used for that purpose.

B. Sewers and Drainage by General Contractor: If sewers are available, provide temporary connections to remove effluent that can be discharged lawfully. If sewers are not available or cannot be used, provide drainage ditches, dry wells, stabilization ponds, and similar facilities. If neither sewers nor drainage facilities can be lawfully used for discharge of effluent, provide containers to remove and dispose of effluent off-site in a lawful manner.
   1. Filter out excessive soil, construction debris, chemicals, oils, and similar contaminants that might clog sewers or pollute waterways before discharge.
   2. Connect temporary sewers to municipal system as directed by sewer department officials.
   3. Maintain temporary sewers and drainage facilities in a clean, sanitary condition. After heavy use, restore normal conditions promptly.
   4. Provide temporary filter beds, settlement tanks, separators, and similar devices to purify effluent to levels acceptable to authorities having jurisdiction.

C. Water Service:
   1. General: Install water service and distribution piping in sizes and pressures adequate for construction.
   2. After new water service is available at the building, Plumbing Contractor shall provide the following:
      a. Water Service: Use of Owner's new water service facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to like-new condition.
      b. Provide rubber hoses as necessary to serve Project site.
      c. As soon as water is required at each level, extend service to form a temporary water- and fire-protection standpipe. Provide distribution piping. Space outlets so water can be reached with a 100-foot (30-m) hose. Provide one hose at each outlet.
      d. Where installations below an outlet might be damaged by spillage or leakage, provide a drip pan of suitable size to minimize water damage. Drain accumulated water promptly from pans.
      e. Provide a minimum of 30-psi (200-kPa) static pressure at highest point.

D. Sanitary Facilities and Drinking Water by General Contractor: Provide temporary toilets, hand/wash facilities, and drinking-water fixtures. Comply with regulations and health codes for type, number, location, operation, and maintenance of fixtures and facilities.
   1. Disposable Supplies: Provide toilet tissue, paper towels, paper cups, hand sanitizer, and similar disposable materials for each facility. Maintain adequate supply. Provide covered waste containers for disposal of used material.

2. Wash Facilities: Install wash facilities supplied with potable water at convenient locations for personnel. Dispose of drainage properly. Supply cleaning compounds appropriate for each type of material handled.

E. Temporary HVAC: The General Contractor shall provide temporary HVAC and humidity control required by construction activities, for curing or drying of completed installations, or protection of installed construction from adverse effects of low temperatures or high humidity from Notice to Proceed to NINETY (90) days prior to Substantial Completion for each new and renovation building area. Temporary HVAC and humidity control shall also be provided in all new building areas scheduled for work in order to maintain productivity of all trade contractors and personnel. Comply with the following:
1. Select safe equipment that will not have a harmful effect on completed installations or elements being installed.
2. Temporary Systems must accommodate high-bay volumes and large overhead doors.
3. Coordinate ventilation requirements to produce the ambient condition required and minimize consumption of energy.
4. Maintain the temporary heat to a minimum of 60 degrees Fahrenheit.
5. The General Contractor shall provide all other Prime Contractors with the Project Schedule and the minimum heating requirements to protect the Work as scheduled. If through no fault of any other Prime Contractor, the General Contractor does not maintain the original approved schedule, the General Contractor shall continue to provide temporary heat and humidity control to other Prime Contractors when required.
6. The General Contractor shall not be responsible for providing temporary heat and humidity control in permanently unconditioned areas or in areas not scheduled for work, unless the approved schedule is modified and accepted by the Owner and all Prime Contractors.
7. Prime Contractors are responsible for protecting their work in unconditioned or unscheduled work areas at no additional expense to the Owner.
8. Prior to the permanent heating system being operational, and when necessary for the proper prosecution of the work, the General Contractor shall provide, maintain, operate and pay all costs including fuel, for sufficient approved heat.

F. Temporary/Existing/Permanent HVAC: The HVAC contractor shall provide HVAC from NINETY (90) days prior to Substantial Completion of each new and renovation building area and at all times for all building areas that are occupied or under construction and shall comply with the following:
1. When noted above, the HVAC contractor shall provide, maintain and operate sufficient temporary heating/cooling. If the new permanent heating or cooling system is used during this period, the HVAC contractor shall professionally clean all HVAC systems.
2. The HVAC Contractor shall properly protect all HVAC equipment / systems from construction air dust and debris beginning from initial installation.
3. Select safe equipment that will not have a harmful effect on completed installations or elements being installed.
4. Coordinate ventilation requirements to produce the ambient condition required and minimize consumption of energy.
5. Maintain the temporary heat to a minimum of 60 degrees Fahrenheit for construction areas and at 70 degrees Fahrenheit for all occupied areas.
6. At NINETY (90) days prior to Substantial Completion of new building areas, the Owner shall pay for fuel and electric energy used to operate the approved temporary or permanent heating or cooling and exhaust system provided that due care is exercised to avoid excessive use of fuel.
7. Portable heaters will not be acceptable during final finishing operations.

8. The new permanent heating and exhaust system or any portion thereof may be used by the HVAC Contractor to provide temporary heat and exhaust as required for the proper prosecution of the work as long as all the necessary protection and cleanup required by the Specifications and recommended by the manufacturer are strictly followed, and only when outside air is supplied directly to the burners. The HVAC Contractor shall, when operating the permanent system complete all required servicing and adjusting to maintain the system in proper running order to prevent damage to the building or its equipment during the construction period. Units placed in permanent operation must be fully controlled using the final control system operational sequence.
9. When the HVAC Contractor performs startup and begins using the permanent HVAC systems, the Contractor must provide pre-filters, return air filters, plenum filters and or other modifications to the systems necessary to prevent dirt, dust and other contaminants from entering the system. If measures implemented do not prevent dust from entering the systems, the HVAC Contractor shall perform cleaning of duct, coil and other HVAC components necessary to provide clean HVAC systems at Substantial Completion of the Project.
10. Prior to turning over the new permanent heating and ventilating system to the Owner, the HVAC Contractor shall thoroughly clean the system, provide new filters, make re-adjustments as required and bear all cost to place the system in first-class operating condition. Contractor shall follow all requirements for cleaning and media as provided in Section 018119, Indoor Air Quality Management.
11. The warranty period of individual pieces of equipment of the permanent system used during the construction period shall be extended during the temporary use period and the starting date used for determination of expiration for such warranties shall begin upon final acceptance of the project by the Owner.
12. Work which is damaged as a result of improper or insufficient climate control shall be removed and replaced.

G. Ventilation and Humidity Control by General Contractor:
1. Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment from that specified that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
2. Temporary Humidity Control:
    a. General: Where control of ambient humidity is required for proper performance of the work, or for curing/drying of installed work, or for protection of installed work from deterioration due to variations in ambient conditions and/or adverse effects of high humidity, the General Contractor shall provide temporary humidification or dehumidification equipment to maintain the required conditions. This equipment may require air conditioning to achieve the desired results and maintain the Project schedule. Determination of the required equipment is the responsibility of the General Contractor. Coordinate the use of the equipment with temporary heating to produce the required conditions with a minimum overall use of energy.
    b. Construction Dehumidification (ongoing): The General Contractor shall provide portable dehumidification units for use during construction. Units shall be provided as required to maintain optimal building moisture conditions required for the proper performance of the Work. Moisture levels shall be maintained throughout both occupied and unoccupied areas of the facilities.
    c. Units shall be refrigeration-based and shall include standard 115V power cord, humidistat, integral condensate pump, wheels and handle. Units shall be as manufactured by Ebac or approved equal. Dehumidifier capacities and quantities shall be as follows:
        1) Quantity 15 - Minimum 25 gallons/day capacity (Ebac BD150CR or equal).

2) Locations shall be as agreed upon in the field with the Architect and Construction Manager.

d. General Contractor shall furnish and install drainage hoses and connections to discharge condensate to exterior of building at locations acceptable to the Construction Manager and Architect.

e. The Electrical Contractor shall be responsible to distribute power sources throughout each area of the building dedicated for the purpose of power for the humidification and/or dehumidification units. This power shall be in addition to power required by the trades for performance of their Work.

H. Electric Power Service by Electrical Contractor: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload-protected disconnecting means, and automatic ground-fault interrupters.

1. Install power distribution wiring overhead or underground and rise vertically where least exposed to damage.
2. Electric power service including all necessary poles and accessories shall be extended from off-site available sources after coordination with local electric utility company.
3. Provide adequate temporary electric service and for the following temporary field offices for light, power, heating and cooling located on the site:
   a. 1 – General Contractor
   b. 1 – Construction Manager
   c. 2 – Additional Prime Contractors
4. Provide or extend the following temporary construction electric services to the various building areas within forty (40) days of Notice to Proceed unless noted otherwise:
   a. 120/208-volt, three phase, four-wire wye with a solid neutral service.
   b. Transformation and power distribution as shown as required for temporary needs specified unless noted otherwise on Construction Documents.
   c. Power receptacles distributed across the building as the Project develops. Minimum requirements for each building area as follows:
      1) Fifteen (15) 120-volt receptacles
      2) Ten (10) 240-volt receptacles
   d. Temporary power for trailers and construction area.
   e. Ten (10) temporary connections to HVAC temporary heating units when directed by CM.
   f. Four (4) site lights when directed by CM (see Article L below).
5. All extensions from the temporary power receptacles shall be provided by the parties requiring power.

I. Electric Power Service: Use of Owner's new electric power service will be permitted, as long as equipment is maintained in a condition acceptable to Owner.

J. Electric Distribution by Electrical Contractor: Provide receptacle outlets adequate for connection of power tools and equipment in new and existing building areas.

1. Provide waterproof connectors to connect separate lengths of electrical power cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.
2. Provide warning signs at power outlets other than 110 to 120 V.
3. Provide metal conduit, tubing, or metallic cable for wiring exposed to possible damage. Provide rigid steel conduits for wiring exposed on grades, floors, decks, or other traffic areas.
4. Provide metal conduit enclosures or boxes for wiring devices.

5. Provide 4-gang outlets, spaced so 100-foot (30-m) extension cord can reach each area for power hand tools and task lighting. Provide a separate 125-V ac, 20-A circuit for each outlet.
6. At earliest feasible time, but no later than 60 days prior to Substantial Completion, provide permanent electric distribution systems.
7. Provide 150A, 208V, 3-phase power distribution for temporary connections of terrazzo grinders during floor terrazzo installation. Provide power distribution at multiple locations as required to ensure the grinders can cover the entire terrazzo floor area using a 100' cord. Power distribution may be provided from temporary source or permanent power distribution where available. Remove all temporary power distribution when it is no longer required.

K. Lighting by Electrical Contractor: Provide and maintain temporary lighting with local switching that provides adequate illumination for construction operations and traffic conditions. Wherever overhead floor or roof deck has been installed, the Electrical Contractor shall provide temporary lighting with local switching.
1. For new construction:
   a. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
   b. Provide LED temporary lighting. Unless noted otherwise, each "lamp" shall be a minimum of 1600 lumens, either screw-in type or native LED type Where higher lumens are specified, lighting shall be native LED, not screw-in type. Lamps shall be uniformly distributed in all areas requiring temporary lighting to meet the minimum illumination intensity noted for the area or operation as outlined by the Occupational Safety and Health Administration (OSHA) standard for minimum illumination requirements at construction sites (OSHA 29 CFR 1926.56).
   c. Install exterior-yard site lighting that will provide adequate illumination for construction operations, security, traffic conditions, and signage visibility when the Work is being performed.
   d. Provide four (4) pole mounted 20 feet high, minimum 10,000 lumens, temporary security lights controlled by a photocell to be installed as directed by CM.
   e. At earliest feasible time, but no later than 60 days prior to Substantial Completion of each Phase, provide permanent lighting systems both inside the building and on the site for use in completing construction and lighting the project site. Contractor must operate, maintain and protect the permanent systems through final completion of the project and provide full project warranty from the contract completion date of the project.

3.4 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:
1. Locate field offices, storage sheds, sanitary facilities, and other temporary construction and support facilities for easy access.
2. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will not be permitted to use permanent facilities.

B. Project Identification and Temporary Signs:
1. The General Contractor shall provide one (1) 8 feet by 4 feet of exterior-type Grade B-B high-density concrete form overlay plywood project identification sign. Support on posts or framing of preservative-treated wood or steel.
2. The General Contractor shall provide one (1) 8 feet by 4 feet of exterior-type Grade B-B high-density concrete form overlay plywood Grant identification sign. Support on posts or framing of preservative-treated wood or steel.
3. The General Contractor shall provide four (4) 4 feet by 4 feet by ¾ inch thick temporary directional signs. Apply graphics and text as directed by Construction Manager. Install where directed.

4. The project identification sign shall contain the name of the project, Contractors, and the design team including the Architect name and logo. Signs shall be painted and lettered in four colors by a professional sign painter. Sign shall have Owner name. Project signs shall be located on the site where directed by Construction Manager.
5. Sign design, including text, layout and sign colors shall be provided by Architect.
6. Exterior signs shall be in accordance with Township requirements.
7. Erection shall not take place until an application, if required, is duly filed by the General Contractor and approved by the Township.
8. No other signs or advertisements will be allowed on the premises.

C. Temporary Site Lighting: Install exterior yard and sign lights so signs are visible when Work is being performed.

D. Temporary Roads and Paved Areas by Site Contractor: Construct and maintain temporary roads and paved areas adequate to support loads and to withstand exposure to traffic during construction period. Locate temporary roads and paved areas in same location as permanent roads and paved areas and in compliance with the Phasing Plan(s). Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.
1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Section 312000 "Earth Moving." Coordinate with HRG
3. Recondition base after temporary use, including removing contaminated material, regrading, proof rolling, compacting, and testing.
4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course according to Division 32.
5. Provide dust-control treatment that is non-polluting and non-tracking. Re-apply treatment as required to minimize dust.
6. Cooperate with Work by others on the adjoining property construction.

E. Dewatering Facilities and Drains: Comply with requirements in applicable Division 31 Sections for temporary drainage and dewatering facilities and operations not directly associated with construction activities included in individual Sections. Where feasible, use same facilities. Maintain Project site, excavations, and all construction areas free of water.
1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining property nor endanger permanent Work or temporary facilities is by Site Contractor.
2. Before connection and operation of permanent drainage piping system, provide temporary drainage where roofing or similar waterproof deck construction is completed is by Plumbing Contractor.
3. Prime Contractor installing drains and any pipes for storm or sanitary systems shall verify that all systems are clear of debris prior to Substantial Completion. If necessary, flush all systems.
4. Remove snow and ice as required to minimize accumulations is by General Contractor.
5. Remove water from trenches, excavations or other work of each contract by individual Prime Contractors.

F. Waste Disposal Facilities and Cleanup: General Prime Contractor will provide waste-collection containers in sizes adequate to handle regular waste generated from construction operations. General Prime Contractor shall pay for and dispose of all the construction waste as required. Each Prime Contractor is responsible for collecting and disposing of their respective construction waste generated from new building construction and all site work operations. Containerize and clearly label hazardous, dangerous, or unsanitary waste materials separately from other waste and dispose of this waste.

1. All Contractors shall clean up all work areas on a daily basis including all site and building area.
2. General Contractor shall be responsible for daily cleanup of all areas of the building unless noted otherwise below. HVAC contractor shall be responsible for daily cleanup of all mechanical and electrical rooms. All contractors shall be responsible for daily cleanup of the areas in which they are working.
3. Owner, after consultation with the Construction Manager, shall deduct $200.00 per day from each contractor that is not performing the required daily cleanup. The total amount will be deducted from the contractor's total contract sum. Construction Manager will re-assign cleanup or hire independent contractor to perform cleanup. Construction Manager may also withhold processing of payment request until cleanup duties are resumed to Construction Manager's satisfaction.
4. Each Contractor is responsible for removal of their respective waste from Work associated with its Contract and shall follow procedures to direct as much waste as possible from the landfill.
5. CWM shall coordinate the locations of the waste containers with Prime Contractors and as noted on Phasing Plan(s). All locations to be confirmed with the Construction Manager prior to placement.
6. General Contractor shall:
    a. Provide equipment and labor required for positioning and relocating waste containers on site as well as compacting or consolidating materials in the containers.
    b. Provide equipment and labor required for lifting and hoisting any material handling units of 2.5 cubic yards, 1,000 lbs. (48" x 40") into the building areas from waste management trucks and also back out onto trucks when boxes are full.
7. Each Contractor's waste hauler will remove their waste containers from the Project site.

G. Field Offices:
1. Locate facility where it will serve the project adequately and result in minimum interference with the performance of the work. Relocate and modify facilities as required. Furnish facility prior to start of work and remove facility at final completion of project. Provide all utilities to service facility, including electric service, lighting, and other facilities as required.

H. Temporary Stairs by General Contractor: Until permanent stairs are available, provide temporary stairs where ladders are not adequate. Cover finished, permanent stairs with protective covering of plywood or similar material so finishes will be undamaged at time of acceptance. At Substantial Completion, restore stairs to condition existing before initial use.
1. Provide protective coverings, barriers, devices, signs or other procedures to protect stairs and to maintain means of egress. If, despite such protection, stairs become damaged, restore damaged areas so no evidence remains of correction work.

I. Traffic Controls by Site Contractor: Provide temporary traffic controls at junction of temporary roads with public roads. Include warning signs for public traffic and "STOP" signs for entrance onto public roads. Provide construction site signage on adjacent roads and site to direct public and construction traffic (both vehicular and pedestrian), comply with CM and Owner's request for all site and road signage. Comply with requirements of authorities having jurisdiction.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects. Avoid using tools and equipment that produce harmful noise. Restrict use of noisemaking tools and equipment to hours that will minimize complaints from persons or firms near Project site.

C. Stormwater Control: Provide silt barriers in and around excavations and subgrade construction, sufficient to prevent flooding by runoff of stormwater from heavy rains.

D. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from construction damage. Protect tree root systems from damage, flooding, and erosion.

E. Site Enclosure Fence: Before construction operations begin, install chain-link enclosure fence with lockable entrance gates. Locate where indicated or enclose entire Project site or portion determined sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs, and other animals from easily entering site except by entrance gates.
   1. Set fence posts below grade a minimum of 3 feet.
   2. Provide gate in sizes and at locations necessary to accommodate delivery vehicles and other construction operations.
   3. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Provide CM and Owner with one set of keys and/or access code(s).

F. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft and similar violations of security. Lock entrances at end of each workday.

G. Site Security: All Contractors shall ensure all windows, doors and gates are closed and secured at the conclusion of each day in scheduled work areas. Should Building and Site Security become an issue, the Construction Manager will assign responsibility and shall set the working hours for the project that all contractors will follow.

H. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erecting structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and public of possible hazard. Where appropriate and needed, provide lighting, including flashing red or amber lights.
   1. For safety barriers, sidewalk bridges, and similar uses, provide minimum 5/8-inch-thick exterior plywood.
   2. Where indicated on logistics plan provide concrete ‘Jersey’ barriers.

I. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations and similar activities. Provide temporary weathertight enclosure for building exterior.
   1. Where heating or cooling is needed and permanent enclosure is not complete, provide insulated temporary enclosures. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
   2. Vertical Openings: Close openings of 25 sq. ft. or less with plywood or similar materials.
   3. Horizontal Openings: Close openings in floor or roof decks and horizontal surfaces with load-bearing, wood-framed construction.
   4. Install tarpaulins securely using fire-retardant-treated wood framing and other materials.

5. Where temporary wood or plywood enclosure exceeds 100 sq. ft. in area, use fire-retardant-treated material for framing and main sheathing.
6. Provide temporary enclosures as required to meet criteria for permanent enclosure no later than the beginning of any of the following Work:
    a. Spray fireproofing.
    b. Interior finishes, including gypsum wallboard finishing, painting and wall coverings.
    c. Architectural woodwork.
    d. Institutional casework.
    e. Install temporary enclosures before time frames stated above when necessary to maintain interior relative humidity levels and temperatures as required to promote drying of concrete and concrete masonry substrates so that they achieve low enough moisture content and vapor emission levels to permit timely installation of finishes.

J. Temporary Partitions: Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.
1. Construction dustproof partitions of not less than nominal 4-inch studs, 5/8-inch gypsum wallboard with joints taped on occupied side, and 1/2-inch fire retardant plywood on construction side.
2. Construct dustproof, floor-to-ceiling partitions of not less than nominal 4-inch studs, 2 layers of 3-mil polyethylene sheets, inside and outside temporary enclosure. Cover floor with 2 layers of 3-mil polyethylene sheets, extending sheets 18 inches up the side walls. Overlap and tape full length of joints. Cover floor with 3/4-inch fire-retardant plywood.
3. Seal joints and perimeter. Equip partitions with dustproof doors and security locks.
4. Protect air-handling equipment.
5. Weatherstrip openings.

K. Exterior Surface Protection:
1. Where sequence of operations exposes exterior finished materials including, but not limited to factory finished metal, anodized metal, glass and the like, to mortars, grouts, alkalis, acids, strong detergents or other materials that may cause damage to adjacent finishes, provide surface protection materials completely over surface to be protected.
2. Comply with surface protection material manufacturer's recommendations. Do not leave materials in place beyond maximum time limit.
3. Remove protection materials completely when at-risk work is complete.

L. Traffic Surface Protection:
1. New Finished Traffic Surfaces: From the time of installation to just before inspection for Substantial Completion, overlay traffic surfaces with traffic protection products as recommended by manufacturer for substrates to be protected. Replace traffic protection products when damaged. Where specified products do not meet construction traffic demands or when required by Architect or Construction Manager, provide more substantial protection as specified below for existing traffic surfaces to remain.
2. Existing Finished Traffic Surfaces to Remain: From the time of one week before the commencement of any work of a phase of any prime contractor in area or areas immediately adjacent to floors to be protected, overlay traffic surfaces with one layer of craft paper and follow with one layer of plywood. Secure plywood with heavy adhesive tape. Maintain protection for duration of work in area and remove just before inspection for Substantial Completion.

M. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.

1. Provide fire extinguishers, installed on walls on mounting brackets, visible and accessible from space being served, with sign mounted above.
2. Develop and supervise an overall fire-prevention and first-aid fire-protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
3. Provide temporary standpipes and hoses for fire protection of sufficient length to reach construction areas. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.
4. Prohibit smoking and vaping in construction areas.
5. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
6. Coordinate activities with Fire Watch. Notify Fire Watch of hours of operation and planned fire-risk activities such as welding within construction areas.

N. Fire Watch: Provide adequate number of and properly trained personnel to provide fire watch in accordance with NFPA 51B “Standard for Fire Protection During Welding, Cutting and Other Hot Work 1999 Edition, NFPA 101 “Life Safety Code”, Articles 9.6.1.8 and 9.7.6.1 (including appendix) and as follows:
1. Fire Watch personnel shall be trained and provide services in compliance with NFPA 601 “Standard for Security Services in Fire Loss Prevention” and shall be acceptable to the Authorities Having Jurisdiction.
2. The responsible party for Fire Watch Services as defined in Division 01 Section “Multiple Contracts Summary” shall be considered “Management” for the purposes of complying with the referenced standards.
3. Fire Watch personnel shall be provided with portable communications to permit immediate communication with school authorities, contractors and public emergency services.
4. Conduct a coordination meeting in advance of the earliest requirement for Fire Watch with the Owner, respective Project Coordinators, Construction Manager, Authorities Having Jurisdiction and Architect.
    a. Develop an emergency response plan for risks associated with construction.
    b. Establish the lines of and order of communications based on each anticipated risk type.
    c. Project Coordinators shall record and transmit minutes of the meeting to attendees and to Fire Watch personnel.
5. Fire Watch shall be provided at the Work by respective responsible entity as defined in Division 01 Section “Multiple Contract Summary.”
    a. When hot work is being conducted.
    b. When fire alarm is not in operation in occupied areas for time greater than 4 hours.
    c. When fire suppression system is not in operation in occupied areas for time greater than 4 hours.

O. Fire Extinguishers: Class A stored-pressure water-type extinguishers. Other Locations: Class ABC dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for exposures.
1. Locate fire extinguishers where convenient and effective for their intended purpose; provide not less than one extinguisher on each floor at or near each usable stairwell.
2. Store combustible materials in containers in fire-safe locations.
3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for firefighting. Prohibit smoking/vaping on the Project site and within all building areas.
4. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition.

P. Permanent Fire Protection: At earliest feasible date in each area of Project, complete installation of permanent fire-protection in facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.

3.6 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage caused by freezing temperatures and similar elements.
1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
2. Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

C. Operate Project-identification-sign lighting daily from dusk until 12:00 midnight.

D. Temporary Facility Changeover for Security and Protection: Except for using permanent fire protection as soon as available, do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

E. Termination, Removal and Temporary Facility Changeover: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
1. Materials and facilities that constitute temporary facilities are the property of Contractor. Owner reserves right to take possession of Project identification signs.
2. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns and dispose of in a legal manner. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements in Section 017700 "Closeout Procedures."
4. Replace significantly worn parts and parts that have been subject to unusual operating conditions.
5. Replace lamps that are burned out or noticeably dimmed by substantial hours of use.

3.7 NO SMOKING

A. Smoking, vaping, or use of any tobacco product is not permitted on the entire Project site.

3.8 IDENTIFICATION OR SIGNS

A. One project sign and one Grant Identification sign will be permitted for the site, provided by the General Contractor. The project sign shall and list Prime Contractors. Individual contractor signs, other advertisements, or flags will not be permitted.

3.9 COMPLIANCE WITH TEMPORARY FACILITIES AND CONTROLS

A. If contractor does not comply with any of the requirements of this Section, CM reserves the right to recommend to Owner to withhold adequate funds from payment applications to pay for completing the Work as required.

END OF SECTION 01 5000

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SECTION 01 6000 - PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. General product requirements.

B. Re-use of existing products.

C. Transportation, handling, storage and protection.

D. Product option requirements.

E. Substitution limitations.

F. Maintenance materials, including extra materials, spare parts, tools, and software.

1.2 DEFINITIONS

A. Products: Items for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material", "equipment", "system", and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make and/or model number/name or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been purchased for or incorporated into another project or facility and purchased from a product supplier, distributor, or manufacturer specifically for this Project. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated by manufacturers literature, product data, and testing results/reports/certifications to meet or exceed the minimum characteristics of Named Products and/or listed minimum requirements of the Contract Documents.
    a. Minimum Characteristics of products include but are not limited to, function, dimensions, in-service performance, physical properties, appearance, options (including color selection), and usability.
    b. The Owner and Architect have final determination whether or not a product meets or exceeds the minimum characteristics of the Named Product(s) and/or listed minimum requirements of the Contract Documents.
4. Basis of Design Product: A specification in which a single manufacturer's product is named and accompanied by the words "basis of design product," including make or model number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products. Minimum requirements of a Basis of Design Product may be supplemented with additional requirements listed within the Contract Documents.
    a. Basis of Design Products are not intended to limit procurement of products to the Named Product unless noted within the product specification with "No Substitutions Allowed" or verbiage of similar intent.

b. Manufacturer's published attributes and characteristics of basis-of-design product establish salient characteristics of products for purposes of evaluating comparable products.

1.3 ACTION SUBMITTALS

A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances. Show coordination with adjacent products, accessories, and other construction.

C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

D. Sustainable Design Submittals: Items necessary to document use of sustainable construction materials, products, and practices.

1.4 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver to Project site; obtain receipt prior to final payment.

1.5 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. Transport and handle products in accordance with manufacturer's instructions.

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

1.6 STORAGE AND PROTECTION

A. Provide protection of stored materials and products against theft, casualty, or deterioration.

B. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.
   1. Structural Loading Limitations: Handle and store products and materials so as not to exceed static and dynamic load-bearing capacities of project floor and roof areas and other Project structures.

C. Store and protect products in accordance with manufacturers' instructions.

D. Store with seals and labels intact and legible.

E. Arrange storage of materials and products to allow for visual inspection for the purpose of determination of quantities, amounts, and unit counts.

F. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.

G. For exterior storage of fabricated products, place on sloped supports above ground.

H. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

I. Comply with manufacturer's warranty conditions.

J. Do not store products directly on the ground.

K. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

L. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

M. Prevent contact with material that may cause corrosion, discoloration, or staining.

N. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

O. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

1.7 PRODUCT WARRANTIES

A. Warranties specified in individual product specifications shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of obligations under requirements of the Contract Documents.
   1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
   2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
   1. Manufacturer's Standard Form: Modified to include Project specific information and properly executed.
   2. Specified Form: When specified forms are included with, appended to, or reference by the individual Specification Sections, prepare the written document using the indicated/provided form properly completed and executed.

PART 2 PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. When individual Specification Sections indicate a Named Product or a list of Named Products, provide the Named Product or one of the Named Products unless specification section Article indicates other Comparable Products may be provided. Other Comparable Products shall be required to meet the minimum requirements and characteristics of the Named Product(s) along with other listed requirements within the individual specification section.
   1. Where individual specification sections allow Comparable Products and those Comparable Products meet the minimum requirements of the Named Product and other requirements of the Section, the Contractor will not be required to comply with the Substitution Procedures of Section 01 2500 - Substitution Procedures. If the product does not meet of the minimum requirements, it shall be considered a substitution and the Contractor will be required to follow the Substitution Procedures of Section 01 2500 - Substitution Procedures.
   2. Where the phrase "No Substitutions Allowed" or "Provide one of the following" or verbiage of similar intent is indicated, provide the Named Product or one of the Named Products only.

B. Where individual Specification Sections provide performance requirements, specific requirements, specific characteristics, or other requirements without providing manufacturer's names or Named Products, provide products complying with or outperforming the requirements indicated. Products not meeting the requirements listed shall be required to comply with the substitution procedures of Section 01 2500 - Substitution Procedures.

C. Visual Matching Specification: Where Specifications require the phrase "match Architect's sample," provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
   1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 01 2500 - Substitution Procedures for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or a similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with the following requirements:
   1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work.
   2. Detailed comparison of significant qualities of proposed product with those of the named basis-of-design product. Significant product qualities include attributes such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
   3. Evidence that proposed product provides specified warranty.
   4. List of similar installations for completed projects, with project names and addresses and names and addresses of architects and owners, if requested.
   5. Samples, if requested.

B. Architect's Action on Comparable Products Submittal: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for a comparable product. Architect will notify Contractor of approval or rejection of proposed comparable product within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
   1. Architect's Approval of Submittal: Marked with approval notation from Architect's action stamp. See Section 01 3300 - Submittal Procedures.
   2. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

C. Submittal Requirements, Two-Step Process: Approval by Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

2.3 EXISTING PRODUCTS

A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.

B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.

2.4 NEW PRODUCTS

A. Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
   1. Provide products complete with accessories, trim, fasteners, finish, and other items needed for a complete installation and intended use and effect.
   2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.

3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Descriptive, performance, and reference standard requirements in Specifications establish salient characteristics of products.

B. Use of products having of the following characteristics is not permitted:
1. Made outside the United States, its territories, Canada, or Mexico.
2. Made using or containing CFC's or HCFC's.
3. Made of wood from newly cut old growth timber.
4. Containing lead, cadmium, or asbestos.

C. Where other criteria are met, Contractor shall give preference to products that:
1. If used on interior, have lower emissions, as defined in Section 01 6116.
2. If wet-applied, have lower VOC content, as defined in Section 01 6116.
3. Are extracted, harvested, and/or manufactured closer to the location of the project.
4. Have longer documented life span under normal use.
5. Result in less construction waste.
6. Are made of vegetable materials that are rapidly renewable.
7. Are made of recycled materials.
8. If made of wood, are made of sustainably harvested wood, wood chips, or wood fiber.
9. If bio-based, other than wood, are or are made of Sustainable Agriculture Network certified products.
10. Are Cradle-to-Cradle Certified.
11. Have a published Environmental Product Declaration (EPD).
12. Have a published Health Product Declaration (HPD).
13. Have a published GreenScreen Chemical Hazard Analysis.
14. Have a published Manufacturer's Inventory of Chemical Content.

D. Provide interchangeable components by the same manufacture for components being replaced.

PART 3 EXECUTION (NOT USED)

END OF SECTION 01 6000

SECTION 01 6116 - VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Requirements for Indoor-Emissions-Restricted products.

B. Requirements for VOC-Content-Restricted products.

C. Requirement for installer certification that they did not use non-compliant products.

1.2 DEFINITIONS

A. Indoor-Emissions-Restricted Products: Products in the following product categories, whether specified or not:
1. Interior paints and coatings applied on site.
2. Interior adhesives and sealants applied on site, including flooring adhesives.
3. Flooring.
4. Composite wood.
5. Products making up wall and ceiling assemblies.
6. Thermal and acoustical insulation.
7. Other products when specifically stated in the specifications.

B. VOC-Content-Restricted Products: Products in the following product categories, whether specified or not:
1. Interior paints and coatings applied on site.
2. Interior adhesives and sealants applied on site, including flooring adhesives.
3. Other products when specifically stated in the specifications.

C. Interior of Building: Inside the exterior weather barrier.

D. Adhesives: Gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.

E. Sealants: Gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.

F. Inherently Non-Emitting Materials: Products composed wholly of minerals or metals, unless they include organic-based surface coatings, binders, or sealants; and specifically the following:
1. Stone.
2. Concrete.
3. Clay brick.
4. Metals that are plated, anodized, or powder-coated.
5. Glass.
6. Ceramics.
7. Solid wood flooring that is unfinished and untreated.

1.3 ACTION SUBMITTALS

A. Product Data: For each VOC-restricted product used in the project, submit evidence of compliance.

B. Sustainable Design Reporting: Submit evidence of compliance.

C. Installer Certifications Regarding Prohibited Content: Require each installer of product (not just the products for which VOC restrictions are specified) to certify that either 1) no adhesives, joint sealants, paints, coatings, or composite wood or agrifiber products have been used in the installation of installer's products, or 2) that such products used comply with these requirements.

1.4 QUALITY ASSURANCE

A. Indoor Emissions Standard and Test Method: CAL (CDPH SM), using Standard Private Office exposure scenario and the allowable concentrations specified in the method, and range of total VOC's after 14 days.
   1. Wet-Applied Products: State amount applied in mass per surface area.
   2. Paints and Coatings: Test tinted products, not just tinting bases.
   3. Evidence of Compliance: Acceptable types of evidence are the following;
      a. Current UL (GGG) certification.
      b. Current SCS (CPD) Floorscore certification.
      c. Current SCS (CPD) Indoor Advantage Gold certification.
      d. Current listing in CHPS (HPPD) as a low-emitting product.
      e. Current CRI (GLP) certification.
      f. Test report showing compliance and stating exposure scenario used.
   4. Product data submittal showing VOC content is NOT acceptable evidence.
   5. Manufacturer's certification without test report by independent agency is NOT acceptable evidence.

B. VOC Content Test Method: 40 CFR 59, Subpart D (EPA Method 24), or ASTM D3960, unless otherwise indicated.
   1. Evidence of Compliance: Acceptable types of evidence are:
      a. Report of laboratory testing performed in accordance with requirements.
      b. Published product data showing compliance with requirements.

C. Composite Wood Emissions Standard: CARB (ATCM) for ultra-low emitting formaldehyde (ULEF) resins.
   1. Evidence of Compliance: Acceptable types of evidence are:
      a. Current SCS "No Added Formaldehyde (NAF)" certification; www.scscertified.com.
      b. Report of laboratory testing performed in accordance with requirements.
      c. Published product data showing compliance with requirements.

D. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 PRODUCTS

2.1 MATERIALS

A. Products: Comply with the most stringent of federal, State, and local requirements, or these specifications.

B. Indoor-Emissions-Restricted Products: Comply with Indoor Emissions Standard and Test Method, except for:
   1. Composite Wood, Wood Fiber, and Wood Chip Products: Comply with Composite Wood Emissions Standard or contain no added formaldehyde resins.
   2. Inherently Non-Emitting Materials.

C. VOC-Content-Restricted Products: VOC content not greater than required by the following:
   1. Adhesives, Including Flooring Adhesives: SCAQMD 1168 Rule.
   2. Joint Sealants: SCAQMD 1168 Rule.
   3. Paints and Coatings: Each color; most stringent of the following:
      a. 40 CFR 59, Subpart D.
      b. SCAQMD 1113 Rule.
      c. CARB (SCM).

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

A. Owner reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to Owner.

B. Additional costs to restore indoor air quality due to installation of non-compliant products will be borne by Contractor.

END OF SECTION 01 6116

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SECTION 01 6116.01 - ACCESSORY MATERIAL VOC CONTENT CERTIFICATION FORM

FORM

1.1 IDENTIFICATION:

A. Project Name: _____

B. Project No.: _____

C. Architect: _____

1.2 USE OF THIS FORM:

A. Because installers are allowed and directed to choose accessory materials suitable for the applicable installation, there is a possibility that such accessory materials might contain VOC content in excess of that permitted, especially where such materials have not been explicitly specified.

B. Contractor is required to obtain and submit this form from each installer of work on this project.

C. For each product category listed, circle the correct words in brackets: either [HAS] or [HAS NOT].

D. If any of these accessory materials has been used, attach to this form product data and MSDS sheet for each such product.

2.1 PRODUCT CERTIFICATION

A. I certify that the installation work of my firm on this project:
1. [HAS] [HAS NOT] required the use of any ADHESIVES.
2. [HAS] [HAS NOT] required the use of any JOINT SEALANTS.
3. [HAS] [HAS NOT] required the use of any PAINTS OR COATINGS.
4. [HAS] [HAS NOT] required the use of any COMPOSITE WOOD or AGRIFIBER PRODUCTS.

B. Product data and MSDS sheets are attached.

3.1 CERTIFIED BY: (INSTALLER/MANUFACTURER/SUPPLIER FIRM)

A. Firm Name: _____

B. Print Name: _____

C. Signature: _____

D. Title: _____ (officer of company)

E. Date: _____

END OF SECTION 01 6116.01

SECTION 01 7000 - EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Pre-installation meetings.

C. Cleaning and protection.

D. Starting of systems and equipment.

E. Demonstration and instruction of Owner personnel.

F. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

G. General requirements for maintenance service.

1.2 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.

1.3 ACTION SUBMITTALS

A. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.4 QUALIFICATIONS

A. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.5 PROJECT CONDITIONS

A. Use of explosives is not permitted.

B. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

C. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

D. Perform dewatering activities, as required, for the duration of the project.

E. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

F. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
   1. Provide dust-proof enclosures to prevent entry of dust generated outdoors.
   2. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Owner.
   3. Provide dust control treatment in areas of bare soil that is non-polluting and non-tracking. Re-apply treatment as required to minimize dust to greatest extent possible.

G. Erosion and Sediment Control (SEC): Comply with approved sediment and erosion control plans. Where SEC plans are not part of the Contract Documents, plan and execute sediment and erosion control work to comply with authorities having jurisdiction by methods approved by the AHJ to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
   1. Minimize amount of bare soil exposed at one time.
   2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
   3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
   4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

H. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.

I. Pest and Rodent Control: Provide methods, means, and facilities to prevent rodents, pests and insects from damaging the Work and accessing and invading premises.
   1. Pest Control Service: Provide treatments as recommended by pest control company to maintain a pest free work area.

J. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.6 COORDINATION

A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements.

B. Notify affected utility companies and comply with their requirements.

C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

F. Coordinate completion and clean-up of work of separate sections.

G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.1 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
   1. Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
      a. If identical materials are unavailable or cannot be used, use materials that, when installed, provide a match acceptable to Architect for the visual and functional performance of in-place materials.

2.2 CLEANING MATERIALS

A. Use cleaning materials and methods recommended by manufacturers of installed products.

B. Use non-toxic, biodegradable cleaning products whenever possible.

C. Do not use cleaning materials that could damage finished surfaces or void manufacturers' warranties.

D. Provide cleaning equipment necessary to perform the work, including:
   1. HEPA-filter vacuums.
   2. Power sweepers.
   3. Glass cleaning equipment.
   4. Floor cleaning equipment.
   5. Pressure washing equipment where permitted.

PART 3 EXECUTION

3.1 EXAMINATION

A. Existing Conditions, Utilities:
   1. Existence and location of underground and other utilities indicated within drawings is not guaranteed.
   2. Prior to beginning site work, investigate and verify the existence and location of underground utilities (underground or otherwise), mechanical and electrical systems, and other construction affecting the Work.
      a. Verify the location and invert elevations at points of connection of sanitary sewer, and water-service piping; underground electrical services, and other utilities.
      b. Furnish location data work related to Project that must be performed by public utilities serving Project site.
   3. Verify that utility services are available, of the correct characteristics, and in the correct locations.

B. Existing Conditions:

1. Prior to proceeding with each component of the Work, examine areas, substrates, surfaces, supporting structure(s), and other conditions that may affect the installation of the next components, products and/or assemblies. Examine with Installer(s) and Applicator(s) present of both installed Work and Work to be installed, for compliance with requirements for installation, including but not limited to, tolerances and surface preparation and adequacy.
2. Examine and verify specific conditions described in individual specification sections.
3. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication
4. Examine rough-in for mechanical, plumbing, and electrical .
5. Record observations, comments, acceptance or non-compliance, and corrective actions to be taken where necessary.
6. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility components ro systems in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication.

C. Clean substrate surfaces prior to applying next material or substance.

D. Seal cracks or openings of substrate prior to applying next material or substance.

E. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying new material or substance in contact or bond.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. In addition to compliance with regulatory requirements, conduct construction operations in compliance with NFPA 241, including applicable recommendations in Appendix A.

B. Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
1. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
2. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
3. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces.

C. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

D. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

E. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

F. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

G. Make neat transitions between different surfaces, maintaining texture and appearance.

H. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

I. Conduct construction operations so no part of Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

J. Sequence the Work and allow adequate clearance to accommodate movement of construction and placement items on site and within the constraints of the new construction.

K. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

L. Templates: Obtain and distribute to the parties involved, templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work and Coordination Drawings to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

M. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and align with other portions of the Work. Where size and type of attachment is not indicated, verify size and type required for load conditions.
   1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
   2. Allow for building movement, including thermal expansion and contraction.
   3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installation anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete and masonry. Deliver items to Project site in time for installation.

N. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

3.4 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Do not allow combustible debris to accumulate.

C. Interior Areas:
   1. Remove scrap materials, packaging, and debris daily.
   2. Maintain clear access to exits, corridors, stairs, and mechanical rooms.
   3. Protect completed work from damage and contamination.
   4. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
   5. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Exterior Areas:
   1. Keep streets, sidewalks, parking lots, and adjacent properties free from mud and debris resulting from construction activities.
   2. Clean public roadways affected by trucking operations.
   3. Prevent dust migration beyond project boundaries.

E. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.
   1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
   2. Do not hold waste materials more than seven days during normal weather or three days if temperature is expected to rise above 80 deg F.
   3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to requirements of AHJ.

F. Installed Work:
   1. Keep installed Work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials or methods are not recommended, use cleaning materials that are not hazardous to health property and that will not damage exposed surfaces.
   2. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

3.5 PROTECTION OF INSTALLED WORK

A. See Section 01 7610 for temporary protective covering materials.

B. Limit Exposures: Supervise construction operations to assure that no part of the construction, complete or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

C. Protect installed work from damage by construction operations.

D. Provide special protection where specified in individual specification sections.

E. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

F. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

G. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

H. Protect work from spilled liquids. If work is exposed to spilled liquids, immediately remove protective coverings, dry out work, and replace protective coverings.

I. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

J. Prohibit traffic from landscaped areas.

K. Prohibit hydraulic equipment from accessing areas with finished surfaces or surfaces that are to receive a clear, transparent, or translucent coating/covering. Where hydraulic equipment is needed to access areas with such surfaces, protect surfaces from spilled hydraulic fluid. Surfaces stained by hydraulic fluid will be removed and replaced in their entirety to provide consistent finish.

L. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.6 SYSTEM STARTUP

A. Coordinate with requirements of Section 01 9113 - General Commissioning Requirements.

3.7 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.8 FINAL CLEANING

A. Execute final cleaning prior to Substantial Completion.
   1. Conduct cleaning and waste removal operations to comply with local laws and ordinances and federal and local environmental and antipollution regulations.

B. Employ experienced professional cleaners for final cleaning.

C. Use cleaning materials that are recommended by manufacturer or fabricator of the surface or equipment to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

D. Clean interior and exterior glass surfaces, including mirrors, exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces.
   1. Leave glass free of scratches, streaks, haze, and residue.

E. Clean interior and exterior hard surface finishes to a dirt free condition, including inside of cabinetry and millwork, free of stains, films, dust/sawdust, debris, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces where intended to remain. Restore reflective surfaces to their original condition.

F. Remove dust from ceiling grids, tiles, and exposed structures.

G. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.

H. Floor Finishes:
   1. Clean, strip, wax, seal, and polish flooring as recommended by manufacturers.
   2. Remove temporary floor protection.
   3. Leave flooring ready for Owner occupancy.

I. Touch up minor damage caused by cleaning operations.

J. Remove labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

K. Clean plumbing equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

L. Clean debris and dust from limited access spaces including but not limited to, plenums, shafts, equipment vaults, manholes, attics, and similar spaces.

M. Clean debris and dust from roofs, gutters, downspouts, scuppers, overflow drains, area drains, and drainage systems.

N. Clean mechanical equipment and fixtures; wipe surfaces.
1. Clean permanent filters and replace disposable filters of operating equipment.
2. Clean exposed surfaces of diffusers, registers, and grilles.
3. Clean ducts, blowers, coils and similar items.
4. Remove excess lubrication and other foreign substances.
5. Remove dirt and debris from HVAC equipment.

O. Plumbing Fixtures:
1. Clean and sanitize plumbing fixtures.
2. Polish exposed piping and trim.
3. Remove construction debris from drains and traps.

P. Clean electrical equipment and fixtures; wipe surface.
1. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
2. Clean switchgear, panelboards, and transformers.

Q. Clean Project site
1. Clean site, yards, and grounds, in areas disturbed by construction activities, including landscape developed areas, of rubbish, waste materials, litter, and other foreign substances.
2. Clean site furnishings and exterior equipment.
3. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
4. Rake grounds that are neither planted nor paved to smooth, even textured surface.
5. Remove tools construction equipment, machinery, and surplus material form Project site.
6. Remove snow and ice to provide safe access to building.

R. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

S. The Project shall be considered acceptably clean when:
1. No visible dust or construction residue remains.
2. Floors, walls, ceilings, and equipment are clean and free of stains.
3. Glass is streak-free.
4. Mechanical and electrical rooms are broom-clean.
5. Site improvements are free of debris.
6. Roof drains, gutters, and drainage systems are clean and functioning.
7. The facility is ready for immediate occupancy and operation.

3.9 RE-CLEANING

A. Areas impacted by punch list, warranty, corrective, or commissioning activities shall be re-cleaned before Final Completion.

B. Reclean areas identified by the Owner, Architect, or Construction Manager at no additional cost.

3.10 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.
   1. Provide copies to Architect and Owner.

B. Closeout Inspections Prior to Substantial Completion
   1. Contractor's Correction Punch List:
      a. Perform a preliminary inspection to determine and record items to be completed or corrected prior to Architect's inspection. Record to include a comprehensive list of items to be completed and/or corrected along with an estimated timeline in which items on the list shall be resolved.
         1) Notify Architect a minimum of 10 days prior to the date the Contractor wishes the Architect's Substantial Completion Inspection be performed and only when work is considered ready for Architect's Substantial Completion Inspection. Along with notification, submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion Inspection.
            a) If required, request Architect's Substantial Completion Inspection prior to resolving items on the Contractor's Correction Punch List. Include with the request an updated Contractor's Correction Punch List indicating resolved items and incomplete items. List incomplete items with value (cost) of incomplete item and explanation of why the work is not complete/resolved. Architect will determine if the Architect's Substantial Completion Inspection will be conducted or delayed pending resolution of additional Contractor's Corrective Punch List items.
      b. Organization of Contractor's Correction Punch List:
         1) Include name and identification of each space and area included within the work area or affected by the Work or where Work was performed and the items that are incomplete or require correction within those areas.
         2) Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest to highest floor.
         3) Organize items applying to each area by major element, including categories for ceiling, individual walls, floors, equipment, and building system.
   2. Architect's Substantial Completion Inspection:
      a. Upon receipt of notification of the completion of the Contractor's Correction Punch List, Architect will either proceed with the inspection or notify the Contractor of unfulfilled requirements.
      b. Upon acceptance of the Contractor's Correction Punch List, the Architect will perform the Architect's Substantial Completion Inspection. Architect will prepare the Certificate of Substantial Completion or will notify the Contractor of items, either on contractor's list or additional items identified by Architect, that must be complete or corrected prior to the issuance of a Certificate of Substantial Completion.
         1) Where items are required to be completed or corrected, the Contractor will notify the Architect that the identified items have been resolved and request a re-inspection.
         2) Results of completed Architect's Substantial Completion Inspection shall be the basis of requirements for Final Completion.

C. Procedures Prior to Substantial Completion:
   1. Complete the following items 10 days prior to the date of the Architect's Substantial Completion Inspection be performed:

a. Advise Owner in writing of pending insurance changeover requirements.
b. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
c. Complete startup and testing of systems and equipment.
d. Perform preventative maintenance on equipment used prior to Substantial Completion.
e. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training media specified in Section 01 7900 - Demonstration and Training.
f. Advise Owner of changeover of utilities.
g. Complete termination and removal of temporary facilities remaining.
h. Complete final cleaning requirements/procedures.

2. Submit the following items 10 days prior to the date of the Architect's Substantial Completion Inspection be performed:
   a. Certificate of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities.
   b. Closeout submittals specified in other Divisions including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information. See Section 01 7800 - Closeout Submittals for additional information.
   c. Maintenance Materials: Provide maintenance material submittals specified in individual Section, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect or Owner.
   d. Submit testing, adjusting, and balancing records.
   e. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

D. Final Completion Procedures:
1. Procedures Prior to Final Completion:
   a. Prior to requesting Final Completion Inspection, complete the following:
      1) Submit Final Application for Payment; See Section 01 2000 - Price and Payment Procedures.
      2) Submit certified list of incomplete items: Submit a certified copy of Architect's Substantial Completion Inspection list of items to be completed or corrected endorsed and dated by Contractor stating each item has been completed or otherwise resolved for acceptance.
      3) Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
      4) Submit pest-control final inspection report.
2. Final Completion Inspection:
   a. Submit a written request for Final Completion Inspection, to determine acceptance, a minimum of 10 days prior to the date the Work will be complete and ready for Final Completion Inspection. Upon receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate of Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
      1) Where items are required to be completed or corrected, notify the Architect that the identified items have been resolved and request a re-inspection.

E. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

3.11 MAINTENANCE

A. Provide service and maintenance of components indicated in specification sections.

B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than two years from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.

C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

E. Do not assign or transfer maintenance service to agent or subcontractor without prior written consent of the Owner.

END OF SECTION 01 7000

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SECTION 01 7123 - FIELD ENGINEERING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes general procedural requirements governing execution of field engineering services including, but not limited to, the following:
   1. Construction layout.
   2. Field surveying and recording of all underground utilities and stormwater.
   3. Registered site drawings.

B. All work specified in this Section shall be provided and paid for by the General Contractor (GC) as noted below:

1.3 SUBMITTALS

A. Qualification Data: For land surveyor to demonstrate their capabilities and experience, include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

B. Certified As-Built Underground Utilities Surveys: Submit two (2) copies signed, sealed, and dated by land surveyor. Certified surveys shall be provided on reproducible mylars and on electronic files in format as directed by the Architect and with Article 3.5.H.15.

C. Registered As-Built Site Drawing: Submit two (2) copies signed, sealed, and dated by registered surveyor within 14 days of Substantial Completion and certificate signed by the Land Surveyor that elevations and locations of Work are in conformance with the Contract Documents. Site drawings shall be provided on reproducible mylars and on electronic files in format as directed by the Architect and with Article 3.5.H.15.

1.4 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally licensed qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 EXAMINATION

A. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
   1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping, and underground electrical services.
   2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
   3. Information and data reflected in the Contract Documents with respect to Underground Facilities at or contiguous to the site is based upon information and data furnished to Owner and Architect by owners of such Underground Facilities or others. Owner, Construction Manager, and Architect do not assume responsibility for the accuracy or completeness thereof unless it is expressly provided otherwise in the General Conditions. Contractor shall verify the location of all underground utilities prior to any excavation.
   4. Site Contractor is responsible, on behalf of the project facility owner, for providing the physical markings of all existing utilities including those on site as indicated on the drawings or that may be identified in the field. The locations shown on the drawings are approximate. The Contractor must include in his bid the cost for hand-dug test holes, or other means, to ascertain the precise position of such underground facilities on the site owned by the Owner. This verification should be performed for any utilities to be relocated, removed, modified, or that may otherwise interfere with planned work. The utilities in the public right of way will be identified and marked by the appropriate facility owner as per the requirements of the PA One Call Act as amended. Physical layout is to be performed in full compliance with the PA One Call PA Act 287 of 1974 as amended by Act 18 of 1996 and Act 50 of 2017.

3.2 CONSTRUCTION LAYOUT

A. General: The GC will be responsible to layout building foundations and column grid locations.

B. Layout for Site Contractor: SC shall be responsible for layout of all work under the Site Contract.

C. Layout for GC: GC shall be responsible for layout and location of all work under the General Contract.

D. Layout for other Trades: SC shall locate on-site control points, elevation control, and reference points for use by MEP Trades to perform their own layout and work.

3.3 FIELD SURVEYING

A. Identification: Owner/Engineer will identify existing benchmark and control point.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

3.4 UNDERGROUND UTILITIES SURVEY

A. The Professional Licensed Land Surveyor in the state of Pennsylvania, obtained by Site Contractor, shall record the location, inverts, etc. of all the following underground utilities, beyond the exterior face of the building:
   1. Storm water: Include all inverts, top of rim or grate, pipe sizes, and locations.
   2. Storm water structures: Include elevations of all tops of grate, bottom of structures, and pipe sizes.
   3. Underground drainage system: Include inverts, top of rim or grate, and locations.
   4. Underground electric, telephone, cable television, manholes, power and control lines, spare conduits for future uses, computer conduits, etc. Provide locations and elevations.
   5. Sanitary sewer system including all structures: Provide locations, inverts, top of rim or grate, and bottom of structures.
   6. Water distribution system, electric, telephone, and cable television lines shall be located at 50-foot intervals and at changes in horizontal and vertical direction of line. Around turns, where the radius is less than 100 feet, the interval shall be 25 feet.
   7. Natural gas system distribution piping, piping sizes, locations, and elevations.

B. The Land Surveyor shall coordinate obtaining all the above improvements information with the Contractor making the installation since trenches for utilities will be backfilled as soon as the lines are installed.

C. Contractor shall prepare all drawings necessary to record the specified information. Drawings shall indicate all property lines, new and existing structures, etc.

3.5 CONTROL POINTS

A. GC shall provide engineering and layout for its work. In addition, the GC shall provide and maintain throughout the Project all building corners and column centerlines. GC shall provide floor control lines for each floor consisting of at least two perpendicular column lines per area and finish floor elevations. Each Prime Contractor shall be responsible for other surveys, engineering, layouts, etc., required in connection with their own work. Each Prime Contractor, at its own expense, is to provide stakes, templates, and labor required in laying out its work as is responsible for proper execution of the Work in accord with lines, levels, elevation, and dimensions indicated in the Contract Documents.

B. Each Prime Contractor shall be responsible for checking the position of the reference points comprising the primary control prior to starting site work and shall notify Engineer of discrepancies found between actual and record measurements.

C. The existing reference points shall not be disturbed without prior written approval from the Engineer. If existing reference points are disturbed during construction, new reference points shall be installed by the GC to control the work. The locations of the new reference points will be approved by the Engineer prior to setting the new reference points.

D. Protection of monuments and stakes is the responsibility of GC. Replacement of damaged control and reference points shall be at Contractor’s expense.

E. From the primary reference control provided by Owner, establish secondary control points necessary for the layout and construction of the Work. Secondary control shall consist of sufficient permanent points to establish the lines and grades for the various Work either directly or by offset. Layout lines for use in construction of the Work shall be established by the Contractor and taken directly from either the primary or secondary controls.

F. Secondary control shall be tied to and closed upon the primary control.

G. Accuracy of Land Based Surveys
1. Points for cross sections shall be located to the nearest 0.05 foot horizontally and vertically.
2. Vertical elevation surveys shall close within 0.05-foot times the square root of the length of the circuit in miles.
3. All grade stakes shall be set to 0.02 foot.
4. Alignment of tangents and curves shall be within 0.01 foot.
5. Points for structures shall be set to the nearest 0.02 foot, except where operational function of special features require closer tolerances.
6. Survey movement monuments shall be surveyed within an accuracy of 0.91 foot vertical and 0.01 foot horizontal.
7. Tolerances for all other Work shall be as shown or specified in the Contract Documents.
8. Survey instruments shall be accurate and shall be subject to inspection by Engineer for proper operation.
9. Electronic distance measuring (EDM) instruments used by Contractor on the Site shall be checked for calibration a minimum of once per month on an established base line approved by Architect and CM. Calibration results shall be kept in a logbook, available for Architect and CM review, showing the date and distances measured on the base line. An EDM shall not be used if it does not meet the minimum advertised accuracy published by the manufacturer of the EDM.
10. Defective instruments shall be promptly replaced, repaired, or adjusted to operate within the tolerances of the instrument manufacturer.
11. All work not performed with the methods and equipment as submitted by Contractor and accepted by Architect and CM shall be removed and replaced by Contractor at its own expense.

H. SC shall submit an electronic copy and a signed, sealed, mylar copy of a registered site drawing(s) prepared by a registered surveyor within 14 days of Substantial Completion and certificate signed by the Land Surveyor that elevations and locations of Work are in conformance with the Contract Documents. Drawing(s) shall include, at a minimum:
1. Property lines with metes and bounds.
2. North arrow.
3. Dimensions (overall) of structures.
4. Location of structures in relation to property lines.
5. Location and dimension of setbacks, easements, and rights-of-way.
6. Location of structures, wooded areas, water courses, rock outcrops, culverts, and other significant physical features on the site.
7. Name of Owners of the adjoining properties. Provide information on adjoining properties as required by the Township Ordinance including, but not limited to, lot number, plat name, recording reference number, etc.
8. Utility data as follows:
    a. Location of utility lines and structures including, but not limited to, electricity, gas, water, sanitary, telephone, cable, and fiber cable.
    b. Location and identification of storm sanitary structures including, but not limited to, manholes, cleanouts, inlets, catch basins, yard drains, and end walls. Include elevations at top and invert of each structure.
    c. Location, size, type, and invert of pipes flowing into and from each storm and sanitary structure.
9. Locations and trunk diameters of existing trees and tree masses located within the project site.
10. Topographic contours with two-foot intervals for overall site plan.

11. Driveway and parking areas, sidewalks, stairs, ball fields (indicating limits of infields), running tracks, bleachers, and other physical features (e.g. lighting standards, fencing, benches, paving types (concrete, bituminous, brick) curb types (concrete bituminous), etc.).
12. Elevations at perimeter of buildings, sidewalks, areaways, curbs, finish floor elevations at each entry of each building, and other site elements. Provide sufficient spot elevations to indicate drainage patterns and vertical elevation changes (e.g. stairs, loading docks, etc.). Provide floor elevations inside building.
13. Names, dimensions, and rights-of-way of adjoining streets at intersecting driveways and streets along and within 100 feet of the property frontage.
14. Utilize the same benchmark as the original survey which is included as part of the drawing set.
15. Final drawing survey to be submitted electronically in either DXF or AutoCAD DWG format.

END OF SECTION 01 7123

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SECTION 01 7329 - CUTTING AND PATCHING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Field verify existing conditions prior to proceeding with the work. Notify the Architect in writing of any conditions that are significantly different from those indicated on the drawings. Adjust work in accordance with the Architect's instructions.

B. This Section includes general administrative and procedural requirements governing execution of the Work.

C. Requirements and limitations for cutting and patching of Work.
1. A Contractor, subcontractor, or sub-subcontractor requiring the cutting of openings in new Work installed by others shall have such openings cut and patched by the trade which installed the work, and such cutting and patching shall be at the expense of the Contractor, subcontractor, or sub-subcontractor requiring the opening.
2. A Contractor, subcontractor, or sub-subcontractor requiring the cutting of openings or patching of existing materials shall be performed by a sub-contractor with experience in cutting and patching of material being modified and shall be at the expense of the Contractor, subcontractor, or sub-subcontractor requiring the opening.
3. Approval to do such cutting and patching shall be received from the Architect prior to proceeding with the work and shall include installation of such reinforcement of the work as the Architect may direct.
4. All blocking, bracing, reinforcement, or structural enhancement required due to cutting and patching shall be provided at no additional cost to Owner. All patching work shall match adjacent existing Work unless otherwise noted.
5. Contractor, subcontractors, and sub-sub-contractors shall conduct Work in accordance with the Occupational Safety and Health Act of 1970 (OSHA) and all additions, amendments, and revisions thereto.

D. Related Sections include the following:
1. Division 01 Section 017300 "Execution" for additional general administrative and procedural requirements governing execution of the Work.
2. Divisions 02 through 31 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
    a. Requirements in this Section apply to plumbing, mechanical, and electrical installations. Refer to Divisions 21 through 28 Sections for other requirements and limitations applicable to cutting and patching plumbing, mechanical, and electrical installations.

1.3 DEFINITIONS

A. Cutting: Removal of existing or in-place construction necessary to permit installation or performance of other Work.

B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.4 REFERENCE STANDARDS

A. 40 CFR 261 - Identification and Listing of Hazardous Waste.

1.5 PREINSTALLATION MEETINGS

A. Cutting and Patching Conferences: Prior to commencing Work requiring cutting and patching, meet at Project site with parties involved in cutting and patching to review extent of cutting and patching anticipated and examine procedures for ensuring satisfactory result from cutting and patching Work. Inform Architect and Construction Manager of scheduled meeting. Require representatives of each Prime Contract directly concerned or affected by the cutting and patching to attend, including the following:
   1. Contractor's superintendent.
   2. Trade supervisor responsible for cutting operations.
   3. Trade supervisor(s) responsible for patching of each type of substrate.
   4. Mechanical, electrical, and utilities subcontractors' supervisors, to the extent each trade is affected by cutting and patching operations.

B. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.6 SUBMITTALS

A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:
   1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
   2. Changes to Existing Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
   3. Products: List products to be used and firms or entities that will perform the Work.
   4. Dates: Indicate when cutting and patching will be performed.
   5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
      a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.
   6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and structural calculations showing integration of reinforcement with original structure.
   7. Architect’s Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.7 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
1. Primary operational systems and equipment.
2. Fire separation assemblies.
3. Air or smoke barriers.
4. Fire-protection systems.
5. Plumbing piping systems.
6. Mechanical systems piping and ducts.
7. Control systems.
8. Communication systems.
9. Fire-detection and -alarm systems.
10. Conveying systems.
11. Electrical wiring systems.
12. Operating systems of special construction.

C. Miscellaneous Elements: Do not cut and patch the following elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
1. Water, moisture, or vapor barriers.
2. Membranes and flashings.
3. Exterior curtain-wall construction.
4. Sprayed fire-resistive material.
5. Equipment supports.
6. Piping, ductwork, vessels, and equipment.
7. Noise- and vibration-control elements and systems.

D. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
1. If possible, retain original Installer or fabricator to cut and patch exposed Work listed below. If it is impossible to engage original Installer or fabricator, engage another recognized, experienced, and specialized firm.
    a. Match-veneer woodwork.
    b. Stonework and stone masonry.
    c. Ornamental metal.
    d. Preformed metal panels.
    e. Roofing.
    f. Firestopping.
    g. Window wall system.
    h. Stucco and ornamental plaster.
    i. Terrazzo.
    j. Carpeting.

k. Finished wood flooring.
l. Wall covering.
m. HVAC enclosures, cabinets, or covers.

1.8 WARRANTY

A. Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void any warranties required or existing.

PART 2 PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections of these Specifications.

B. Existing Materials: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of existing materials. Use materials that are not considered hazardous.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
1. Before proceeding, meet at the Project Site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.
2. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
3. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
   1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently, patch as required to restore surfaces to their original condition.

B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations. Cutting tools or saws shall be equipped with bays or containers, or connected to vacuum systems, to minimize dust.
   1. In general, use hand or small power tools designed for sawing and grinding, not hammering, and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
   2. Finished Surfaces: To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
   3. Concrete and Masonry: Cut using a cutting machine, such as a carborundum saw or a diamond-core drill.
   4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
   5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
   6. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections, where applicable.
   1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
   2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
      a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
      b. Restore damaged pipe covering to its original condition.
   3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
      a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
   4. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.
   5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

D. Each Prime Contractor shall do cutting and patching in existing work or work already constructed required for the work involved in their Contract. Patch holes or openings left by him to match the unaltered existing construction:

1. In Work already constructed, lintels and structural supports required to maintain structural integrity shall be provided by the Contractor whose work requires the opening.
2. Cutting of holes, installation of curbs, and temporary, weatherproof, and secured enclosures for penetrations through the existing Work shall be the responsibility of the Prime Contractor whose work requires the penetration. Actual roof flashing and associated work must be executed by a subcontractor, hired by the Prime Contractor, who is acceptable to the manufacturer of the existing roof which shall be certified, in writing, to the Owner and Architect/Engineer by the manufacturer. Existing warranty/guarantee shall be certified as remaining valid.
3. For penetrations through new work, the Prime Contractor whose work requires the penetration shall be responsible to provide the General Contractor of location, size, and configuration required for the penetration well in advance of the scheduled work. Prime Contractor who requires penetrations through the new roof construction shall provide the prefabricated roof curb and temporary, weatherproof, and secured enclosure on top of curb.

E. Each Prime Contractor shall employ skilled and experienced installer to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.

F. Each Prime Contractor shall submit written request in advance of cutting or altering elements affecting:
1. Structural integrity of element.
2. Integrity of weather-exposed or moisture-resistant elements.
3. Efficiency, maintenance, or safety of element.
4. Visual qualities of sight-exposed elements.
5. Work of Owner or separate contractor.

G. Should conditions of work or the schedule indicate a change of products from original installation, each Prime Contractor shall submit request for substitution as specified in Section 016000 “Product Requirements”.
1. Inspect existing conditions of project, including elements subject to damage or to movement during cutting and patching.
2. After uncovering work, inspect conditions affecting installation of products or performance of work.
3. Report unsatisfactory or questionable conditions to Construction Manager and Architect/Engineer, in writing; do not proceed with Work until Architect/Engineer has provided further instructions.

H. Each Prime Contractor shall submit written notice to Construction Manager designating the date and time the work will be uncovered.
1. Provide adequate temporary support as necessary to assure structural value or integrity of affected portion of work.
2. Provide devices and methods to protect other portions of project from damage.
3. Provide protection from elements for that portion of the project exposed by cutting and patching work and maintain excavations free from water.

I. Each Prime Contractor shall execute cutting, fitting, and patching including excavation and fill, to complete Work and to:
1. Make its several parts fit together properly.
2. Uncover portions of the work to provide for installation of ill-timed work.
3. Remove and replace defective work.
4. Remove and replace work not conforming to requirements of the Contract Documents.
5. Remove samples of installed work as specified for testing.
6. Provide routine penetrations of non-structural surfaces for installation of piping and electrical conduit.

J. Each Prime Contractor shall execute Work by avoiding damage to other work and providing proper surfaces to receive patching and finishing.

K. Each Prime Contractor shall execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances, and finishes.

L. Each Prime Contractor shall restore Work with new products in accord with requirements of Contract Documents.

M. Each Prime Contractor shall fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

N. Each Prime Contractor shall maintain integrity of wall, ceiling, or floor construction, and completely seal voids.

O. Each Prime Contractor shall refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for an assembly, refinish entire unit.

P. Each Prime Contractor shall identify hazardous substance or condition exposed during the Work and report to the Construction Manager for decision or remedy.

3.4 HAZARDOUS MATERIAL PROVISIONS

A. Potential for Hazardous Materials that may affect the Work: Certain environmental conditions or hazardous materials may exist or be encountered during the Work. Each Prime Contractor shall follow the guidelines listed below for the environmental conditions listed that may exist or be encountered during the Work.

B. The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a hazardous material or substance, including but not limited to asbestos, mercury, or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner, Construction Manager, and Architect of the condition.

1. Lead-Based Paint: Painted and varnished surfaces in buildings built prior to 1978 must be assumed to be coated with lead-based paint. Contractors shall immediately report to Construction Manager any areas suspected to be lead paint for decision or remedy. Contractor shall be responsible for all costs related to removal of lead-based paint items in areas affected by their Work as noted below. All required testing shall be performed in accordance with applicable EPA and HUD standards and guidelines pertaining to lead-based paint inspections.
    a. Lead-Based Paint Disturbance. Each Prime Contractor shall be responsible for lead-based paint disturbance precautions.
        1) For buildings defined as a Child-Occupied Facility (children under the age of 6). When these surfaces are disturbed, that disturbance shall be conducted in accord with the Environmental Protection Agency (EPA) 40 CFR, Part 745 “Lead, Renovation, Repair and Painting Program”. Compliance is to include using EPA licenses and certified trained renovators, Owner and occupant notifications, work area containment, dust minimization, and clean-up certification. Architect/Engineer shall be copied on the Owner and occupant notifications.

2) For buildings that are not defined as a Child-Occupied Facility (children under the age of 6), all renovation or new construction work that impacts painted components containing lead shall be performed in accordance with the OSHA Lead-in Construction Standard (29 CFR 1926.62), as applicable to the work being performed; and a proper waste management plan shall be utilized to certify that the waste is tested for hazardous waste classification, as applicable, and properly disposed or recycled. Contractors working on the project are responsible for fulfilling all applicable OSHA requirements pertaining to lead, as well as all other applicable federal, state, or local requirements or regulations pertaining to lead-in construction.

b. Lead-Based Paint: Demolition and Handling

1) Contractor shall handle, contain, store, test, transport, and dispose of demolition debris with lead-containing surface coating in accordance with applicable local, state, and federal regulations. Most painted architectural components in fair condition (not blistering, peeling, etc.), by law, may be disposed of as Construction and Demolition (C&D) debris. If deemed necessary for disposal, Contractor shall be responsible for collecting and having analyzed representative samples of the waste. If necessary, samples shall be tested for toxicity using the Toxicity Characteristics Leaching Procedure (TCLP) for lead sufficient to determine whether the debris is a hazardous waste as defined in 40 CFR 261.3, or a residual waste, as defined in 25 PA Code 287.1, and shall include such analysis as required by the disposal facility. A qualified environmental laboratory acceptable to the Architect and Construction Manager shall conduct tests. A copy of all testing shall be forwarded to the Architect, Construction Manager and Owner.

2) The Contractor shall be responsible for the costs of sample collection and laboratory analysis. Alternately, Contractor can assume lead waste generated is a hazardous waste and TCLP testing is not required, but the waste must then be disposed of and transported as hazardous waste.

3) If, based on testing, there is any hazardous waste generated and transferred to a hazardous waste disposal facility, Contractor shall provide, within 45 days from the time the material is transferred to the disposal facility, a waste manifest to the Owner that identifies the disposal facility name and address, EPA Identification Number, the identity of the waste material, and a statement certifying that the waste was disposed at that facility, including the date. Forward original document to Owner with a copy to the Architect and Construction Manager.

2. Polychlorinated Biphenyl (PCB) Light Ballasts and Mercury-Containing Fluorescent Light Fixture Recycling and Disposal

a. PCB Light ballasts:

1) Ballasts demarcated as non-PCB containing may be recycled as non-PCB ballasts in accordance with applicable industry standards for those types of ballasts.

2) Ballast that do not carry a demarcation of non-PCB should be assumed to contain PCB's and recycled as PCB ballasts in a facility that accepts PCB ballasts as universal waste unless they are electronic (no suspect oil). Leaking PCB light ballasts shall be disposed of as hazardous waste unless testing is performed to classify the waste for PCB's.

b. Fluorescent light tubes should be assumed to contain mercury at levels that could deem them "hazardous waste" for disposal purposes. All fluorescent light tubes impacted by renovation or new construction work shall be sent for recycling as universal waste to a facility that accepts mercury-containing light tubes as part of their universal waste program.

3.5 CLEANING

A. Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar items. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.

END OF SECTION 01 7329

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SECTION 01 7800 - CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Project record documents.

B. Operation and maintenance data.

C. Materials transparency manual.

D. Warranties and bonds.

1.2 ACTION SUBMITTALS

A. Project Record Documents: Submit documents to Architect prior to Substantial Completion Inspection.
1. Record Drawings:
    a. Initial Submittal: Submit PDF electronic file of scanned record drawings.
        1) PDF files shall be a single file of Contract drawings. Label Contract Drawings with sheet number and bookmark.
    b. Final Submittal:
        1) Submit PDF electronic files of scanned record drawings incorporating comments and corrections made during Initial Submittal.
            a) PDF files shall be a single file of all drawings. Drawings shall be labeled with sheet number and bookmarked.
        2) Submit one set of printed drawings.
2. Record Specifications: Submit annotated PDF electronic files and number of paper copies of Project's Specifications, including addenda and Contract modifications.
3. Record Product Data:
    a. Submit PDF annotated PDF electronic files and directories of each submittal.
    b. Where Record Product Data is required as part of the Operation and Maintenance Manual, submit duplicate marked up Record Product Data as a component of the maintenance manual.
4. Miscellaneous Record Submittals: See other Sections for record keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories of each submittal.

B. Operation and Maintenance Data:
1. Submit PDF electronic file. Assemble manual into a composite electronically indexed (book marked) file.
    a. Preliminary Submission: Submit preliminary draft of format and outlines of content 30 days prior to commencement of demonstration and training. Architect will review preliminary draft and return copy with comments.
    b. Initial Submission: Submit draft copy of manual(s) 15 days prior to final inspection. Architect will review and return after final inspection, with Architect's comments. Revise content of documents as required for final submission.

c. Final Submission: Submit manual(s) in final form 15 days after receipt of Architect's comments of Initial Submission.
d. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.

C. Warranties and Bonds:
1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
1. Drawings.
2. Specifications.
3. Addenda.
4. Change Orders and other modifications to the Contract.
5. Reviewed shop drawings, product data, and samples.
6. Manufacturer's instruction for assembly, installation, and adjusting.

B. Ensure entries are complete and accurate, enabling future reference by Owner.
1. Mark to show the actual installation where Installation varies from that shown originally.
2. Give particular attention to information of concealed elements that would be difficult to identify or measure and record at a later time. verify mark-ups before enclosing concealed installations.
3. Record data as soon as possible after obtaining.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress.

E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
1. Manufacturer's name and product model and number.
2. Product substitutions or alternates utilized.
3. Changes made by Addenda and modifications.

F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
1. Measured depths of foundations in relation to finish first floor datum.
2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
    a. Revisions to routing of piping and conduits.
    b. Duct size and routing.
    c. Equipment locations.
    d. Revisions to electrical circuitry.
4. Field changes of dimension and detail.
5. Details not on original Contract drawings.
6. Note identifying numbers of Architects Supplemental Instructions (ASI), Change Directives, Change Orders, construction sketches, and other modification documents.

3.2 OPERATION AND MAINTENANCE DATA

A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts. Cross-reference specification section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.3 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for each of the following:
    1. Type of emergency.
    2. Emergency instructions.
    3. Emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
    1. Fire.
    2. Flood.
    3. Gas leak.
    4. Water leak.
    5. Power failure.
    6. Water outage.
    7. System, subsystem, or equipment failure.
    8. Chemical release or spill.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owners operating personnel for notification of installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

3.4 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:
1. Product data, with catalog number, size, composition, and color and texture designations.
2. Information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

C. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.

D. Additional information as specified in individual product specification sections.

E. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.5 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:
1. Description of unit or system, and component parts.
   a. Product name and model number.
   b. Manufacturer's name.
   c. Equipment identification with serial number of each component.
2. Identify function, normal operating characteristics, and limiting conditions.
3. Include performance curves, with engineering data and tests.
   a. Performance and design criteria if Contractor has delegated design responsibility.
4. Complete nomenclature and model number of replaceable parts.
5. License requirements including inspection and renewal dates.

B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.

D. Include color coded wiring diagrams as installed.

E. Include piped system diagrams.

F. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and special operating instructions.

G. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
   1. Include HVAC outdoor and exhaust air damper calibration strategy.
      a. Include provisions which ensure that full closure of dampers can be achieved.
   2. Include Carbon Dioxide Monitoring Protocol.
   3. Include Carbon Monoxide Monitoring Protocol.
   4. Include Frost Mitigation Strategy for ventilation heat-recovery system.

H. Provide servicing and lubrication schedule, and list of lubricants required.

I. Include manufacturer's printed operation and maintenance instructions.

J. Include sequence of operation by controls manufacturer.

K. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

L. Provide control diagrams by controls manufacturer as installed.

M. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.

N. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

O. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

P. Include test and balancing reports.

Q. Additional Requirements: As specified in individual product specification sections.

3.6 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

A. Directory:
   1. Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:
      a. List of Documents.
      b. List of Systems.
      c. List of Equipment.
      d. Table of Contents.
   2. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
   3. List of Equipment: List of equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
   4. Table of Contents: Include a table of contents for each emergency, operation and maintenance manual.

B. Organize operations and maintenance manuals following the example template appended to this document following this Section.

C. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

D. Where systems involve more than one specification section, provide separate tabbed divider for each system.

E. Manuals, Physical
   1. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
   2. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
   3. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.
   4. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include Tables of Contents in each volume, with the current volume clearly identified.
   5. Dividers/Separation Pages: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.
   6. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.
   7. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

F. Operations and Maintenance Manual, Electronic: Combine PDF files of Cover, Project Directory, Table of Contents, and Separation Pages, Text/Copy/Data, and Drawings. Organize pdf in same manner as physical manual and bookmark each item.
   1. Scan original physical documents to be included in the electronic manual where electronic versions do not exist. Document data size shall be reduced to smallest file size without data loss or reduction in legibility.

G. Arrangement of Contents: Organize each volume in parts as follows:
   1. Project Directory.
   2. Table of Contents, of all volumes, and of this volume.
   3. Operation and Maintenance Data: Arranged by system, then by product category.
      a. Source data.
      b. Product data, shop drawings, and other submittals.
      c. Operation and maintenance data.
      d. Field quality control data.
      e. Photocopies of warranties and bonds.
   4. Design Data: To allow for addition of design data furnished by Architect or others, provide a tab labeled "Design Data" and provide a binder large enough to allow for insertion of at least 20 pages of typed text.

3.7 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

E. Include originals of each in operation and maintenance manuals, indexed separately on Table of Contents.

F. Warranty Manual, Physical: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.
   1. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.
   2. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.
   3. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

G. Warranty Manual, Electronic: Combine PDF files of Cover, Table of Contents, and Separation Pages, and Warranties and Bonds. Organize pdf in same manner as physical manual and bookmark each warranty and bond.
   1. Scan original warranties and bonds to be included in the electronic manual.

END OF SECTION 01 7800

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INSERT OWNER LOGO HERE
IF OWNER DOES NOT HAVE LOGO,
INSERT COMPLETED PROJECT PHOTO OF ENTRY FAÇADE

OPERATION & MAINTENANCE MANUAL VOLUME {#}

{PROJECT NAME}

{PROJECT ADDRESS LINE 1}
{PROJECT ADDRESS LINE 2}

DATE OF SUBSTANTIAL COMPLETION
{January 1, 0000}

Contractor: {Company Name}

{Point of Contract Name}
{Point of Contact Title}
{Address Line 1}
{Address Line 2}
Phone: {Phone Number}
E-mail: {Point of Contact E-mail}

Architect: MW Studios.
Architect of Record: David Woodward
{Point of Contact}
{Point of Contact Title}
8098 Sandpiper Circle, Suite H
Nottingham, Maryland 21236
Phone: 410-344-1460
E-mail: {Point of Contract E-mail}

{Contractors Company Name & Phone Number}

{PROJECT NAME}
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Page #

{Contractors Company Name & Phone Number}

{PROJECT NAME}

{Address Line 1}
{Address Line 2}

PROJECT DIRECTORY

OWNER

{Entity Name of Owner}
{Owner Address Line 1}
{Owner Address Line 2}

	Business Phone	Mobile Phone	E-Mail Address
{Point of Contact Name & Title}	{Phone #}	{Phone #}	{E-mail Address}
{Point of Contact Name & Title}	{Phone #}	{Phone #}	{E-mail Address}

GENERAL CONTRACTOR

{Entity Name}
{Owner Address Line 1}
{Owner Address Line 2}

	Business Phone	Mobile Phone	E-Mail Address
{Point of Contact Name & Title}	{Phone #}	{Phone #}	{E-mail Address}
{Point of Contact Name & Title}	{Phone #}	{Phone #}	{E-mail Address}

ARCHITECT

{Entity Name}
{Owner Address Line 1}
{Owner Address Line 2}

	Business Phone	Mobile Phone	E-Mail Address
{Point of Contact Name & Title}	{Phone #}	{Phone #}	{E-mail Address}
{Point of Contact Name & Title}	{Phone #}	{Phone #}	{E-mail Address}

{Contractors Company Name & Phone Number}

{DESIGN TEAM MEMBER AS LISTED ON DRAWING COVER SHEET}

{Entity Name}
{Owner Address Line 1}
{Owner Address Line 2}

	Business Phone	Mobile Phone	E-Mail Address
{Point of Contact Name & Title}	{Phone #}	{Phone #}	{E-mail Address}
{Point of Contact Name & Title}	{Phone #}	{Phone #}	{E-mail Address}

{SUBCONTRACTOR – list each separately}

{Entity Name}
{Owner Address Line 1}
{Owner Address Line 2}

	Business Phone	Mobile Phone	E-Mail Address
{Point of Contact Name & Title}	{Phone #}	{Phone #}	{E-mail Address}
{Point of Contact Name & Title}	{Phone #}	{Phone #}	{E-mail Address}

{CONTRACTORS WARRANTY, ON COMPANY LETTERHEAD, SIGNED BY COMPANY REPRESENTATIVE AUTHORIZED TO SIGN BINDING DOCUMENTS}

{Contractors Company Name & Phone Number}

{PROJECT NAME}

{Address Line 1}
{Address Line 2}

REQUIRED MAINTENANCE SCHEDULES

*****INCLUDE ALL REQUIRED MAINTENANCE FOR EQUIPMENT AND FINISHES*****

{Contractors Company Name & Phone Number}

Division {#}
{Division Title}

*****Division Separator Page (Electronic Manual);
Hyperlink or bookmark this page in the Table of Contents*****

*****Tab Divider (Physical Manual);
Print on Card Stock divider with numbered tab*****

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Division {#}

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SECTION 01 7900 - DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.1 SUMMARY

A. Demonstration of products and systems where indicated in specific specification sections.

B. Training of Owner personnel in operation and maintenance is required for:
1. All software-operated systems.
2. HVAC systems and equipment.
3. Plumbing equipment.
4. Electrical systems and equipment.
5. Conveying systems.
6. Landscape irrigation.
7. Items specified in individual product Sections.

C. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:
1. Roofing, waterproofing, and other weather-exposed or moisture protection products.
2. Finishes, including flooring, wall finishes, ceiling finishes.
3. Fixtures and fittings.
4. Items specified in individual product Sections.

1.2 ACRONYMS

A. O&M: Operations and Maintenance.

1.3 ACTION SUBMITTALS

A. Training Plan: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
1. Submit to Architect for transmittal to Owner.
2. Submit not less than four weeks prior to start of training.
3. Revise and resubmit until acceptable.
4. Provide an overall schedule showing training sessions.
5. Include at least the following for each training session:
    a. Identification, date, time, and duration.
    b. Description of products and/or systems to be covered.
    c. Name of firm and person conducting training; include qualifications.
    d. Intended audience, such as job description.
    e. Objectives of training and suggested methods of ensuring adequate training.
    f. Instruction methods include, but are not limited to, classroom lecture, live demonstrations, and hands-on training.
    g. Media types include, but are not limited to, presentation slides, hard copy hand-outs, and digital files saved on USBs.

h. Training equipment required, including projector and projection screen.

1.4 INFORMATIONAL SUBMITTALS

A. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
1. Include applicable portion of O&M manuals.
2. Include copies of hand-outs, slides, overheads, and video presentations that are not included in O&M manuals.
3. Provide one extra copy of each training manual to be included with operation and maintenance data.

B. Training Reports:
1. Identification of each training session, date, time, and duration.
2. Sign-in sheet showing names and job titles of attendees.
3. List of attendee questions and written answers given, including copies of and references to supporting documentation required for clarification; include answers to questions that could not be answered in original training session.

1.5 CLOSEOUT SUBMITTALS

A. Video Recordings: Submit digital video recording of each demonstration and training session for Owner's subsequent use.
1. Format: DVD Disc.
2. Label each disc and container with session identification and date.

1.6 QUALITY ASSURANCE

A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 DEMONSTRATION, GENERAL

A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.

B. Demonstration may be combined with Owner personnel training if applicable.

C. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.

1. Perform demonstrations not less than two weeks prior to Substantial Completion.
2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

D. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
1. Perform demonstrations not less than two weeks prior to Substantial Completion.

3.2 TRAINING, GENERAL

A. Conduct training on-site unless otherwise indicated.

B. Provide training in minimum two hour segments.

C. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.

D. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
1. The location of the O&M manuals and procedures for use and preservation; backup copies.
2. Typical contents and organization of manuals, including explanatory information, system narratives, and product specific information.
3. Typical uses of the O&M manuals.

E. Product- and System-Specific Training:
1. Review the applicable O&M manuals.
2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
4. Provide hands-on training on operational modes possible and preventive maintenance.
5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
6. Discuss common troubleshooting problems and solutions.
7. Discuss peculiarities of equipment installation or operation.
8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
9. Review recommended tools and spare parts inventory suggestions of manufacturers.
10. Review spare parts and tools required to be furnished by Contractor.
11. Review spare parts suppliers and sources and procurement procedures.

F. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

END OF SECTION 01 7900

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SECTION 01 9113 - GENERAL COMMISSIONING REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

A. Commissioning is intended to achieve the following specific objectives; this section specifies the Contractor's responsibilities for commissioning:
   1. Verify that the work is installed in accordance with the Contract Documents, the manufacturer's recommendations and instructions, and that it receives adequate operational checkout prior to startup: Startup reports are utilized to achieve this.
   2. Verify and document that functional performance is in accordance with the Contract Documents: Functional Tests such as manufacturers startup reports, balancing, and site demonstrations executed by the contractor and witnessed by the Commissioning Authority are utilized to achieve this.
   3. Verify that operation and maintenance manuals submitted to Owner are complete: Detailed operation and maintenance (O&M) data submittals by Contractor are utilized to achieve this.
   4. Verify that the Owner's operating personnel are adequately trained: Formal training conducted by Contractor is utilized to achieve this.

B. The Commissioning Authority is employed by Construction Manager on behalf of Owner.

1.2 SCOPE OF COMMISSIONING

A. The following are to be commissioned:
   1. Plumbing Systems:
      a. Water heaters.
      b. Domestic Water Treatment System.
      c. Radon mitigation system (Section 22 38 00), including radon fans, system monitors and alarms, and riser pressure test taps; all four systems, no sampling.
   2. HVAC System, including:
      a. Major and minor equipment items.
      b. DOAS / VRF units.
      c. Piping systems and equipment.
      d. Ductwork and accessories.
      e. Infrared Heating system
      f. CO/NO2 Exhaust System
      g. Control system.
      h. Radon system monitor alarm points at the building automation system (BAS).
      i. Variable frequency drives.
   3. Electrical Systems:
      a. Emergency power systems.
      b. Lighting controls other than manual switches.

B. Other equipment and systems explicitly identified elsewhere in Contract Documents as requiring commissioning.

1.3 SUBMITTALS

A. Product Data: If submittals to DEDC, LLC do not include the following, submit copies as soon as possible:

B. Product Data: Submit to DEDC, LLC:
1. Manufacturer's product data, cut sheets, and shop drawings.
2. Manufacturer's installation instructions.
3. Startup, operating, and troubleshooting procedures.
4. Fan and pump curves.
5. Factory test reports.
6. Warranty information, including details of Owner's responsibilities in regard to keeping warranties in force.

C. Manufacturers' Instructions: Submit copies of all manufacturer-provided instructions that are shipped with the equipment as soon as the equipment is delivered.

D. Startup Plans and Reports.

E. Completed Prefunctional Checklists/Start-up Documentation.

F. Radon Mitigation System: Copies of the delegated design submittal, field inspection reports, PFE and commissioning report, and Pennsylvania DEP filings specified in Section 22 38 00, submitted directly to the Commissioning Authority.

PART 2 PRODUCTS

2.1 TEST EQUIPMENT

A. Provide all standard testing equipment required to perform startup and initial checkout and required Functional Testing; unless otherwise noted such testing equipment will NOT become the property of Owner.

B. Calibration Tolerances: Provide testing equipment of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified. If not otherwise noted, the following minimum requirements apply:
1. Temperature Sensors and Digital Thermometers: Certified calibration within past year to accuracy of 0.5 degree F and resolution of plus/minus 0.1 degree F.
2. Pressure Sensors: Accuracy of plus/minus 2.0 percent of the value range being measured (not full range of meter), calibrated within the last year.
3. Digital Micromanometers (Radon PFE Testing): Resolution of 0.001 inch water column (0.25 Pa), calibrated within the last year.
4. Calibration: According to the manufacturer’s recommended intervals and when dropped or damaged; affix calibration tags or keep certificates readily available for inspection.

C. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required in order to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Owner; such equipment, tools, and instruments are to become the property of Owner.

PART 3 EXECUTION

3.1 COMMISSIONING PLAN

A. Commissioning Authority will prepare the Commissioning Plan.
   1. Attend meetings called by the Commissioning Authority for purposes of completing the commissioning plan.
   2. Require attendance and participation of relevant subcontractors, installers, suppliers, and manufacturer representatives.

B. Contractor is responsible for compliance with the Commissioning Plan.

C. Commissioning Plan: The commissioning schedule, procedures, and coordination requirements for all parties in the commissioning process.

D. Commissioning Schedule:
   1. Submit anticipated dates of startup of each item of equipment and system to Commissioning Authority within 30 days after award of Contract.
   2. Re-submit anticipated startup dates monthly, but not less than 4 weeks prior to startup.
   3. Prefunctional Checklists and Functional Tests are to be performed in sequence from components, to subsystems, to systems.
   4. Provide sufficient notice to Commissioning Authority for delivery of relevant Checklists and Functional Test procedures, to avoid delay.

3.2 STARTUP PLANS AND REPORTS

A. Startup Plans: For each item of equipment and system for which the manufacturer provides a startup plan, submit the plan not less than 2 weeks prior to startup.

B. Startup Reports: For each item of equipment and system for which the manufacturer provides a startup checklist (or startup plan or field checkout sheet), document compliance by submitting the completed startup checklist prior to startup, signed and dated by responsible entity.

C. Submit directly to the Commissioning Authority and DEDC,LLC.

3.3 PREFUNCTIONAL CHECKLISTS

A. A Prefunctional Checklist is required to be filled out for each item of equipment or other assembly specified to be commissioned.
   1. No sampling of identical or near-identical items is allowed.
   2. These checklists do not replace manufacturers' recommended startup checklists, regardless of apparent redundancy.
   3. Prefunctional Checklist forms will not be complete until after award of the contract; the following types of information will be gathered via the completed Checklist forms:
      a. Certification by installing contractor that the unit is properly installed, started up, and operating and ready for Functional Testing.
      b. Confirmation of receipt of each shop drawing and commissioning submittal specified, itemized by unit.

c. Manufacturer, model number, and relevant capacity information; list information "as specified," "as submitted," and "as installed."
d. Serial number of installed unit.
e. List of inspections to be conducted to document proper installation prior to startup and Functional Testing; these will be primarily static inspections and procedures; for equipment and systems may include normal manufacturer's start-up checklist items and minor testing.
f. Sensor and actuator calibration information.

B. Contractor is responsible for filling out Prefunctional Checklists, after completion of installation and before startup; witnessing by the Commissioning Authority is not required unless otherwise specified.
1. Each line item without deficiency is to be witnessed, initialed, and dated by the actual witness; checklists are not complete until all line items are initialed and dated complete without deficiencies.
2. Checklists with incomplete items may be submitted for approval provided the Contractor attests that incomplete items do not preclude the performance of safe and reliable Functional Testing; re-submission of the Checklist is required upon completion of remaining items.
3. Individual Checklists may contain line items that are the responsibility of more than one installer; Contractor shall assign responsibility to appropriate installers or subcontractors, with identification recorded on the form.
4. If any Checklist line item is not relevant, record reasons on the form.
5. Contractor may independently perform startup inspections and/or tests, at Contractor's option.
6. Regardless of these reporting requirements, Contractor is responsible for correct startup and operation.
7. Submit completed Checklists to Commissioning Authority within two days of completion.

C. Commissioning Authority is responsible for furnishing the Prefunctional Checklists to Contractor.
1. Provide all additional information requested by Commissioning Authority to aid in preparation of checklists, such as shop drawing submittals, manufacturers' startup checklists, and O&M data.
2. Commissioning Authority may add any relevant items deemed necessary regardless of whether they are explicitly mentioned in Contract Documents or not.
3. When asked to review the proposed Checklists, do so in a timely manner.

D. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Owner.
1. If difficulty in correction would delay progress, report deficiency to the Commissioning Authority immediately.

3.4 FUNCTIONAL TESTS

A. A Functional Test is required for each item of equipment, system, or other assembly specified to be commissioned, unless sampling of multiple identical or near-identical units is allowed by the final test procedures.

B. Contractor is responsible for execution of required Functional Tests, after completion of Prefunctional Checklist and before closeout.

C. Commissioning Authority is responsible for witnessing and reporting results of Functional Tests, including preparation and completion of forms for that purpose.

D. Commissioning Authority is responsible for witnessing results of Functional Tests.

E. Contractor is responsible for correction of deficiencies and re-testing at no extra cost to Owner; if a deficiency is not corrected and re-tested immediately, the Commissioning Authority will document the deficiency and the Contractor's stated intentions regarding correction.
   1. Deficiencies are any condition in the installation or function of a component, piece of equipment or system that is not in compliance with Contract Documents or does not perform properly.
   2. When the deficiency has been corrected, the Contractor completes the form certifying that the item is ready to be re-tested and returns the form to the Commissioning Authority; the Commissioning Authority will reschedule the test and the Contractor shall re-test.
   3. Identical or Near-Identical Items: If 10 percent, or three, whichever is greater, of identical or near-identical items fail to perform due to material or manufacturing defect, all items will be considered defective; provide a proposal for correction within 2 weeks after notification of defect, including provision for testing sample installations prior to replacement of all items.
   4. Contractor shall bear the cost of Owner and Commissioning Authority personnel time witnessing re-testing.

F. Functional Test Procedures:
   1. Functional Test procedures are not included in Contract Documents, test procedures will be determined by the Commissioning Authority with input by and coordination with Contractor.
   2. Examples of Functional Testing:
      a. Test the dynamic function and operation of equipment and systems (rather than just components) using manual (direct observation) or monitoring methods under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint).
      b. Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc.
      c. Systems are run through all the HVAC control system’s sequences of operation and components are verified to be responding as the sequence's state.
      d. Traditional air or water test and balancing (TAB) is not Functional Testing; spot checking of TAB by demonstration to the Commissioning Authority is Functional Testing.

G. Deferred Functional Tests: Some tests may need to be performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions; performance of these tests remains the Contractor's responsibility regardless of timing.
   1. Long-term radon testing during the first heating season following Substantial Completion, as specified in Section 22 38 00 and in Article “Radon Mitigation System Commissioning” below.

3.5 RADON MITIGATION SYSTEM COMMISSIONING

A. General: Commission the radon mitigation system specified in Section 22 38 00, consisting of four independent active soil depressurization systems (R1, R2, R3, and R4). The work of Section 22 38 00 is part of the Plumbing contract; related work is provided under the General Construction, Electrical, and HVAC (controls) contracts as listed in that Section.

B. Radon Testing Agency: The Commissioning Authority will retain, on behalf of the Owner, an independent radon testing agency to perform the post-construction radon testing specified in Section 22 38 00.
   1. The testing agency and the individuals performing testing shall hold current Pennsylvania DEP radon testing certification under 25 Pa. Code Chapter 240, and test devices shall be analyzed by a Pennsylvania DEP-certified radon laboratory.

2. The testing agency shall have no financial affiliation with the Plumbing Contractor, the radon Delegated Designer, or their subcontractors.

C. Commissioning Authority Responsibilities:
1. Include the radon mitigation system in the Commissioning Plan and schedule, coordinated with the inspection hold points specified in Section 22 38 00.
2. Prepare Prefunctional Checklists and Functional Test procedures for each radon system, based on Section 22 38 00 and the accepted delegated design.
3. Witness system activation and PFE testing of each system, and verify that the specified sub-slab pressure differential of not less than 0.004 inch water column (1 Pa) negative is achieved at every test port with the HVAC systems in their normal occupied mode.
4. Verify fan operation, recorded fan speed settings, and riser static pressures for each system against the PFE and commissioning report.
5. Witness verification of each system monitor alarm, locally and at the BAS, by simulated loss of system vacuum.
6. Verify system labeling, test port and test tap accessibility, and fan disconnects, and visually verify that exhaust terminations comply with the separation requirements of Section 22 38 00.
7. Schedule the initial post-construction radon testing to begin no sooner than 24 hours and no later than 30 days after activation of each system, in accordance with 25 Pa. Code Chapter 240, under the building conditions and test device quantities and locations specified in Section 22 38 00.
8. Distribute radon test results, on the Pennsylvania DEP-approved result report form, to the Owner, Architect, DEDC, LLC, and the Plumbing Contractor.
9. Track corrective work and schedule retesting of affected areas where any result is 4.0 pCi/L or greater.
10. Deferred Testing: Schedule and report the long-term radon testing (91 days minimum) during the first heating season following Substantial Completion, in each sleeping room and not less than 25 percent of the other locations tested, as specified in Section 22 38 00.
11. Review the radon OM&M manual and include radon system commissioning records and radon test results in the commissioning report.

D. Contractor Responsibilities:
1. Plumbing Contractor: Notify the Commissioning Authority not less than 7 days before activation of each radon system. Complete Prefunctional Checklists for each system, and perform activation, PFE testing, fan speed adjustment, and alarm verification with the Delegated Designer present, witnessed by the Commissioning Authority.
2. HVAC Contractor (Controls): Participate in verification of radon alarm points at the BAS.
3. Electrical Contractor: Verify that power to each radon fan and monitor is energized, dedicated, and not switched or interlocked with other systems, before activation.
4. All Contractors: Maintain closed-building conditions, with HVAC systems in normal occupied mode and apparatus bay overhead doors closed except for normal entry and exit, during radon testing.
5. Retesting: Corrective work, and the cost of radon retesting after a failed test, shall be at no additional cost to the Owner, as specified in Section 22 38 00.

3.6 TEST PROCEDURES - GENERAL

A. Provide skilled technicians to execute starting of equipment and to execute the Functional Tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.

B. Provide all necessary materials and system modifications required to produce the flows, pressures, temperatures, and conditions necessary to execute the test according to the specified conditions. At completion of the test, return all affected equipment and systems to their pre-test condition.

3.7 OPERATION AND MAINTENANCE MANUALS

A. Submit manuals related to items that were commissioned to Commissioning Authority for review; make changes recommended by Commissioning Authority.

B. Commissioning Authority will add commissioning records to manuals after submission to Owner.

END OF SECTION 01 9113

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SECTION 032000 - CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Steel reinforcement bars.
   2. Welded-wire reinforcement.

1.2 ACTION SUBMITTALS

A. Shop Drawings: Comply with ACI SP-066:
   1. Include placing drawings that detail fabrication, bending, and placement.
   2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, details of mechanical splice couplers, details of welding splices, tie spacing, hoop spacing, and supports for concrete reinforcement.

B. Construction Joint Layout: Indicate proposed construction joints required to build the structure.
   1. Location of construction joints is subject to approval of Architect.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A615, Grade 60 deformed.

B. Smooth Welded-Wire Reinforcement: ASTM A1064, Grade 65.

2.2 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.
   1. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete.
      a. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.

B. Steel Tie Wire: ASTM A1064, annealed steel.

2.3 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

PART 3 - EXECUTION

3.1 PREPARATION

A. Protection of In-Place Conditions:
   1. Do not cut or puncture vapor retarder.
   2. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

3.2 INSTALLATION OF STEEL REINFORCEMENT

A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.

B. Accurately position, support, and secure reinforcement against displacement.
   1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
   2. Do not tack weld crossing reinforcing bars.

C. Preserve clearance between bars in accordance with ACI 318.

D. Provide coverage in accordance with ACI 318.

E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

F. Splices: Lap splices as indicated on Drawings.
   1. Stagger splices in accordance with ACI 318.

G. Install welded-wire reinforcement in longest practicable lengths.
   1. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."
      a. For reinforcement less than W4.0 or D4.0, continuous support spacing to not exceed 12 inches.
   2. Lap edges and ends of adjoining sheets per guidelines set by the wire reinforcement institute.
   3. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.
   4. Lace overlaps with wire.

3.3 JOINTS

A. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect. Refer to the structural drawings.

3.4 INSTALLATION TOLERANCES

A. Comply with ACI 117.

3.5 FIELD QUALITY CONTROL

A. Special Inspections: Engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Inspections:
   1. As noted in the structural general notes.

END OF SECTION 032000

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SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.

B. Related Requirements:
1. Section 031000 "Concrete Forming and Accessories" for form-facing materials, form liners, insulating concrete forms, and waterstops.
2. Section 032000 "Concrete Reinforcing" for steel reinforcing bars and welded-wire reinforcement.
3. Section 312000 "Earth Moving" for drainage fill under slabs-on-ground.

1.2 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, and other pozzolans materials subject to compliance with requirements.

B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.3 ACTION SUBMITTALS

A. Product Data: For each of the following.
1. Admixtures:
2. Vapor retarders.
3. Curing materials.
4. Joint fillers.

B. Design Mixtures: For each concrete mixture, include the following:
1. Mixture identification.
2. Minimum 28-day compressive strength.
3. Maximum w/cm.
4. Slump limit.
5. Air content.
6. Nominal maximum aggregate size.

C. Shop Drawings:
1. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
a. Location of construction joints is subject to approval of the Architect.

1.4 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each of the following, signed by manufacturers:
1. Cementitious materials.

2. Admixtures.
3. Curing compounds.
4. Vapor retarders.
5. Joint-filler strips.

B. Material Test Reports: For the following, from a qualified testing agency:
1. Aggregates.
2. Admixtures:

C. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94 requirements for production facilities and equipment.
1. Manufacturer certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with ASTM C94 and ACI 301.

1.7 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 301 and ACI 306.1.

B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301 unless modified by requirements in the Contract Documents.

2.2 CONCRETE MATERIALS

A. Cementitious Materials:
1. Portland Cement: ASTM C150, Type I/II, gray.
2. Fly Ash: ASTM C618, Class C or F.
3. Slag Cement: ASTM C989, Grade 100 or 120.

B. Normal-Weight Aggregates: ASTM C33, coarse aggregate or better, graded. Provide aggregates from a single source.
1. Maximum Coarse-Aggregate Size: as noted in the structural drawings.

C. Air-Entraining Admixture: ASTM C260.

D. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do 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 C494, Type A.
2. Retarding Admixture: ASTM C494, Type B.
3. Water-Reducing and -Retarding Admixture: ASTM C494, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C494, Type F.
5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494, Type G.
6. Plasticizing and Retarding Admixture: ASTM C1017, Type II.

E. Water and Water Used to Make Ice: ASTM C94, potable.

2.3 VAPOR RETARDERS

A. Sheet Vapor Retarder, Class A: ASTM E1745, Class A; not less than 10 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive tape.

2.4 CURING MATERIALS

In accordance with the structural general notes.

2.5 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber.

2.6 CONCRETE MIXTURES, GENERAL

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, in accordance with ACI 301.
   1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
   1. Fly Ash or Other Pozzolans: 25 percent by mass.
   2. Slag Cement: 50 percent by mass.
   3. Total of Fly Ash or Other Pozzolans, Slag Cement: 50 percent by mass, with fly ash or pozzolans not exceeding 25 percent by mass.
   4. Total of Fly Ash or Other Pozzolans: 35 percent by mass with fly ash or pozzolans not exceeding 25 percent by mass.

C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.
   1. Use water-reducing, high-range water-reducing, or plasticizing 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 and concrete with a w/cm below 0.50.

2.7 CONCRETE MIXTURES

In accordance with the structural drawings.

2.8 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94 and furnish batch ticket information.

PART 3 - EXECUTION

3.1 INSTALLATION OF 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.
   1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.
   3. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3.2 INSTALLATION OF VAPOR RETARDER

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.
   1. Install vapor retarder with longest dimension parallel with direction of concrete pour.
   2. Face laps away from exposed direction of concrete pour.
   3. Lap vapor retarder over footings not less than 6 inches, sealing vapor retarder to concrete.
   4. Lap joints 6 inches and seal with manufacturer's recommended tape.
   5. Seal penetrations in accordance with vapor retarder manufacturer's instructions.
   6. Protect vapor retarder during placement of reinforcement and concrete.

3.3 JOINTS

A. Construct joints true to line, with faces perpendicular to surface plane of concrete.

B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.
   1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Architect.

C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:
   1. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.

D. Isolation Joints in Slabs-on-Ground: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls and other locations, as indicated.
   1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated on Drawings.

2. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Dowel Plates: Install dowel plates at joints as indicated on Drawings.

3.4 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.
1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.

B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.

C. Before test sampling and placing concrete, water may be added at Project site, if approved by the Architect in writing, subject to limitations of ACI 301, but not to exceed the amount indicated on the concrete delivery ticket.
1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.
1. If a section cannot be placed continuously, provide construction joints as indicated.
2. Deposit concrete to avoid segregation.
3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.
    a. Do not use vibrators to transport concrete inside forms.
    b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.
    c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
    d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Do not place concrete floors and slabs in a checkerboard sequence.
2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
3. Maintain reinforcement in position on chairs during concrete placement.
4. Screed slab surfaces with a straightedge and strike off to correct elevations.
5. Level concrete, cut high areas, and fill low areas.
6. Slope surfaces uniformly to drains where required.
7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
8. Do not further disturb slab surfaces before starting finishing operations.

3.5 FINISHING FORMED SURFACES

A. As-Cast Surface Finishes:
   1. ACI 301 Surface Finish SF-1.0: As-cast concrete texture imparted by form-facing material.
      a. Patch voids larger than 1-1/2 inches wide or 1/2 inch deep.
      b. Remove projections larger than 1 inch.
      c. Tie holes do not require patching.
      d. Surface Tolerance: ACI 117 Class D.
      e. Apply to concrete surfaces not exposed to public view.
   2. ACI 301 Surface Finish SF-2.0: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams.
      a. Patch voids larger than 3/4 inch wide or 1/2 inch deep.
      b. Remove projections larger than 1/4 inch.
      c. Patch tie holes.
      d. Surface Tolerance: ACI 117 Class B.
      e. Locations: 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.

B. Related Unformed Surfaces:
   1. At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a color and texture matching adjacent formed surfaces.
   2. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.6 FINISHING FLOORS AND SLABS

A. Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish:
   1. While still plastic, texture concrete surface that has been screeded and bull-floated or darbied.
   2. Use stiff brushes, brooms, or rakes to produce a profile depth of 1/4 inch in one direction.
   3. Apply scratch finish to surfaces to receive mortar setting beds for bonded cementitious floor finishes

C. Float Finish:
   1. When bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operation of specific float apparatus, consolidate concrete surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats.
   2. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 tolerances for conventional concrete.
   3. Apply float finish to surfaces to receive trowel finish.

D. Trowel Finish:
   1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
   2. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.
   3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
   4. Do not add water to concrete surface.

5. Do not apply hard-troweled finish to concrete, which has a total air content greater than 3 percent.
6. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system
7. Finish and measure surface, so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4 inch.

E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and locations indicated on Drawings.
1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.
2. Coordinate required final finish with Architect before application.

3.7 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

A. Filling In:
1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
2. Mix, place, and cure concrete, as specified, to blend with in-place construction.
3. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations:
1. Coordinate sizes and locations of concrete bases with actual equipment provided.
2. Construct concrete bases as indicated on Drawings, and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated on Drawings, or unless required for seismic anchor support.
3. Minimum Compressive Strength: 4500 psi at 28 days.
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 substrate.
6. Prior to pouring concrete, place and secure anchorage devices.
    a. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
    b. Cast anchor-bolt insert into bases.
    c. Install anchor bolts to elevations required for proper attachment to supported equipment.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items.
1. Cast-in inserts and accessories, as shown on Drawings.
2. Screed, tamp, and trowel finish concrete surfaces.

3.8 CONCRETE CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

1. Comply with ACI 301 and ACI 306.1 for cold weather protection during curing.
2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.

B. Curing Formed Surfaces: Comply with ACI 308.1 as follows:
1. In accordance with the structural general notes.

C. Curing Unformed Surfaces: Comply with ACI 308.1 as follows:
1. Begin curing immediately after finishing concrete.
2. In accordance with the structural general notes.

3.9 TOLERANCES

A. Conform to ACI 117.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
1. Testing agency to be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31.
2. Testing agency to immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
3. Testing agency shall report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.
a. Test reports to include reporting requirements of ASTM C31, ASTM C39, and ACI 301, including the following as applicable to each test and inspection:
1) Project name.
2) Name of testing agency.
3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
4) Name of concrete manufacturer.
5) Date and time of inspection, sampling, and field testing.
6) Date and time of concrete placement.
7) Location in Work of concrete represented by samples.
8) Date and time sample was obtained.
9) Truck and batch ticket numbers.
10) Design compressive strength at 28 days.
11) Concrete mixture designation, proportions, and materials.
12) Field test results.
13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.
14) Type of fracture and compressive break strengths at seven days and 28 days.

B. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.

C. Inspections:
1. Verification of use of required design mixture.

2. Concrete placement, including conveying and depositing.
3. Curing procedures and maintenance of curing temperature.
4. Batch Plant Inspections: On a random basis, as determined by Architect.

D. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172 shall be performed in accordance with the following requirements:
   1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
      a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing to be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
   2. Slump: ASTM C143:
      a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
      b. Perform additional tests when concrete consistency appears to change.
   3. Air Content: ASTM C231 pressure method, for normal-weight concrete;
      a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
   4. Concrete Temperature: ASTM C1064:
      a. One test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
   5. Compression Test Specimens: ASTM C31:
      a. Cast and laboratory cure two sets of two cylinder specimens for each composite sample.
      b. Cast, initial cure, and field cure two sets of two standard cylinder specimens for each composite sample.
   6. Compressive-Strength Tests: ASTM C39.
      a. Test one set of two laboratory-cured specimens at seven days and one set of two specimens at 28 days.
      b. Test one set of two field-cured specimens at seven days and one set of two specimens at 28 days.
      c. A compressive-strength test to be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
   7. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor to evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
   8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi if specified compressive strength is 5000 psi, or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi.
   9. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
   10. Additional Tests:
      a. Testing and inspecting agency to make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.

b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42 or by other methods as directed by Architect.
   1) Acceptance criteria for concrete strength to be in accordance with ACI 301, Section 1.6.6.3.

11. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
12. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

E. Measure floor and slab flatness and levelness in accordance with ASTM E1155 within 48 hours of completion of floor finishing and promptly report test results to Architect.

3.11 PROTECTION

A. Protect concrete surfaces as follows:
   1. Protect from petroleum stains.
   2. Diaper hydraulic equipment used over concrete surfaces.
   3. Prohibit vehicles from interior concrete slabs.
   4. Prohibit use of pipe-cutting machinery over concrete surfaces.
   5. Prohibit placement of steel items on concrete surfaces.
   6. Prohibit use of acids or acidic detergents over concrete surfaces.
   7. Protect concrete surfaces scheduled to receive surface hardener or polished concrete finish using Floor Slab Protective Covering.

END OF SECTION 033000

SECTION 03 3511 - CONCRETE FLOOR FINISHES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surface treatments.

B. Liquid densifiers and hardeners.

C. Dry shake hardeners.

D. Low-gloss sealer.

E. Slip-resistant coatings.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
1. Coordinate the work with concrete floor placement and concrete floor curing.

1.3 ACTION SUBMITTALS

A. Product Data: Manufacturer's published data on each finishing product, including information on compatibility of different products and limitations.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturer's Instructions: Indicate manufacturer's installation instructions for preparation of substrate, application of finishing products, and requirements for protection of finished surface.

B. Manufacturer's qualification statement.

C. Installer's qualification statement.

D. Specimen warranty.

E. Field quality report.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: Provide data on maintenance and renewal of applied finishes.

B. Executed warranty.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least 3 years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least 3 years of documented experience and approved by manufacturer.

1.7 MOCK-UPS

A. For coatings, construct mock-up area under conditions similar to those that will exist during application, with coatings applied.
   1. Use manufacturer's application instructions. Install with the same equipment, recommended surface preparation and application procedures planned for general application. Allow mockup to cure or dry 3 to 7 days before inspection.

B. Construct mock-ups of each exposed concrete floor finish indicated on drawings, 10 feet square.

C. Locate where directed.

D. Mock-up may remain as part of the work.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's sealed packaging, including application instructions.

1.9 FIELD CONDITIONS

A. Maintain light level equivalent to a minimum 200 W light source at 8 feet above the floor surface over each 20 foot square area of floor being finished.

B. Do not finish floors until interior heating system is operational.

C. Maintain ambient temperature of 50 degrees F minimum.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Slip Resistance: Minimum Dynamic Coefficient of Friction (DCOF) of 0.42 per ASN A326.3.

2.2 SURFACE TREATMENTS

A. Troweling Aid, Densifier and Curing Agent: Liquid reactive colloidal silica-based topical treatment, spray-applied to wet concrete and floated or troweled into the surface.
   1. Product:
      a. Adhesives Technology Corp; SlabArmor Starter and Closer.
      b. Penetron; Peneseal FH-PS.
      c. or comparable product submitted for Architect's review.

2.3 DENSIFIERS AND HARDENERS

A. Liquid Densifier and Hardener: Penetrating chemical compound that reacts with concrete, filling the pores, hardening, and dustproofing. Contractor to select most appropriate system to suit type of cement blend in concrete.
   1. Composition: Lithium silicate.
      a. Products:
         1) Adhesives Technology Corporation; CONVERGENT Pentra-Sil (244+)
         2) Concrete Sealers USA; PS103.
         3) Kaufman Products Inc; SureHard LS.
         4) PROSOCO, Inc; Consolideck LS.
         5) W. R. Meadows, Inc; Liqui-Hard Ultra.
   2. Composition: Sodium silicate.
      a. Products:
         1) Curecrete Distribution, Inc; Ashford Formula.
         2) Euclid Chemical Company; EUCOSIL.
         3) Kaufman Products Inc; SureHard.
         4) W. R. Meadows, Inc; Liqui-Hard.
   3. Composition: Hybrid silicate/Silicate Blend.
      a. Products:
         1) PROSOCO, Inc; Consolideck BD1
         2) or comparable product submitted for Architect's review.

B. Dry Shake Hardener: Premixed dry powder for spreading on and working into concrete surface prior to set.
   1. Composition: Metallic, aluminum oxide (emery) aggregate.
      a. Products:
         1) Dayton Superior; Emery Tuff.
         2) L&M Construction Chemicals, Inc; EMERYPLATE FF.
         3) Sika USA; EmeriCrete SH.
         4) or comparable product submitted for Architect's review.

2.4 COATINGS

A. Low-Gloss or Matte Clear Coating: Transparent, nonyellowing, acrylic-polymer-based coating.
   1. Composition: Water-based urethane.
      a. Nonvolatile Content: 20 percent, minimum, when measured by volume.
      b. Basis-of-Design Product: Concrete Sealers USA; TS210 or provide one of the following comparable products:
         1) EZChem USA; Water Based Urethane.
         2) Foundation Armor; UTX60 - Matte.

B. Slip-Resistant Coating:
   1. Plastic Aggregate: Finely ground polymer for addition to coatings for slip resistance.
      a. Products:
         1) Kaufman Products, Inc; SureGrip.
         2) Euclid Chemical Company; EUCO GRIP.
         3) SpecChem, LLC; Surface Grip.

4) Or comparable product recommended by floor coating manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that floor surfaces are acceptable to receive the work of this section.

B. Verify that flaws in concrete have been patched and joints filled with methods and materials suitable for further finishes.

3.2 GENERAL

A. Apply materials in accordance with manufacturer's instructions.

3.3 COATING APPLICATION

A. Verify that surface is free of previous coatings, sealers, curing compounds, water repellents, laitance, efflorescence, fats, oils, grease, wax, soluble salts, residues from cleaning agents, and other impediments to adhesion.

B. Verify that water vapor emission from concrete and relative humidity in concrete are within limits established by coating manufacturer.

C. Protect adjacent non-coated areas from drips, overflow, and overspray; immediately remove excess material.

D. Apply coatings in accordance with manufacturer's instructions, matching approved mock-ups for color, special effects, sealing and workmanship.

3.4 PROTECTION

A. Protect installed coatings from subsequent construction operations.

B. Do not permit traffic over unprotected floor surface.

3.5 FIELD QUALITY CONTROL

A. Defective Concrete: Repair or replace concrete not complying with required lines, details, dimensions, tolerances, or specified requirements at no additional cost to Owner.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

C. Verify compliance of slip resistance to comply with specified slip-resistance rating.
1. Perform dynamic testing per ASTM E303.
2. Perform testing at 3 locations; perform one test each on stairs and landing (2) at Training Tower and at mechanical room (1).

D. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

E. Prepare test and inspection reports.

3.6 APPLICATIONS

A. Unless otherwise indicated on drawings, finish concrete floors using troweling aid, densifier, and curing agent.

B. Densifier and Hardener:
   1. Use at the following locations: Typical Concrete Floors.

C. Dry Shake Hardener:
   1. Use at the following locations: At Apparatus Bays.

D. Low-Gloss Clear Coating:
   1. Use at the following locations: at locations indicated to receive SC-1.

E. Slip-Resistant Coating: Finely-ground aggregates added to coatings.
   1. Use at the following locations: at locations indicated to receive SC-1.

END OF SECTION 03 3511

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SECTION 04 0511 - MASONRY MORTARING AND GROUTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Mortar for masonry.

B. Grout for masonry.

1.2 ACTION SUBMITTALS

A. Product Data:
1. For each type of product.
2. For each type of mortar and grout, include description of design mix and indicate whether the Proportion or Property specification of ASTM C270 is to be used. Also include required environmental conditions and admixture limitations.

B. Samples: Submit two samples of each pigmented and color-aggregate mortar, illustrating mortar color and color range. Make samples using same sand and mortar ingredients to be used on Project.

1.3 INFORMATIONAL SUBMITTALS

A. Reports: Submit reports on mortar indicating compliance of mortar to property requirements of ASTM C270 and test and evaluation reports per ASTM C780.

B. Reports: Submit reports on grout indicating compliance of component grout materials to requirements of ASTM C476 and test and evaluation reports to requirements of ASTM C1019.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Manufacturer's Installation Instructions: Submit packaged dry mortar manufacturer's installation instructions.

E. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to TMS 602/ACI 530.1/ASCE 6.

F. Cold-Weather and Hot Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements. It is the Contractors responsibility to determine sequence of Work and project schedule. As such it is the Contractors responsibility to provide within their work scope cold weather and/or hot weather procedures as required to complete the Work within the approved schedule.

1.4 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.
1. Maintain one copy of each document on project site.

1.5 PRECONSTRUCTION TESTING

A. Testing will be conducted by an independent test agency, in accordance with provisions of Section 01 4000 - Quality Requirements.

B. Mortar Mixes: Test mortars prebatched by weight in accordance with ASTM C780 recommendations for preconstruction testing.
   1. Test results will be used to establish optimum mortar proportions and establish quality control values for construction testing.

C. Grout Mixes: Test grout batches in accordance with ASTM C1019 procedures.
   1. Test results will be used to establish optimum grout proportions and establish quality control values for construction testing.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store cementitious materials on elevated platforms, under cover, and in dry location. Do not use cementitious materials that have become damp or wet.

B. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

C. Deliver preblended, dry mortar mix in moisture resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.

D. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

1.7 FIELD CONDITIONS

A. Cold and Hot Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.
   1. Do not use frozen materials or materials mixed or coated with ice of frost.
   2. Do not build on frozen substrates.
   3. Cold weather cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less then seven days after completing cleaning.

PART 2 PRODUCTS

2.1 MORTAR AND GROUT APPLICATIONS

A. Use factory premixed packaged dry materials for mortar and grout, with addition of water at project site.
   1. Exception: If a specified mix design is not available in a premixed dry package, provide equivalent mix design using standard non-premixed materials.

B. Mortar Color for Hidden Masonry Applications: Natural gray unless otherwise indicated.

C. Mortar Color for Exposed Masonry Applications: Use pigmented mortar to produce color required.

D. Mortar Mix Designs: ASTM C270, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
   1. Masonry below grade and in contact with earth: Type S.
   2. Exterior Masonry Veneer: Type N.
   3. Exterior Cavity Walls: Type S mortar with Type N pointing mortar.
   4. Exterior, Loadbearing Masonry: Type N.
   5. Exterior, Non-loadbearing Masonry: Type N.
   6. Interior, Loadbearing Masonry: Type N.
   7. Interior, Non-loadbearing Masonry: Type N; Type O may be used

E. Grout Mix Designs:
   1. Bond Beams and Lintels: 3,000 psi strength at 28 days; 8-10 inches slump; provide premixed type in accordance with ASTM C 94/C 94M.
      a. Fine grout for spaces with smallest horizontal dimension of 2 inches or less.
      b. Coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

2.2 MATERIALS

A. Packaged Dry Material for Mortar for Unit Masonry: Premixed masonry cement and mason's sand; complying with ASTM C1714/C1714M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
   1. Type: Types as scheduled in this section.
   2. Exposed Mortar Color: Mineral pigments added as required to produce approved color sample.
   3. Water repellent mortar for use with water repellent masonry units.
   4. Basis-of-Design Product:
      a. SPEC MIX, LLC; SPEC MIX Masonry Cement & Sand mortar or comparable product by one of the following:
         1) Lafarge North America.
         2) QUIKRETE.
         3) or submit comparable product for Architect's review.

B. Packaged Dry Material for Grout for Masonry: Premixed cementitious materials and dried aggregates; capable of producing grout of the specified strength in accordance with ASTM C476 with the addition of water only.
   1. Type: Use grout of type indicated, or if not indicated, of type (fine or course) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
   2. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C143/C143M.
   3. Manufacturers: Provide products complying with requirements including, but are not limited to, the following:
      a. Amerimix.
      b. Lafarge North America.
      c. Spec Mix, LL
      d. QUIKRETE.

C. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979/C979M. Use only pigments with a record of satisfactory performance in masonry mortar.

1. Color(s): As indicated on drawings.
2. Manufacturers: Provide products complying with requirements, from one of the following manufacturers.
   a. Davis Colors; True Tone Mortar Colors.
   b. Lambert Corporation; Mortar Color.
   c. Solomon Colors; SGS Mortar Colors.

D. Water: Clean and potable.

E. Admixtures
1. Cold Weather Accelerating Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C494/C494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
2. Bonding Agent: Epoxy type.
3. Integral Water Repellent Admixture: Polymeric liquid admixture added to mortar at the time of manufacture.
   a. Performance of Mortar with Integral Water Repellent:
      1) Water Permeance: When tested per ASTM E514/E514M and for a minimum of 72 hours:
         a) No water visible on back of wall above flashing at the end of 24 hours.
         b) No flow of water from flashing equal to or greater than 0.032 gallons per hour at the end of 24 hours.
         c) No more than 25 percent of wall area above flashing visibly damp at end of test.
      2) Flexural Bond Strength: ASTM C1072; minimum 10 percent increase.
      3) Compressive Strength: ASTM C1314; maximum 5 percent decrease.
   b. Use only in combination with masonry units produced with integral water repellent admixture.
   c. Product: Subject to compliance with requirements, provide one of the following or comparable product by another manufacturer.
      1) ACM Chemistries; RainBloc for Mortar.
      2) Master Builders Solutions; MasterPel 240MA.
      3) GCP Applied Technologies.; Dry-Block Mortar.

2.3 MORTAR MIXING

A. Thoroughly mix mortar ingredients in accordance with ASTM C270 and in quantities needed for immediate use.

B. Maintain sand uniformly damp immediately before the mixing process.

C. Colored Mortar: Proportion selected pigments and other ingredients to match Architect's sample, without exceeding manufacturer's recommended pigment-to-cement ratio; mix in accordance with manufacturer's instructions, uniform in coloration.

D. Add admixtures in accordance with manufacturer's instructions; mix uniformly.

E. Do not use anti-freeze compounds to lower the freezing point of mortar.

F. If water is lost by evaporation, re-temper only within two hours of mixing.

2.4 GROUT MIXING

A. Mix grout in accordance with ASTM C94/C94M.

B. Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C476 for fine and coarse grout.

C. Add admixtures in accordance with manufacturer's instructions; mix uniformly.

D. Do not use anti-freeze compounds to lower the freezing point of grout.

PART 3 EXECUTION

3.1 PREPARATION

A. Apply bonding agent to existing concrete surfaces.

B. Plug clean-out holes for grouted masonry with brick masonry units. Brace masonry to resist wet grout pressure.

3.2 INSTALLATION

A. Install mortar and grout to requirements of section(s) in which masonry is specified.

B. Do not install grout in lifts greater than 16 inches without consolidating grout by rodding.

3.3 GROUTING

A. Perform all grouting by means of low-lift technique. Do not employ high-lift grouting.

B. Low-Lift Grouting:
1. Limit height of pours to 60 inches.
2. Limit height of masonry to 16 inches above each pour.
3. Pour grout only after vertical reinforcing is in place; place horizontal reinforcing as grout is poured. Prevent displacement of bars as grout is poured.
4. Place grout for each pour continuously and consolidate immediately; do not interrupt pours for more than 1-1/2 hours.

3.4 FIELD QUALITY CONTROL

A. Testing and Inspecting: Engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense. Perform field tests, in accordance with provisions of Section 01 4000 - Quality Requirements.

B. Inspections: Special inspections according to Level C in TMS 402/ACI 530/ASCE 5.
1. Begin masonry construction only after inspectors have verified proportions of prepared mortar.
2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
3. Place grout only after inspectors have verified proportions of prepared

C. Test and evaluate mortar in accordance with ASTM C780 procedures.
   1. Test Prior to Construction: One set of tests.
   2. Test Frequency: Once set of tests for each 5000 s.f. of wall area or portion thereof.
   3. Test with same frequency as specified for masonry units.

D. Test and evaluate grout in accordance with ASTM C1019 procedures.
   1. Test with same frequency as specified for masonry units.

END OF SECTION 04 0511

SECTION 04 2000 - UNIT MASONRY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Concrete block.

B. Clay facing brick.

C. Mortar and grout.

D. Reinforcement and anchorage.

E. Flashings.

F. Lintels.

G. Accessories.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all relevant installers.

1.3 ACTION SUBMITTALS

A. Product Data: Provide data for each product type including, but not limited to, masonry units, fabricated wire reinforcement, mortar, and masonry accessories.

B. Shop Drawings: Indicate pertinent dimensions, materials, anchorage, size and type of fasteners, and accessories for brickwork support system.
1. Masonry Units: Indicate sizes (dimensions), profiles, coursing, and locations of special shapes.
2. Indicate anchorage, size and type of fasteners
3. Reinforcing Steel: Detail bending, laps, lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315.
4. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
5. Indicate locations of expansion and control joints on elevations where elevation of walls is provided within Contract Documents. Otherwise show locations of joints on plans.

C. Delegated Design Submittals: For masonry anchors and ties, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Samples: Submit four samples of decorative block units to illustrate color, texture, and extremes of color range.
1. Initial Samples:
   a. Masonry Units: Submit, in the form of small scale samples, two samples of decorative block units for initial selection verification.

b. Colored Mortar: Submit two color sample selection kits.
c. Weep Vents: Submit color selection kit/ring.

2. Final Sample Verification: provide Sample panel per Mockups article.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturer's Certificate:
1. Certify that masonry units meet or exceed specified requirements.
2. Certify that water repellent admixture manufacturer has certified masonry unit manufacturer as an approved user of water repellent admixture in the manufacture of concrete block.
3. Cementitious Materials: Include name of manufacturer, brand name, and type.
4. Mortar admixtures.
5. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
6. Grout mixes. Include description of type and proportions of ingredients.
7. Reinforcing bars.
8. Joint reinforcement.
9. Anchors, ties, and metal accessories.

B. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91/C 91M for air content.
2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirements.

C. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to TMS 602/ACI 530.1/ASCE 6.

D. Cold-Weather and Hot Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements. It is the Contractors responsibility to determine sequence of Work and project schedule. As such it is the Contractors responsibility to provide within their work scope cold weather and/or hot weather procedures as required to complete the Work within the approved schedule.

E. Test Reports: Concrete masonry manufacturer's test reports for units with integral water repellent admixture.

F. Designer's Qualification Statement.

G. Manufacturer's Qualification Statement.

H. Installer's Qualification Statement.

1.5 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.
1. Maintain one copy of each document on project site.

B. Fire Rated Assemblies: Comply with requirements for fire resistance rated assembly designs indicated within Contract Documents.

C. Designer Qualifications: Perform design under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

D. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum three years of documented experience.

E. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

F. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.

1.6 MOCK-UPS AND SAMPLE PANELS

A. Sample Panels: Build sample panels to verify selections made under Sample submittals and to demonstrate aesthetic effects.
1. Build panels for each exposed unit masonry construction in sizes approximately 72 inches square by full thickness.
2. Build panels facing south.
3. Where masonry is to match existing, build panels adjacent and parallel to existing surface being matched.

B. Mock-up Assemblies: Build Mock-up assemblies to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
1. Build mock-up assemblies for typical exterior and interior walls in sizes approximately 72 inches wide by 72 inches high by full thickness of wall assembly, including face and back up wythes and accessories.
    a. Include sealant- filled joint at least 16 inches long in each mock-up.
    b. Include preformed expansion joint splitting entire wall assembly mock-up.
    c. Include lower corner of window opening at upper corner of exterior wall mock-up. Make opening approximately 12 inches wide by 16 inches high.
    d. Include through-wall flashing installed for 24-inch length in corner of exterior wall mock-up assembly, with a 12 inch length of flashing left exposed to view (omit masonry above half of flashing.)

C. Protect accepted sample panels and mock-up assemblies with weather resistant membrane.

D. Approval of sample panels and mock-up assemblies is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities to be specifically approved by Architect
1. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless Architect specifically approves such deviations in writing.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.
1. Store on elevated platform in dry location.
2. Cover units to prevent soiling or becoming wet; If units become wet, dry before installation.

B. Handle and store decorative masonry units in protective cartons or trays. Do not remove from protective packaging until ready for installation.

C. Pre-blended, dry mortar mixes: deliver pre-blended, dry mortar mix in moisture resistant containers. Store pre-blended, dry mortar mix in delivery containers on elevated platforms in dry location or in covered weatherproof dispensing silos.

D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.8 FIELD CONDITIONS

A. Protection of Installed Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
   1. Extend cover minimum of 24 inches down both sides of walls, and hold cover securely in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
   1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over 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 neat wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. 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 unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
   1. Cold Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 4000 "Quality Requirements," to design masonry anchors and ties.

B. Seismic Performance: Masonry to withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7.

2.2 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 602, except as modified by requirements in the Contract Documents.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed work.

C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.
1. Where fire-resistance-rated construction is indicated, units are listed by UL or a qualified testing agency acceptable to authorities having jurisdiction.

2.3 CONCRETE MASONRY UNITS

A. Concrete Block, General: Comply with referenced standards and as follows:
1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on drawings for specific locations.
2. Special Shapes: Provide nonstandard blocks with exposed surfaces matching exposed faces of adjacent units and configured for corners, lintels, headers, jambs, sashes, control joint edges, bonding, and other detailed conditions.
    a. Provide bullnose units for outside corners of units with interior exposed corners unless otherwise indicated.
3. Integral Water Repellent: Provide units with integral water repellent that are visible and are exposed to weather/weathering (exterior units) and direct water contact (interior units). Interior units that are subject to direct water contact are exposed masonry units located within apparatus or vehicle bays, sally ports, areas of detention, kitchens, equipment/utility service areas, janitorial, toilet/shower rooms, locker rooms, storage, and other similar rooms/areas.
    a. Polymeric liquid admixture added to concrete masonry units at time of manufacture.
    b. Performance of Units with Integral Water Repellent:
        1) Water Permeance: When tested per ASTM E514/E514M and for a minimum of 72 hours.
            a) No water visible on back of wall above flashing at the end of 24 hours.
            b) No flow of water from flashing equal to or greater than 0.032 gallons per hour at the end of 24 hours.
            c) No more than 25 percent of wall area above flashing visibly damp at end of test.
        2) Flexural Bond Strength: ASTM C1072; minimum 10 percent increase.
        3) Compressive Strength: ASTM C1314; maximum 5 percent decrease.
    c. Use only in combination with mortar that also has integral water repellent admixture.
    d. Use water repellent admixtures for masonry units and mortar by a single manufacturer.
4. Load-Bearing Units: ASTM C90, normal weight.
    a. Unit Compressive Strength: Provide units with minimum average net compressive strength of 2800 psi.
5. Nonloadbearing Units: ASTM C129, normal weight.
    a. Unit Compressive Strength: Provide units with minimum average net compressive strength of 2150 psi.
6. Common/Standard Block Units; for hidden or painted installations only, unless noted otherwise.
    a. Smooth face units.
    b. Color: Gray

c. Painted Common Block: Where indicated in drawings.
1) Joints: Flush
2) Paint Color: As indicated on drawings.

7. Decorative Block Units:
a. Split Face Units; EF-2
1) Basis of Design Product: Subject to compliance with requirements, provide basis of design product indicated on Exterior Finish Key Schedule or one of the other products listed.
a) York Building Products; Split Face.
b) Echelon Standard Masonry; Split Face.
c) Westbrook Concrete Block; Split Face.
2) Bond/Pattern: Running.
3) Joint:Concave
4) Color: As indicated on drawings.
b. Ground Face Units; Standard Unit; EF-3
1) Basis of Design Product: Subject to compliance with requirements, provide basis of design product indicated on Exterior Finish Key Schedule or one of the other products listed.
a) York Building Products; Gemstone.
b) Echelon Masonry, Trenwyth Architectural Masonry; Trendstone.
c) Westbrook Concrete Block; Ground Face.
2) Bond/Pattern: Running.
3) Joint:Concave
4) Color: As indicated on drawings

2.4 BRICK UNITS

A. EF-1, Facing Brick: ASTM C216, Type FBX, Grade SW.
1. Basis of Design Product: Subject to compliance with requirements, provide basis of design product indicated on Exterior Finish Key Schedule or comparable product by another manufacturer.
2. Bond/Pattern: Running.
3. Joint:Concave
4. Color: As indicated on drawings.
5. Actual size: Modular: 3-5/8 x 2-1/4 x 7-5/8 inches.
6. Special shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.
7. Compressive strength: As indicated on drawings, measured in accordance with ASTM C67/C67M.

2.5 MORTAR AND GROUT MATERIALS

A. Mortar and Grout: As specified in Section 04 0511.

2.6 REINFORCEMENT AND ANCHORAGE

A. Reinforcement
1. Uncoated Reinforcing Steel: ASTM A615/A615M or ASTM A996/A996M, Grade 60 (60,000 psi).
2. Masonry Joint Reinforcement, General: ASTM A951/A951M.
a. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.

b. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.
c. Use ladder type joint reinforcement where vertical reinforcement is involved and truss type elsewhere, unless otherwise indicated.

3. Single Wythe Joint Reinforcement: ASTM A951/A951M.
   a. Type: Truss or ladder.
   b. Interior Wall Material: ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M Class 3.
   c. Exterior Wall Material: ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to ASTM A153/A153M Class B.
   d. Size: 0.1483 inch side rods with 0.1875 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.
4. Multiple Wythe Joint Reinforcement with Mortar Joint Between Wythes: ASTM A951/A951M.
   a. Type: Truss.
   b. Interior Wall Material: ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M Class 3.
   c. Exterior Wall Material: ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to ASTM A153/A153M Class B.
   d. Size: 0.1875 inch side rods with 0.1875 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.
5. Adjustable Multiple Wythe Joint Reinforcement: ASTM A951/A951M.
   a. Type: Truss, with adjustable pintle and eye ties spaced at 16 in on center.
      1) Reinforcement shall have one side rod at each face of masonry shell of backing wythe.
      2) Ties shall not have more than 1/16 inch play in any horizontal direction.
      3) Ties shall be sized to extend minimum of half facing wythe but not extend more than 5/8 inch from face of facing wythe.
   b. Material: stainless steel complying with ASTM A580/A580M Type 304.
   c. Size: 0.1875 inch side rods with 0.1875 inch cross rods and adjustable components of 0.1875 inchwire, width of components as required to provide not less than 5/8 inch of mortar coverage from each masonry face.
   d. Vertical adjustment: Not more than 1 1/4 inches.
   e. Seismic Feature: Provide lip, hook, or clip on extended leg of wall ties to engage or enclose not less than one continuous horizontal joint reinforcement wire of 0.1483 inch diameter.
   f. Insulation Clips: Provide clips at tabs or ties designed to secure insulation against outer face of inner wythe of masonry.

B. Ties and Anchors
1. Strap Anchors: Bent steel shapes, 1-1/2 inch width, 0.105 inch thick, 24 inch length, with 1-1/2 inch long, 90 degree bend at each end to form a U or Z shape or with cross pins, hot dip galvanized to ASTM A153/A153M Class B.
2. Partition Top Anchor: 0.105 inch thick metal plate with a 3/8 inch diameter metal rod 6 inches long welded to metal plate and with closed end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot dip galvanized after fabrication.
3. Flexible Anchors: 2-piece anchors that permit differential movement between masonry and building frame, sized to provide not less than 5/8 inch of mortar coverage from masonry face.
   a. Concrete frame: Dovetail anchors of bent steel strap, nominal 1 inch width x 0.024 in thick, with trapezoidal wire ties 0.1875 inch thick, hot dip galvanized to ASTM A 153/A 153M, Class B.

b. Steel frame: Crimped wire anchors for welding to frame, 0.25 inch thick, with trapezoidal wire ties 0.1875 inch thick, hot dip galvanized to ASTM A 153/A 153M, Class B.

4. Masonry Veneer Anchors: Single-Barrel Screw with Double-Pintle Wingnut: Self-drilling single-barrel screw with thermally resistant wingnut head designed to receive double-pintle wire tie. Screw has a smooth barrel the same thickness as insulation with factory installed gasketed washer to seal at face of insulation and sheathing. Provide with seismic tie, clip, and continuous wire in veneer.
   a. Barrel: Stainless steel, AISI Type 304; ASTM A580/A580M.
   b. Screw: Carbon steel; ASTM A510/A510M. Polymer Coating; ASTM C954
   c. Wire: Stainless steel, AISI Type 304; ASTM A580/A580M
   d. Basis of Design Product: Subject to compliance with requirements, provide basis of design product indicated or comparable product by another manufacturer.
      1) Basis of Design: Hohmann & Barnard, Inc.;
         a) Concrete, Masonry, Wood Framing: Thermal Concrete 2-Seal Wing Nut Anchor.
         b) Metal Framing: Thermal 2-Seal Wing Nut Anchor.
         c) Pintle: Mighty-Lok Hook.

2.7 FLASHINGS

A. Application: Unless otherwise indicated, use the following:
   1. Where flashing is indicated to receive counterflashing, use metal flashing.
   2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
   3. Where flashing is partly exposed and is indicated to terminate at the wall face, use metal flashing or flexible flashing with metal drip edge.
   4. Where flashing is fully concealed, use flexible flashing.

B. Metal Flashing: Provide metal flashing complying with 07 6200 - Sheet Metal Flashing and Trim and as follows:
   1. Stainless Steel Flashing: ASTM A666/A666M, Type 304, soft temper; 26 gauge, 0.0187 inch thick; finish 2B to 2D.
   2. Fabricate continuous flashing in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing.
   3. Fabricate through wall metal flashing embedded in masonry from stainless steel, with ribs at 3 inch intervals along length of flashing to provide an integral mortar bond.
   4. Fabricate through wall flashing with snap lock receiver on exterior face where indicated to receive counterflashing.
   5. Fabricate through wall flashing with drip edge where indicated. Fabricate by extending flashing 1/2 inch out form wall, with outer edge bent down 30 degrees and hemmed.
   6. Fabricate metal expansion joint strips from stainless steel to shapes indicated.
   7. Solder metal items at corners.
   8. Prefabricated Metal Flashing: Sawtooth fabricated 16 oz/sq ft stainless steel (type 304) flashing for thru-wall conditions.
      a. Manufacturers: Provide products complying with requirements, from one of the following manufacturers.
         1) Cheney Flashing Company.
         2) Hohmann & Barnard, Inc.
         3) WIRE-BOND.

C. Flexible Flashing

1. Combination Non-Asphaltic Flashing Materials - Stainless Steel:
    a. Stainless Steel/Polymer Fabric Drainage Plane Flashing: ASTM A240/A240M; 2 mil type 304 stainless steel sheet bonded between one sheet of polymer fabric and one sheet of non-woven drainage material.
        1) Basis of Design Product: Subject to compliance with requirements, provide basis of design product indicated or comparable product by another manufacturer.
            a) Basis of Design: York Flashings; Flash-Vent SS.

D. Factory-Fabricated Flashing Corners and End Dams: Stainless steel.
1. Manufacturers: Provide products complying with requirements, from one of the following manufacturers.
    a. 3GEN Masonry Products.
    b. Hohmann & Barnard, Inc.
    c. Mortar Net Solutions.
    d. WIRE-BOND.
    e. York Flashings.

E. Flashing Sealant/Adhesives: Silicone, polyurethane, or silyl-terminated polyether/polyurethane or other type required or recommended by flashing manufacturer; type capable of adhering to type of flashing used.

F. Termination Bars: Stainless steel; compatible with membrane and adhesives.

G. Drip Edge: Stainless steel; angled drip with hemmed edge; compatible with membrane and adhesives.

H. Lap Sealants and Tapes: As recommended by flashing manufacturer; compatible with membrane and adhesives.

2.8 ACCESSORIES

A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints; ASTM D2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall.
1. Manufacturers: Provide products complying with requirements, from one of the following manufacturers.
    a. Blok-Lok Limited.
    b. Hohmann & Barnard, Inc.
    c. WIRE-BOND.

B. Joint Filler: Closed cell polyurethane; oversized 50 percent to joint width; self expanding; in maximum lengths available.
1. Manufacturers: Provide products complying with requirements, from one of the following manufacturers.
    a. Hohmann & Barnard, Inc.
    b. WIRE-BOND.

C. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.

1. Mortar Diverter: Semi-rigid mesh designed for installation at flashing locations.
    a. Locations: Provide continuous cavity drainage material within masonry wall cavity, directly on top of through wall flashing and protecting veneer weeps, at every through wall flashing line, whether specifically indicated in drawings or not; and elsewhere where specifically indicated.
    b. Product: Subject to compliance with requirements, provide one of the following or comparable product by another manufacturer.
        1) 3GEN Masonry Products; Wall Defender.
        2) Advanced Building Products, Inc; Mortar Break DT.
        3) Advanced Building Products Inc; Mortar Break.
        4) Mortar Net Solutions; MortarNet.
        5) WIRE-BOND.
        6) York Flashings.

D. Cavity Vents:
1. One-piece flexible extrusion; full height and width of head joint and depth 1/8 inch less than depth of outer wythe.
2. Type: Extruded propylene with honeycomb design.
3. Color: As selected from manufacturer's full range.
4. Product: Subject to compliance with requirements, provide one of the following or comparable product by another manufacturer.
    a. 3GEN Masonry Products; Cell Vent.
    b. Advanced Building Products, Inc; Weep Vents.
    c. Blok-Lok Limited; Cellvent.
    d. Hohmann & Barnard, Inc; QV Quadro-Vent.
    e. Mortar Net Solutions; CellVent.
    f. Heckmann Building Products, Inc; Cell Vent No. 85.
    g. WIRE-BOND; Cell Vent.

E. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.9 LINTELS

A. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam units matching adjacent units in color texture, texture, and density classification, with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.

4. Verify that substrates are free of substances that would impair mortar bond.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Direct and coordinate placement of metal anchors supplied for installation under other sections.

B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

C. Layout walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less than half size units particularly at corners, jambs, and where possible, at other locations.

3.3 COLD AND HOT WEATHER REQUIREMENTS

A. Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

3.4 PLACING AND BONDING

A. Build chases and recesses to accommodate items specified in this and other Sections.

B. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.

C. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
1. Units shall not be mitered to form corners; provide special shapes where necessary to form corners with finished faces.

D. Exposed Masonry: Mix units to produce uniform blend of colors and textures, unless otherwise indicated.

E. Where existing masonry occurs, match coursing, bonding, color, and texture of existing masonry.

F. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond pattern; do not use units with less than nominal 4 inch horizontal face dimension at corners or jambs.

G. Lay concealed masonry with all units in a wythe in running bond pattern. Bond and interlock each course of each wythe at corners. Do not use units with less than 4 inch horizontal face dimension at corners or jambs.

H. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work. Do not deeply furrow bed joints or slush head joints.

I. Lay hollow masonry units as follows:
1. Bed face shells in mortar and make head joints of depth equal to bed joints.

2. Bed webs in mortar in all courses of piers, columns, and pilasters.
3. Bed webs in mortar in grouted masonry, including starting course on footings.
4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.

J. Where applicable set masonry trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.
1. Clean soiled surfaces with fiber brush an soap powder and rinse thoroughly with clear water.
2. Wet joint surfaces thoroughly before applying mortar.
3. Rake out mortar joints for pointing with sealant.

K. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.

L. Remove excess mortar and mortar smears as work progresses.

M. Remove excess mortar with water repellent admixture promptly. Do not use acids, sandblasting or high pressure cleaning methods.

N. Interlock intersections and external corners, except for units laid in stack bond.

O. Rake out mortar joints at pre-faced CMUs to uniform depth of 1/4 inch and point with epoxy mortar to comply with epoxy mortar manufacturer's written instructions.

P. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

Q. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

R. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

S. Cut mortar joints flush where wall tile is scheduled, other direct applied finishes (other than paint) is scheduled, resilient base is scheduled, cavity insulation vapor barrier adhesive is applied, or other membrane coating is applied.

T. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
1. Isolate masonry partitions from vertical structural framing members with a control joint as indicated.
2. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.
3. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2 inch clearance between end of anchor rod and end of tube. Space anchors 48 inches on center unless otherwise indicated.
4. At fire rated partitions, treat joint between top of partition and underside of structure above to comply with Section 07 8443 - Joint Firestopping.

U. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

3.5 WEEPS/CAVITY VENTS

A. Install weeps in veneer and cavity walls at 24 inches on center horizontally on top of through-wall flashing above shelf angles and lintels and at bottom of walls.

B. Install cavity vents in veneer and cavity walls at 24 inches on center horizontally below shelf angles and lintels and near top of walls.

3.6 CAVITY MORTAR CONTROL

A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

B. For cavity walls, build inner wythe ahead of outer wythe to accommodate accessories.

C. Where air space in cavity wall assemblies is 1-1/2 inches or less, install cavity mortar control panels continuously throughout full height of exterior masonry cavities during construction of exterior wythe, complying with manufacturer's installation instructions.
1. Verify that airspace width is no more than 3/8 inch greater than panel thickness.
2. Hold cavity mortar control panel tight to face wythe.
3. Install horizontally between joint reinforcement.
4. Stagger end joints in adjacent rows.
5. Fit to perimeter construction and penetrations without voids.

D. Where air space in cavity wall assemblies is greater than 1-1/2 inches, install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

3.7 REINFORCEMENT AND ANCHORAGE - GENERAL

A. Embed longitudinal wires of joint reinforcement in mortar joint with at least 5/8 inch mortar cover on each side.
1. Unless otherwise indicated, install horizontal joint reinforcement 16 inches on center.
2. Horizontal joint reinforcement in parapets and foundation walls shall be spaced not more than 8 inches on center.
3. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 24 inches each side of opening.
4. Place continuous joint reinforcement in first and second joint below top of walls.

B. Lap joint reinforcement ends minimum 6 inches.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at wall corners by using prefabricated L-shaped units.

E. Reinforce stack bonded unit joint corners and intersections with strap anchors 16 inches on center.

F. Reinforced Unit Masonry
1. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

a. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
b. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.

2. Placing Reinforcement: Comply with requirements in TMS 602.
3. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
   a. Comply with requirements in TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
   b. Limit height of vertical grout pours to not more than 60 inches.

G. Anchoring Masonry to Structural Steel and Concrete:
1. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:
   a. Provide an open space not less than 2 inches wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
   b. Anchor masonry with anchors embedded in masonry joints and attached to structure.
   c. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.8 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

A. Masonry Back-Up: Embed adjustable multiple wythe joint reinforcement within back-up wythe with pintle and eye veneer anchors (ties) embedded in veneer wythe at maximum 16 inches on center vertically and horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.

B. Masonry or Concrete Back-Up, Thermally Broken: Fasten masonry veneer anchors into masonry back-up and embed pintle and eye veneer anchors (ties) within veneer wythe at maximum 1.77 sq ft of wall surface per anchor. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.

C. Stud Back-Up, Thermally Broken: Secure veneer anchors to stub framed back-up and embed pintle and eye veneer anchors (ties) within veneer wythe at maximum 1.77 sq ft of wall surface per anchor. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.

D. Seismic Reinforcement: Connect veneer anchors with continuous horizontal wire reinforcement before embedding anchors in mortar.

3.9 REINFORCEMENT AND ANCHORAGES - MULTIPLE WYTHE UNIT MASONRY

A. Use multiple wythe joint reinforcement installed in horizontal joints to bond wythes together. Space horizontal joint reinforcement as indicated in REINFORCEMENT AND ANCHORAGES - GENERAL article above.

3.10 MASONRY FLASHINGS

A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
   1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing.
   2. Where flashing is within mortar joint, place through wall flashing on sloping bed of mortar and cover with mortar.
   3. Extend flashings full width at such interruptions and at least 6 inches, minimum, into adjacent masonry; turn up flashing ends at least 1 inch, minimum, to form watertight pan.
   4. Seal lapped ends and penetrations of flashing before covering with mortar.

B. At multiple wythe masonry walls, including cavity walls, extend flashing through outer wythe, turn up a minimum of 8 inches, turn and extend through inner wythe to within 1/2 inch of interior face of exposed masonry wall. Where interior masonry wall is covered with furring or other construction assembly continue flashing through inner wythe and turn up interior face 2 inches.

C. Framed or concrete walls with masonry veneer, terminate flashing up 8 inches minimum on vertical surface of backing:
   1. Install vertical leg of flashing behind water-resistive barrier sheet over backing.
   2. Install vertical leg of flashing over fluid-applied or self-adhered air/vapor barriers over backing or per manufacturer’s directions.
   3. Terminate vertical leg of flashing into reglet in concrete.
   4. Anchor vertical leg of flashing into backing with a termination bar and sealant.
   5. Apply cap bead of sealant on top edge of self-adhered flashing.

D. Install flashing in accordance with manufacturer's instructions and BIA Technical Notes No. 7.

E. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Section 07 9200 "Joint Sealants" for application indicated.

F. Extend metal flashings through exterior face of masonry and terminate in an angled drip with hemmed edge. Install joint sealer below drip edge to prevent moisture migration under flashing.

G. Support flexible flashings across gaps and openings.

H. Extend laminated flashings to within 1/2 inch of exterior face of masonry and adhere to top of stainless steel angled drip with hemmed edge.

I. Lap end joints of flashings at least 6 inches, minimum, and seal watertight with flashing sealant/adhesive.

3.11 LINTELS

A. Install lintels over openings as indicated.

B. Install loose steel lintels or formed-in-place masonry lintels where shown and indicated and where openings of more than 12 inches for brick size units and 24 inches for block size units are shown without structural steel or other supporting lintels. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.
   1. Provide loose steel lintels unless otherwise indicated.

2. Provide formed-in-place masonry lintels for openings in fire rated masonry walls and masonry walls in damp, wet, or exterior locations.

C. Maintain minimum 8 inches of bearing on each side of opening.

3.12 CONTROL AND EXPANSION JOINTS

A. Do not continue horizontal joint reinforcement through control or expansion joints.

B. Do not allow materials to span control joints without provision to allow for in-plane wall or partition movement.

C. Locate control joints and expansion joints per drawings. Where joints are not specifically indicated on drawings locate joints to comply with NCMA TEK 10-02D. Location of control and expansion joints shall be indicated on shop drawings and approved by architect prior to the start of masonry installation.

D. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

E. Size control joints as indicated on drawings; if not indicated, 3/4 inch wide and deep.

F. Form expansion joint as detailed on drawings.

3.13 BUILT-IN WORK

A. As work progresses, build in items as specified in this and other Sections. Fill in solidly with masonry around built-in items.

B. Install built-in items plumb, level, and true to line.

C. Bed anchors of metal door frames in adjacent mortar joints. Fill frame voids solid with grout.
1. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.

D. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.

E. Fill cores in hollow CMUs with grout 24 inches

F. Do not build into masonry construction organic materials that are subject to deterioration.

3.14 TOLERANCES

A. Dimensions and Locations of Elements:
1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:
1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 ft., or 1/2 inch maximum.

2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 ft., 1/4 inch in 20 ft., or 1/2 inch maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 ft., 3/8 inch in 20 ft., or 1/2 inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 ft., 1/4 inch in 20 ft., or 1/2 inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 ft., 3/8 inch in 20 ft., or 1/2 inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 ft. or 1/2 inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch.

C. Joints:
1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

3.15 CUTTING AND FITTING

A. Cut and fit for chases. Coordinate with other sections of work to provide correct size, shape, and location.

B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.16 FIELD QUALITY CONTROL

A. Testing and Inspecting: Engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense. Perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.

B. Inspections: Special inspections to comply with International Building Code.
1. Inspections: Special inspections in accordance with Level 3 in TMS 402.
2. Begin masonry construction only after inspectors have verified proportions of prepared mortar.
3. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
4. Place grout only after inspectors have verified proportions of prepared grout.

C. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

D. Concrete Masonry Unit Tests: Test each variety of concrete unit masonry in accordance with ASTM C140/C140M for compliance with requirements of this specification.

E. Mortar Tests: Test each type of mortar in accordance with ASTM C780.

1. Prior to Construction: One set of tests.
2. Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

F. Grout Test (Compressive Strength): For each mix provided, in accordance with ASTM C1019.

3.17 REPAIRING, REPOINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-progress cleaning: Clean unit masonry as work progresses by dry brush to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample panel or mock-up assembly; leave one half of panel uncleaned for comparison purposes.
3. Protect adjacent surfaces from contact with cleaner.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
6. Clean masonry with proprietary acidic cleaner applied according to manufacturer's written instructions.

3.18 PROTECTION

A. Stain Prevention: Prevent construction materials and soil from staining the face of masonry to be left exposed or painted. Immediately remove all deleterious and damaging/staining materials and soil that come in contact with such masonry.
1. Protect base of walls from rain-splashed mud by spreading coverings on ground and over wall surface.

B. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

3.19 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
1. Crush masonry waste to less than 4 inches in each dimension.
2. Mix masonry waste with at least 2 parts of specified fill material for each part of masonry waste.
3. Do not dispose of masonry waste as fill within 18 inches of finished grade.

C. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.

D. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04 2000

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SECTION 04 7200 - CAST STONE MASONRY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Architectural cast stone.
   1. Units required are indicated on drawings as "cast stone".

1.2 DEFINITIONS

A. Cast Stone: An architectural stone unit manufactured to copy fine grain texture and color of natural cut stone used in unit masonry applications. Meets ASTM C1364 requirements.

B. Dry Cast: Manufactured from zero-slump concrete.
   1. Vibrant Hand Tamp Casting Method: Vibratory compaction by hand tamp of earth-moist, zero slump concrete against rigid mold until it is densely compacted.

C. Wet Cast: Manufactured from measurable slump concrete.
   1. West Casting Method: Manufactured from measurable slump concrete and consolidated into a mold.

1.3 ACTION SUBMITTALS

A. Product Data: Test results of cast stone components made previously by the manufacturer.
   1. Include one copy of ASTM C1364 for Architect's use.

B. Shop Drawings: Include elevations, dimensions, modular unit length, layouts, profiles, cross sections, reinforcement, exposed faces, arrangement of joints, anchoring methods, anchors, annotations of cast stone types and locations, and piece numbers.

C. Mortar Color Selection Samples.

D. Verification Samples: Pieces of actual cast stone components not less than 6 inches square, illustrating cast stone edge and face quality as well as range of color and texture to be anticipated in components furnished for the project.

1.4 INFORMATIONAL SUBMITTALS

A. Source Quality Control Test Reports.

B. Manufacturer's Qualification Data: Documentation showing compliance with specified requirements.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. A firm with a minimum of 5 years experience producing cast stone of types required for project.

2. Manufacturer's production facility currently holds a Plant Certification from the Cast Stone Institute or the Architectural Precast Association.
3. Adequate plant capacity to furnish quality, sizes, and quantity of cast stone required without delaying progress of the work.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.6 MOCK-UPS

A. Provide full size cast stone components for installation in mock-up of exterior wall.

B. Approved mock-up will become standard for appearance and workmanship.

C. Mock-up may remain as part of the completed work.

D. Remove mock-up not incorporated into the work and dispose of debris.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver cast stone components secured to shipping pallets and protected from damage and discoloration. Protect corners from damage.

B. Number each piece individually to match shop drawings and schedule.

C. Store cast stone components and installation materials in accordance with manufacturer's instructions.

D. Store cast stone components on pallets with nonstaining, waterproof covers. Ventilate under covers to prevent condensation. Prevent contact with dirt.

E. Protect cast stone components during handling and installation to prevent chipping, cracking, or other damage.

F. Store mortar materials where contamination can be avoided.

G. Schedule and coordinate production and delivery of cast stone components with unit masonry work to optimize on-site inventory and to avoid delaying the work.

PART 2 PRODUCTS

2.1 ARCHITECTURAL CAST STONE

A. EF-7, Basis of Design Product: Subject to compliance with requirements, provide basis of design product indicated on Exterior Finish Key Schedule, or one of the other products listed.
1. Faddis Concrete Products; Architectural Cast Stone.
2. Advanced Architectural Stone, Inc.; Architectural Cast Stone.
3. Reading Rock, Inc.; Rockcast, Architectural Cast Stone.

B. Cast Stone: Architectural concrete product manufactured to simulate appearance of natural stone, complying with ASTM C1364.
1. Casting Method: Units shall be manufactured using vibrant dry hand tamp casting method.

2. Compressive Strength: As specified in ASTM C1364; calculate strength of pieces to be field cut at 80 percent of uncut piece.
3. Freeze-Thaw Resistance: Units shall be resistant to freezing and thawing as determined by laboratory testing according to ASTM C666, Procedure A, as modified by ASTM C1364.
4. Surface Texture: Fine grained texture, with no bugholes, air voids, or other surface blemishes visible from distance of 20 feet.
5. Curing:
   a. Cure units in enclosed, moist curing room at 95 to 100 relative humidity and temperature of 100 deg F for 12 hours or 70 deg F for 16 hours.
   b. Keep units damp and continue to comply with the following:
      1) No fewer than three days at mean daily temperature of 70 deg F or above.
6. Color: as indicated on Exterior Finish Key.
7. Remove cement film from exposed surfaces before packaging for shipment.

C. Shapes: Provide shapes indicated on drawings.
1. Fabricate units with sharp arris and accurately reproduced details, with indicated texture on all exposed surfaces unless otherwise indicated.
2. Variation from Any Dimension, Including Bow, Camber, and Twist: Maximum of plus/minus 1/8 inch or length divided by 360, whichever is greater, but not more than 1/4 inch.
3. Unless otherwise indicated on drawings, provide:
   a. Wash or slope of 1:12 on exterior horizontal surfaces to drain.
   b. Drips on projecting components unless otherwise indicated.
   c. Raised fillets at back of sills and at ends to be built in.

D. Reinforcement: Provide reinforcement as required to withstand handling and structural stresses; comply with ACI CODE-318.
1. Pieces More than 24 inches in Any Dimension: Provide full length two-way reinforcement of cross-sectional area not less than 0.25 percent of unit cross-sectional area.

2.2 MATERIALS

A. Portland Cement: ASTM C150/C150M.

B. Coarse Aggregate: ASTM C33/C33M, except for gradation; granite, quartz, or limestone.

C. Fine Aggregate: ASTM C33/C33M, except for gradation; natural or manufactured sands.

D. Pigments: ASTM C979, inorganic iron oxides; do not use carbon black.

E. Admixtures:
1. Water Reducing, Retarding, and Accelerating Admixtures: ASTM C494/C494M.
2. Air-Entraining Admixtures: ASTM C 260

F. Water: Potable.

G. Reinforcing Bars: ASTM A615/A615M, Grade 40 (40,000 psi), deformed bars, galvanized.
1. Galvanized in accordance with ASTM A767/A767M, Class I.

H. Steel Welded Wire Reinforcement: ASTM A1064/A1064M, galvanized or ASTM A884/A884M, epoxy coated.

I. Embedded Anchors, Dowels, and Inserts: Type 304 stainless steel, of type and size as required for conditions.

J. Shelf Angles and Similar Structural Items: Hot-dip galvanized steel per ASTM A123/A123M, of shapes and sizes as required for conditions.

K. Mortar: Portland cement-lime, as specified in Section 04 0511 .

L. Cleaner: General-purpose cleaner designed for removing mortar and grout stains, efflorescence, and other construction stains from new masonry surfaces without discoloring or damaging masonry surfaces; approved for intended use by cast stone manufacturer and by cleaner manufacturer for use on cast stone and adjacent masonry materials.

2.3 SOURCE QUALITY CONTROL

A. Test compressive strength and absorption of specimens selected at random from plant production.
1. Test in accordance with ASTM C642.
2. Select specimens at rate of 3 per 500 cubic feet, with a minimum of 3 per production week.
3. Submit reports of tests by independent testing agency, showing compliance with requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine construction to receive cast stone components. Notify Architect if construction is not acceptable.

B. Do not begin installation until unacceptable conditions have been corrected.

3.2 INSTALLATION

A. Install cast stone components in conjunction with masonry, complying with requirements of Section 04 2000.

B. Mechanically anchor cast stone units indicated; set remainder in mortar.

C. Setting Cast Stone in Mortar:
1. Drench cast stone components with clear, running water immediately before installation.
2. Set units in a full bed of mortar with full head joints unless otherwise indicated.
3. Fill vertical joints with mortar.
4. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.
5. Build concealed flashing into mortar joints as units are set.
6. Rake out joints for pointing to depths of not less then 3/4 inch. Scrub faces of units to remove excess mortar as joints are raked.
7. Provide sealant in head joints of top courses, including copings, parapets, cornices, sills, steps, and other horizontal surfaces; joints at shelf angles; joints in projecting units; joints at expansion, control, and pressure-relieving joints; joints between rigidly anchored units, including soffits, panels, and column covers; joints between lugged sills and stair treads; and joints at other locations indicated.
   a. Keep joints free of mortar and other rigid materials.

b. Prepare and apply sealant to type and at locations indicated to comply with applicable requirements in Section 07 9200 - Joint Sealants.

D. Setting Anchored Cast Stone with Sealant-Filled Joints
1. Set cast stone in locations indicated within Drawings. Set units accurately with edges and faces aligned according to established relationships and indicated tolerances.
   a. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure units in place.
   b. Shim and adjust anchors, supports, and accessories to set cast stone in locations with uniform joints.
2. Fill anchor holes with sealant.
   a. Where dowel holes occur at pressure-relieving joints, provide compressible materials at ends of dowels.
3. Set cast stone supported on clips or continuous angles on resilient setting shims. Use materials of thickness required to maintain uniform joint widths. Hold shims back from face of cast stone a distance at least equal to width of joint.
4. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Section 07 9200 - Joint Sealants.

3.3 TOLERANCES

A. Joints: Make all joints 3/8 inch, except as otherwise detailed.
1. Rake mortar joints 3/4 inch for pointing.
2. Remove excess mortar from face of stone before pointing joints.
3. Point joints with mortar in layers 3/8 inch thick and tool to a slight concave profile.

B. Installation Tolerances:
1. Variation from Plumb: Not more than 1/8 inch in 10 feet or 1/4 inch in 20 feet or more.
2. Variation from Level: Not more than 1/8 inch in 10 feet or 1/4 inch in 20 feet, or 3/8 inch maximum.
3. Variation in Joint Width: Not more than 1/8 inch in 36 inches or 1/4 of nominal joint width, whichever is less.
4. Variation in Plane Between Adjacent Surfaces (Lipping): Not more than 1/16 inch difference between planes of adjacent units or adjacent surfaces indicated to be flush with units.

3.4 REPAIR

A. Remove and replace stained and otherwise damaged units and units not matching approved Samples. Cast stone may be repaired if methods and results are approved by Architect.

B. Repair chips and other surface damage noticeable when viewed in direct daylight at 20 feet.

C. Repair with matching touch-up material provided by the manufacturer and in accordance with manufacturer's instructions.

3.5 CLEANING

A. In-Progress Cleaning: Keep cast stone components clean as work progresses.
1. Remove mortar fins and smears before tooling joints.
2. Remove excess sealant immediately, including spills, smears, and spatter.

B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed cast stone as follows:
   1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
   2. Test cleaning methods on sample; leave one sample uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of cast stone.
   3. Protect adjacent surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
   4. Wet surfaces with water before applying cleaners; remove cleaners promptly by rinsing thoroughly with clear water. Clean cast stone by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20. Clean cast stone with proprietary acidic cleaner applied according to manufacturer's written instructions.

3.6 PROTECTION

A. Protect completed work from damage.

B. Clean, repair, restore or replace damaged or mortar-splashed work to condition of new work.

END OF SECTION 04 7200

SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Structural steel.
   2. Shrinkage-resistant grout.

1.2 DEFINITIONS

A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in ANSI/AISC 303.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show fabrication of structural-steel components.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU or is accredited by the IAS Fabricator Inspection Program for Structural Steel (Acceptance Criteria 172).

B. Installer Qualifications: A qualified Installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector.

C. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with applicable provisions of the following specifications and documents:
   1. ANSI/AISC 303.
   2. ANSI/AISC 360.
   3. RCSC's "Specification for Structural Joints Using High-Strength Bolts."

B. Connection Design Information:

1. Fabricator's experienced steel detailer selects or completes connections in accordance with ANSI/AISC 303.
   a. Select and complete connections using schematic details indicated and ANSI/AISC 360.
   b. Use Allowable Stress Design; data are given at service-load level.

C. Moment Connections: Type FR, fully restrained.

D. Construction: Combined system of moment frame, portal frame, and shear walls.

2.2 STRUCTURAL-STEEL MATERIALS

In accordance with the structural general notes.

2.3 BOLTS AND CONNECTORS

A. High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125, Grade A325, Type 1, heavy-hex steel structural bolts.

2.4 RODS

A. Anchor Rods: ASTM F1554, Grade 36, straight.

B. Threaded Rods: ASTM A36.

2.5 PRIMER

In accordance with the structural drawings.

2.6 SHRINKAGE-RESISTANT GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.7 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with ANSI/AISC 303 and to ANSI/AISC 360.

2.8 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.
   1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

2.9 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel in accordance with ASTM A123.
   1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
   2. Galvanize lintels and shelf angles located in exterior walls.

2.10 SHOP PRIMING

A. Shop prime steel surfaces in accordance with the structural general notes.

B. Surface Preparation of Steel: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces in accordance with the structural general notes.

C. Surface Preparation of Galvanized Steel: Prepare galvanized-steel surfaces for shop priming by thoroughly cleaning steel of grease, dirt, oil, flux, and other foreign matter, and treating with etching cleaner or in accordance with SSPC-SP 16.

D. Priming: Immediately after surface preparation, apply primer in accordance with manufacturer's written instructions and at rate recommended by SSPC. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

2.11 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform shop tests and inspections.
   1. Allow testing agency access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
   2. Bolted Connections: Inspect shop-bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
   3. Welded Connections: Visually inspect shop-welded connections in accordance with AWS D1.1 and the following inspection procedures, at testing agency's option:
      a. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
   4. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and in accordance with ANSI/AISC 303 and ANSI/AISC 360.

B. Baseplates, Bearing Plates, and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

C. Maintain erection tolerances of structural steel within ANSI/AISC 303.

3.3 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt and joint type specified.
1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
1. Comply with ANSI/AISC 303 and ANSI/AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Engage a special inspector to perform the following special inspections:
1. Verify structural-steel materials and inspect steel frame joint details.
2. Verify weld materials and inspect welds.
3. Verify connection materials and inspect high-strength bolted connections.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
1. Bolted Connections: Inspect bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
2. Welded Connections: Visually inspect field welds in accordance with AWS D1.1.
a. In addition to visual inspection, test and inspect field welds in accordance with AWS D1.1 and the following inspection procedures, at testing agency's option:
1) Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.

END OF SECTION 051200

SECTION 052100 - STEEL JOIST FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. K-series steel joists.
   2. Steel joist accessories.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of joist, accessory, and product.

B. Shop Drawings:
   1. Include layout, designation, number, type, location, and spacing of joists.
   2. Include joining and anchorage details; bracing, bridging, and joist accessories; splice and connection locations and details; and attachments to other construction.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Manufacturer certificates.

C. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables in SJI's "Specifications."
   1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.

B. Welding Qualifications: Qualify field-welding procedures and personnel in accordance with AWS D1.1, "Structural Welding Code - Steel."

PART 2 - PRODUCTS

2.1 STEEL JOISTS

A. K-Series Steel Joist: Manufactured steel joists of type indicated in accordance with "Standard Specification for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord.

2.2 PRIMERS

As indicated in the structural general notes.

2.3 STEEL JOIST ACCESSORIES

A. Bridging:
1. Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.

B. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.

2.4 CLEANING AND SHOP PAINTING

A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories.

B. Apply shop primer to joists and joist accessories in accordance with the paint manufacturer’s recommendations.

2.5 INSTALLATION

A. Do not install joists until supporting construction is in place and secured.

B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction in accordance with SJI's "Specifications," joist manufacturer's written instructions, and requirements in this Section.
1. Before installation, splice joists delivered to Project site in more than one piece.
2. Space, adjust, and align joists accurately in location before permanently fastening.
3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.

C. Field weld joists to supporting steel bearing plates and steel members. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

D. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

2.6 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Visually inspect field welds in accordance with AWS D1.1.

C. Visually inspect bolted connections.

D. Prepare test and inspection reports.

END OF SECTION 052100

SECTION 053100 - STEEL DECKING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Roof deck.
2. Composite floor deck.

1.2 ACTION SUBMITTALS

1. Roof deck.
2. Composite floor deck.

B. Shop Drawings:
1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.3 INFORMATIONAL SUBMITTALS

A. Certificates:
1. Welding certificates.
2. Product Certificates: For each type of steel deck.

B. Field Quality-Control Submittals:
1. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Qualifications:
1. Welding Qualifications: Qualify procedures and personnel in accordance with SDI QA/QC and the following welding code:
a. AWS D1.3.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store products in accordance with SDI MOC3. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck in accordance with AISI S100.

2.2 ROOF DECK

A. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with SDI RD and with the following:
1. Galvanized-Steel Sheet: As indicated.
2. Deck Profile: As indicated.
3. Profile Depth: As indicated.
4. Design Uncoated-Steel Thickness: As indicated.
5. Span Condition: As indicated.
6. Side Laps: Overlapped.

2.3 COMPOSITE FLOOR DECK

A. Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with SDI C, with the minimum section properties indicated, and with the following:
1. Galvanized-Steel Sheet: As indicated.
2. Deck Profile: As indicated.
3. Profile Depth: As indicated.
4. Design Uncoated-Steel Thickness: As indicated.
5. Span Condition: As indicated.
6. Side Laps: Overlapped.

2.4 ACCESSORIES

A. Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 50,000 psi, not less than 0.0295-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Pour Stops: Steel sheet, minimum yield strength of 50,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI standards for overhang and slab depth.

G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.

H. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0747 inch thick, with factory-punched hole of 3/8-inch minimum diameter.

I. Galvanizing Repair Paint: ASTM A780.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Install deck panels and accessories in accordance with SDI C, SDI NC, and SDI RD, as applicable; manufacturer's written instructions; and requirements in this Section.

B. Install temporary shoring before placing deck panels if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

3.2 INSTALLATION OF ROOF DECK

A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:
   1. Weld Diameter: 5/8 inch nominal.
   2. Weld Spacing: As indicated.
   3. Weld Washers: Install weld washers at each weld location.

B. Side-Lap and Perimeter Edge Fastening: As indicated.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing as required by the manufacturer, or 2 inches, whichever is greater.
   1. End Joints: Lapped 2 inches minimum.

D. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels in accordance with deck manufacturer's written instructions. Weld to substrate to provide a complete deck installation.
   1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.

E. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive in accordance with manufacturer's written instructions to ensure complete closure.

3.3 INSTALLATION OF FLOOR DECK

A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:

1. Weld Diameter: 5/8 inch nominal.
2. Weld Spacing: As indicated.
3. Weld Washers: Install weld washers at each weld location.

B. Side-Lap and Perimeter Edge Fastening: As indicated.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing as required by the manufacturer, or 2 inches, whichever is greater.
1. End Joints: Lapped 2 inches minimum.

D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure in accordance with SDI recommendations unless otherwise indicated.

E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, in accordance with SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

3.4 REPAIR

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint in accordance with ASTM A780 and manufacturer's written instructions.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections:
1. Special inspections and qualification of welding special inspectors for cold-formed steel floor and roof deck in accordance with quality-assurance inspection requirements of SDI QA/QC.
a. Field welds will be subject to inspection.
2. Steel decking will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION 053100

SECTION 05 5000 - METAL FABRICATIONS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Shop fabricated steel items, including:
   a. Framing and supports for overhead doors, mechanical and electrical equipment, and applications where framing and supports are not specified in other Sections.
2. Slotted channel framing.
3. Loose bearing and leveling plates for applications where they are not specified in other Sections.
4. Downspout boots.

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.

1.2 COORDINATION

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 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.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:
1. Fasteners.
2. Shop primers.
3. Shrinkage-resisting grout.
4. Slotted channel framing.
5. Metal downspout boots.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
2. Steel framing and supports for overhead doors.
3. Steel framing and supports for mechanical and electrical equipment.

4. Steel framing and supports for applications where framing and supports are not specified in other Sections.
5. Miscellaneous steel trim including steel angle corner guards, steel edgings, and loading-dock edge angles.

1.4 INFORMATIONAL SUBMITTALS

A. Welders' Qualification Statement and certificates.

B. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

C. Research Reports: For post-installed anchors.

1.5 QUALITY ASSURANCE

A. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and AWS D1.2/D1.2M and dated no more than 12 months before start of scheduled welding work.

1.6 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls, floor slabs, decks, 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. Base engineering calculations on surface temperature of materials due to both solar heat gain and nighttime sky heat loss.
1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 MATERIALS, GENERAL

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.

2.3 MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M.

B. Plates: ASTM A283/A283M.

C. Stainless Steel, General: ASTM A666/A666M, Type 304.

D. Stainless Steel Bars, Shapes and Moldings: ASTM A276/A276M, Type 304.

E. 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 ([41] mm).
2. Material: Galvanized steel, ASTM A653/A653M, commercial steel, Type B, with G90 (Z275) coating; 0.108-inch (2.8-mm) nominal thickness.

F. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

G. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

H. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.4 FASTENERS

A. Fasteners: provide Type 304 stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
1. Bolts, Nuts, and Washers for fastening Aluminum: Stainless steel.

B. Bolts, Nuts, and Washers: ASTM A307, Grade A, plain, with hex nuts, ASTM A563; and, where indicated, flat washers.

C. High Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 3, plain, heavy-hex steel structural bolts; ASTM 563, Grade DH3, heavy-hex carbon-steel nuts; and where indicated flat washers.

D. Stainless Steel Bolts and Nuts: Regular hexagon-head annealed stainless steel bolts, ASTM F593 (ISO 3506-1); with hex nuts, ASTM F594 (ASTM F836M); and, where indicated, flat washers; Alloy Group 1 (A1).

E. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563 (ASTM A563M); and, where indicated, flat washers.
1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

F. Anchors, General: 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 in accordance with ASTM E488/E488M, conducted by a qualified independent testing agency.

G. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.
2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (A1) stainless steel bolts, ASTM F593 (ASTM F738M), and nuts, ASTM F594 (ASTM F836M).

H. Machine Screws: ASME B18.6.3.

I. Lag Bolts: ASME B18.2.1.

J. Wood Screws: Flat Head ASME B18.6.1.

K. Plain Washers: Round, ASME B18.2.2.1.

L. Lock Washers: Helical, spring type, ASME B18.21.1.

M. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches (41 by 22 mm) 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 B633, Class Fe/Zn 5, as needed for fastening to inserts.

2.5 FABRICATION

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 and contour of welded surface matches that of adjacent surface.

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 (150-mm) embedment and 2-inch (50-mm) 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 supports for operable partitions from continuous steel beams of sizes recommended by partition manufacturer with attached bearing plates, anchors, and braces as recommended by partition manufacturer. Drill or punch bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.

C. 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.

D. Galvanize miscellaneous framing and supports where indicated.

2.7 FABRICATED ITEMS

A. Door Frames for Overhead Door Openings and Wall Openings: Channel sections; galvanized finish.

B. Slotted Channel Framing: Fabricate channels and fittings from structural steel complying with the referenced standards; hot-dipped galvanized per ASTM A653, Grade G90 finish.

2.8 SHELF ANGLES

A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch (19-mm) bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.
1. Provide mitered and welded units at corners.
2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches larger than expansion or control joint.

B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.

C. Galvanize and prime shelf angles located in exterior walls.

2.9 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.

B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span, but not less than 8 inches unless otherwise indicated.

C. Galvanize loose steel lintels located in exterior walls.

D. Prime loose steel lintels located in exterior walls with primer specified in Section 09 9600 "High-Performance Coatings."

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 bearing and leveling plates.

2.11 DOWNSPOUT BOOTS

A. Downspout Boots: Smooth interior without boxed corners or choke points; include integral lug slots and on-body cleanout and cover with neoprene gaskets.
1. Configuration: Offset.
2. Material: Cast iron; ASTM A48/A48M; casting thickness 3/8 inch (9.5 mm), minimum.
3. Finish: Manufacturer's standard factory applied powder coat finish.
4. Color: To be selected by Architect from manufacturer's standard range.
5. Accessories: Manufacturer's standard stainless steel fasteners, stainless steel building wall anchors, and rubber coupling.
6. Manufacturers:
   a. Downspoutboots.com, a division of J. R. Hoe & Sons.
   b. Neenah Foundry.
   c. Zurn.

2.12 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.

2.13 FINISHES - STEEL

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

B. Prime Painting: One coat.

C. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

D. Slotted Channel Framing: ASTM A653/A653M, Grade 33.

2.14 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch.

C. Maximum Misalignment of Adjacent Members: 1/16 inch.

D. Maximum Bow: 1/8 inch in 48 inches.

E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.2 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Furnish setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.3 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. 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.

D. 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.

E. Perform field welding in accordance with AWS D1.1/D1.1M.
   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.

F. Obtain approval prior to site cutting or making adjustments not scheduled.

G. 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.

3.4 INSTALLATION OF MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Anchor supports for overhead doors and overhead grilles securely to, and rigidly brace from, building structure.

C. Anchor shelf angles securely to existing construction with anchor bolts.

3.5 SHELF ANGLES

A. Install shelf angles as required to keep masonry level, at correct elevation, and flush with vertical plane.

3.6 INSTALLATION OF ELEVATOR PIT SUMP COVERS

A. Install tops of elevator sump pit cover plates and frames flush with finished surface. Adjust as required to avoid lippage that could present a tripping hazard.

3.7 INSTALLATION OF MISCELLANEOUS STEEL TRIM

A. Anchor to concrete construction to comply with manufacturer's written instructions.

3.8 INSTALLATION OF METAL DOWNSPOUT BOOTS

A. Anchor metal downspout boots to concrete or masonry construction to comply with manufacturer's written instructions.

B. Secure downspouts terminations to downspouts and substrate per manufacturer's instructions.

3.9 INSTALLATION OF LOOSE 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 shrinkage-resistant grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.10 REPAIRS

A. Touchup Painting:
1. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in 09 9600 - High-Performance Coatings.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

3.11 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION 05 5000

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SECTION 05 5113 - METAL PAN STAIRS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Preassembled steel stairs with concrete-filled treads.

1.2 COORDINATION

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 with one another.

B. Coordinate installation of anchorages for metal stairs.
1. 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.
2. Deliver such items to Project site in time for installation.

C. Coordinate locations of hanger rods and struts with other work so they do not encroach on required stair width and are within fire-resistance-rated stair enclosure.

D. Schedule installation of railings and guards so wall attachments are made only to completed walls.
1. Do not support railings and guards temporarily by any means that do not satisfy structural performance requirements.

1.3 ACTION SUBMITTALS

A. Product Data: For metal pan stairs and the following:
1. Prefilled metal-pan-stair treads.
2. Abrasive nosings.
3. Shop primer products.
4. Nonslip-aggregate concrete finish.
5. Grout.

B. Shop Drawings:
1. Include plans, elevations, sections, details, and attachments to other work.
2. Indicate sizes of metal sections, thickness of metals, profiles, holes, and field joints.
3. Include plan at each level.
4. Indicate locations of anchors, weld plates, and blocking for attachment of wall-mounted handrails.

C. Samples for Verification: For each type and finish of nosing.

D. Delegated Design Submittal: For stairs, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer's experience with providing delegated design engineering services of the kind indicated, including documentation that engineer is licensed in the State in which Project is located.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification.
1. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers.
2. Protect steel members and packaged materials from corrosion and deterioration.
3. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures.
    a. Repair or replace damaged materials or structures as directed.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 4000 - Quality Requirements, to design stairs, including attachment to building construction.

B. Structural Performance of Stairs: Metal stairs withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
1. Uniform Load: 100 lbf/sq. ft. (4.79 kN/sq. m).
2. Concentrated Load: 300 lbf (1.33 kN) applied on an area of 4 sq. in. (2580 sq. mm).
3. Uniform and concentrated loads need not be assumed to act concurrently.
4. Stair Framing: Capable of withstanding stresses resulting from railing and guard loads in addition to loads specified above.
5. Limit deflection of treads, platforms, and framing members to L/360 or 1/4 inch, whichever is less.

C. Seismic Performance of Stairs: Metal stairs withstand the effects of earthquake motions determined according to ASCE/SEI 7.
1. Component Importance Factor: 1.5.

2.2 METALS

A. Metal Surfaces: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

C. Uncoated, Cold-Rolled Steel Sheet: ASTM A1008/A1008M, either commercial steel, Type B, or structural steel, Grade 25 (Grade 170), unless another grade is required by design loads; exposed.

2.3 ABRASIVE NOSINGS

A. Extruded Units: Aluminum units with abrasive filler consisting of aluminum oxide, silicon carbide, or a combination of both, in an epoxy-resin binder. Fabricate units in lengths necessary to accurately fit openings or conditions.
   1. Basis-of-Design Product: Nystrom; STSF-N Inset Full Abrasive Stair Nosings or comparable product by one of the following manufacturers:
      a. Balco; a CSW Industrials Company.
      b. Babcock-Davis.
      c. Wooster Products Inc.
   2. Provide solid-abrasive units without ribs.
   3. Nosings, Square-Back Units: 2-1/4 inches wide, without lip.

B. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.

C. Apply clear lacquer to concealed surfaces of extruded units set into concrete.

2.4 FASTENERS

A. General: Provide Type 304 stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M , Class Fe/Zn 5 where built into exterior walls.
   1. Select fasteners for type, grade, and class required.

B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563 (ASTM A563M); and, where indicated, flat washers.

C. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563 (ASTM A563M); and, where indicated, flat washers.
   1. Provide mechanically deposited or hot-dip, zinc-coated anchor bolts for exterior stairs.

D. Post-Installed Anchors: Torque-controlled expansion 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 E488/E488M, conducted by a qualified independent testing agency.
   1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.

2.5 MISCELLANEOUS MATERIALS

A. Welding Electrodes: Comply with AWS requirements.

B. Shop Primers: Provide primers that comply with Section 09 9600 - High-Performance Coatings

C. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout; recommended by manufacturer for interior use; noncorrosive and nonstaining; mixed with water to consistency suitable for application and a 30-minute working time.

D. Prefilled Concrete Treads:
1. Concrete Materials and Properties: Comply with requirements in Section 03 3000 - Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with minimum 28-day compressive strength of 3000 psi and maximum aggregate size of 1/2 inch unless otherwise indicated.
2. Nonslip-Aggregate Concrete Finish: Factory-packaged abrasive aggregate made from fused, aluminum-oxide grits or crushed emery; rustproof and nonglazing; unaffected by freezing, moisture, or cleaning materials.
3. Plain Steel Welded-Wire Reinforcement: ASTM A1064/A10645M, galvanized steel, 6 by 6 inches (152 by 152 mm), W1.4 by W1.4, unless otherwise indicated on Drawings.
4. Reinforcement Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening welded-wire reinforcement in place.
    a. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete.

E. For galvanized reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.

2.6 FABRICATION, GENERAL

A. Provide complete stair assemblies, including metal framing, hangers, struts, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
1. Join components by welding unless otherwise indicated.
2. Use connections that maintain structural value of joined pieces.

B. Assemble stairs in shop to greatest extent possible.
1. Disassemble units only as necessary for shipping and handling limitations.
2. Clearly mark units for reassembly and coordinated installation.

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 bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Form exposed work with accurate angles and surfaces and straight edges.

F. Weld connections 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. Weld exposed corners and seams continuously unless otherwise indicated.
5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #1 - No evidence of welded joint.

G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.
1. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated.
2. Locate joints where least conspicuous.

2.7 FABRICATION OF STEEL-FRAMED STAIRS

A. NAAMM Stair Standard: Comply with NAAMM AMP 510, "Metal Stairs Manual," for Architectural Class, unless more stringent requirements are indicated.

B. Stair Framing:
1. Stringers: Fabricate of steel plates, steel channels, or steel rectangular tubes.
a. Stringer Size: As required to comply with "Performance Requirements" Article.
b. Provide closures for exposed ends of channel and rectangular tube stringers.
c. Finish: Shop primed.
2. Platforms: Construct of steel plate, steel channel, or steel rectangular tube headers and miscellaneous framing members as required to comply with "Performance Requirements" Article.
a. Provide closures for exposed ends of channel and rectangular tube framing.
b. Finish: Shop primed.
3. Weld stringers to headers; weld framing members to stringers and headers.
4. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.

C. Metal Pan Stairs: Form risers, subtread pans, and subplatforms to configurations shown from steel sheet of thickness needed to comply with performance requirements, but not less than 0.067 inch.
1. Fabricate treads and landing subplatforms of exterior stairs so finished walking surfaces slope to drain.
2. Steel Sheet, Uncoated: Cold-rolled steel sheet.
3. Directly weld metal pans to stringers; locate welds on top of subtreads where they will be concealed by concrete fill. Do not weld risers to stringers.
4. Attach abrasive nosings to risers.
5. At Contractor's option, provide stair assemblies with metal pan subtreads filled with reinforced concrete during fabrication.
6. Provide subplatforms of configuration indicated or, if not indicated, the same as subtreads. Weld subplatforms to platform framing.

2.8 FABRICATION OF STAIR RAILINGS AND GUARDS

A. Comply with applicable requirements in Section 05 5213 "Pipe and Tube Railings."

2.9 FINISHES

A. Finish metal stairs after assembly.

B. Preparation for Shop Priming: Prepare uncoated, ferrous-metal surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."

C. Apply shop primer to uncoated surfaces of metal stair components, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify elevations of floors, bearing surfaces and locations of bearing plates, and other embedments for compliance with requirements.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF METAL PAN STAIRS

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction.
   1. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.

C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.
   1. Grouted Baseplates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates.
      a. Clean bottom surface of plates.
      b. Set plates for structural members on wedges, shims, or setting nuts.
      c. Tighten anchor bolts after supported members have been positioned and plumbed.
      d. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
      e. Promptly pack grout solidly between bearing surfaces and plates so no voids remain.
         1) Neatly finish exposed surfaces; protect grout and allow to cure.
         2) Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

E. Fit exposed connections accurately together to form hairline joints.
   1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.

2. 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.
3. Comply with requirements for welding in "Fabrication, General" Article.

F. Place and finish concrete fill for treads and platforms to comply with Section 03 3000 - Cast-in-Place Concrete.
1. Install abrasive nosings with anchors fully embedded in concrete.
2. Center nosings on tread width.

3.3 REPAIR

A. Touchup Painting:
1. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09 9600 - High-Performance Coatings.

END OF SECTION 05 5113

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SECTION 05 5213 - PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wall mounted handrails.

B. Stair railings and guardrails.

1.2 COORDINATION

A. 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.

1.3 ACTION SUBMITTALS

A. Product Data:
1. Manufacturer's product lines of mechanically connected railings.
2. Fasteners.
3. Post-installed anchors.
4. Handrail brackets.
5. Nonshrink, nonmetallic grout.
6. Metal finishes.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

C. Delegated Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. 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, 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.
    a. Show method of connecting and finishing members at intersections.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For delegated design professional engineer, fabricator, and testing agency.

B. Welding Qualifications and Certificates.

C. Product Test Reports: For tests on railings performed by a qualified testing agency, in accordance with ASTM E894 and ASTM E935.

D. Research Reports: For post-installed anchors, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.5 QUALITY ASSURANCE

A. Delegated Design Professional Engineer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.

B. Welder Qualifications and Certifications: Welding processes and welding operators qualified within previous 12 months. Qualify procedures and personnel in accordance with the following:
1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Fabricator Qualifications:
1. A company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect mechanical finishes on exposed surfaces of railings from damage by applying a strippable, temporary protective covering before shipping.

1.7 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. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 4000 "Quality Requirements," to design railings, including attachment to building construction.

B. Structural Performance: Railings, including attachment to building construction, 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. (0.73 kN/m) applied in any direction.
   b. Concentrated load of 200 lbf (0.89 kN) 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 (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
   b. Infill load and other loads need not be assumed to act concurrently.

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.
   1. Provide type of bracket with flange tapped for concealed anchorage to threaded hanger bolt and that provides 1-1/2-inch (38-mm) clearance from inside face of handrail to finished wall surface.

2.3 RAILINGS, GENERAL

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. Blum, Julius & Co., Inc.
   2. Hollaender Mfg. Co.
   3. Kee Safety, Inc.
   4. R & B Wagner, Inc.
   5. Trex Commercial Products, Inc.
   6. TrueNorth Steel.
   7. Tuttle, a Dant Clayton Division.
   8. VIVA Railings, LLC.

B. Source Limitations: Obtain each type of railing from single source from single manufacturer.

C. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
   1. For anchorage to concrete, provide inserts to be cast into concrete, for welding anchors.
   2. For anchorage to masonry, provide brackets to be embedded in masonry, for welding anchors.

D. Provide welding fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

E. Welded and Brazed Joints: Make visible joints butt tight, flush, and hairline; use methods that avoid discoloration and damage of finish; grind smooth, polish, and restore to required finish.
   1. Ease exposed edges to a small uniform radius.
   2. Welded Joints:
      a. Carbon Steel: Perform welding in accordance with AWS D1.1/D1.1M.

2.4 STEEL RAILING SYSTEM

A. Steel Pipe: ASTM A53/A53M Grade B Schedule 40, galvanized finish.

B. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.

C. Exposed Fasteners: No exposed bolts or screws.

D. Straight Splice Connectors: Steel concealed spigots.

E. Galvanizing: In accordance with requirements of ASTM A123/A123M.
   1. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type II - Organic.

2.5 FASTENERS

A. Fastener Materials:
   1. Hot-Dip Galvanized 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.

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 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.

D. Provide tamper-resistant flat-head machine screws for exposed fasteners unless otherwise indicated.

E. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193 or ICC-ES AC308.
   1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.

2.6 MISCELLANEOUS MATERIALS

A. Handrail Brackets: Cast stainless steel, center of handrail [2-1/2 inches (63.5 mm)] [3-1/8 inches (79.4 mm)] from [face of railing] [wall].

B. Welding Rods and Bare Electrodes: Select in accordance with 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.

C. Etching Cleaner for Galvanized Metal: Complying with MPI#25.

D. Galvanizing Repair Paint: High-zinc-dust-content paint, complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

E. 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.

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.
   1. Form rails from Schedule 40 pipe and form posts form Schedule 80 pipe.

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 (1 mm) unless otherwise indicated.
2. Remove sharp or rough areas on exposed surfaces.

D. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.

E. Form work true to line and level with accurate angles and surfaces.

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. Gates: Form gates from steel tube of same size and shape as top rails, with infill to match guards. Provide with cam-type, self-closing hinges for fastening to wall and overlapping stop with rubber bumper to prevent gate from opening in direction opposite egress.

I. Welded Connections: Fabricate railings and guards with welded connections.
1. Fabricate connections that are exposed to weather in a manner that excludes water.
    a. Provide weep holes where water may accumulate internally.
2. Cope components at connections to provide close fit, or use fittings designed for this purpose.
3. Weld all around at connections, including at fittings.
4. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
5. Obtain fusion without undercut or overlap.
6. Remove flux immediately.
7. Finish welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #1 - No evidence of a welded joint as shown in NAAMM AMP 521.

J. Form changes in direction of railings and guards as follows:
1. As detailed.

K. 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.

L. Close exposed ends of railing and guard members with prefabricated end fittings.

M. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated.
1. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.

N. Connect posts to stair framing by direct welding unless otherwise indicated.

O. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work.
1. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.
2. For galvanized railings and guards, provide galvanized fittings, brackets, fasteners, sleeves, and other ferrous-metal components.

3. Provide type of bracket with flange tapped for concealed anchorage to threaded hanger bolt and that provides 1-1/2-inch (38-mm) clearance from inside face of handrail to finished wall surface.

P. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports.
1. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

2.8 STEEL FINISHES

A. Galvanized Railings:
1. Hot-dip galvanize steel railings, including hardware, after fabrication.
2. Comply with ASTM A123/A123M for hot-dip galvanized railings.
3. Comply with ASTM A153/A153M for hot-dip galvanized hardware.
4. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.2 PREPARATION

A. Supply items required to be cast into concrete or embedded in masonry with setting templates, for installation as work of other sections.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.

C. Install railings in compliance with ADA Standards for accessible design at applicable locations.

D. 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 are 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 (2 mm in 1 m).
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 (6 mm in 3.5 m).

E. Anchor railings securely to structure.

F. Adjust railings before anchoring to ensure matching alignment at abutting joints.

G. Field weld anchors as indicated on shop drawings. Touch-up welds with primer. Grind welds smooth.

H. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

I. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.4 RAILING CONNECTIONS

A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws, using plastic cement filler colored to match finish of railings.

B. 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.

3.5 ANCHORING POSTS

A. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.

B. Leave anchorage joint exposed with anchoring material flush with adjacent surface.

C. 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 steel railings, weld flanges to post and bolt to metal supporting surfaces.

3.6 ATTACHING RAILINGS

A. Anchor railing ends to concrete and masonry with sleeves concealed within railing ends and anchored to wall construction with anchors and bolts.

B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends.

C. Attach handrails to walls with wall brackets, except where end flanges are used. Provide brackets with 1-1/2 inch clearance from inside face of handrail and finished wall surface.
   1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
   2. 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.

E. Install railing gates level, plumb, and secure for full opening without interference.
   1. Attach hardware using tamper-resistant or concealed means.

2. Adjust hardware for smooth operation.

3.7 CLEANING

A. Clean stainless steel by washing thoroughly with clean water and soap and rinsing with clean water.

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 05 5213

SECTION 06 1053 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 GENERAL

1.1 SECTIONS INCLUDES

A. Preservative-treated wood materials.

B. Fire-retardant-treated wood materials.

C. Communications and electrical room mounting boards.

D. Wood in contact with membrane roofing.

E. Wood in contact with membrane waterproofing.

F. Concealed wood blocking, nailers, and supports.

1.2 DEFINITIONS

A. Boards and Strips: Lumber of less than 2 inches nominal size in least dimension.

B. Dimensional Lumber: Lumber of 2 inches nominal or greater size but less than 5 inches nominal size in least dimension.

1.3 ACTION SUBMITTALS

A. Product Data: Provide chemical treatment manufacturer and certification by treatment plant that treatment materials comply with requirements. Indicate type of treatment used and net amount of treatment retained.
   1. Fire-retardant treatment.
      a. Include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by qualified independent testing agency according to ASTM D5664.
   2. Pressure-preservative treatment.
   3. Field-applied preservative treatment product data and application instructions.

B. Evaluation Reports: For the following, from ICC-ES:
   1. Preservative-treated wood.
   2. Fire-retardant-treated wood.
   3. Power-driven fasteners.
   4. Metal framing anchors.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Cover wood products to protect against moisture. Support stacked products to prevent deformation and allow air circulation.

B. Fire-Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, and installation.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
   1. Species:
      a. Spruce-Pine-Fir (South).
      b. Hem-Fir (North).
      c. Douglas Fir (South).
   2. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org), and that provides grading service for species and grade specified. Provide lumber stamped with grade mark unless otherwise indicated.
   3. Lumber of other species or grades is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.

2.2 DIMENSION LUMBER

A. Sizes: Nominal sizes as indicated on drawings, S4S.

B. Moisture Content: Kiln-dry or MC15.

C. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
   1. Lumber: S4S, No.2 or Standard Grade.
   2. Boards: Standard or No.3.

2.3 CONSTRUCTION PANELS

A. Communications and Electrical Room Mounting Boards: PS 1, A-D plywood; 3/4 inch thick; fire-retardant treated.

B. Plywood Concealed from View but Located Within Exterior Enclosure: PS 1, C-C Plugged or better, exterior grade.

C. Plywood Exposed to View but Not Exposed to Weather: PS 1, A-D, or better.

D. Plywood Concealed From View But Located Within Exterior Enclosure: PS 1, C-C Plugged or better, Exterior grade.

E. Plywood Exposed to View But Not Exposed to Weather: PS 1, A-D, or better.

F. Other Locations: PS 1, C-D Plugged or better.

2.4 FIRE-RETARDANT TREATMENT (FRT)

A. Factory-treat wood members in accordance with AWPA U1 and use category indicated.

B. Fire-Retardant Treatment: Interior Type A, Use Category UCFA (LT), Low-Temperature (low hygroscopic).
   1. Treat blocking and other wood members concealed in noncombustible construction.
   2. Treat electrical and communications panel backer boards.

3. Treat wood in locations indicated on drawings.

C. Fire-Retardant Treatment: Exterior Type B, Use Category UCFB.

D. Kiln-dry after treatment (KDAT) to maximum moisture content of 19 percent for sawn material and 15 percent for plywood.

E. Fabrication of FRT Wood:
1. Ripping or milling of boards, lumber, and timber after treatment is not permitted.
2. Field cutting to length and drilling of holes in boards, lumber, and timber are permitted without additional treatment.
3. Field cutting and drilling of holes in plywood are permitted.

F. Label or brand FRT wood with classification mark of UL (DIR) or ITS (DIR) or other approved inspection agency, the treatment plant, name of treatment, species of wood, flame spread and smoke-developed indexes, method of drying after treatment, and treating standard.
1. In addition, Exterior Type B labeling shall include the words: NO INCREASE IN THE LISTED CLASSIFICATION WHEN SUBJECTED TO THE STANDARD RAIN TEST (ASTM D2898).

2.5 PRESSURE-PRESERVATIVE TREATMENT (PPT)

A. Factory-treat wood members in accordance with AWPA U1 and use category indicated.

B. Application: Treat all miscellaneous carpentry unless otherwise indicated.
1. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A.
   a. Treat lumber exposed to weather.
2. Preservative Pressure Treatment of Plywood Above Grade: AWPA U1, Use Category UC2 and UC3B, Commodity Specification F.
   a. Kiln dry plywood after treatment to maximum moisture content of 19 percent.
   b. Treat plywood in connection 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.

C. Kiln-dry wood after treatment with waterborne preservative to maximum moisture content of 19 percent for lumber and 15 percent for plywood.

D. Perform fabrication such as cutting, boring, milling, and surfacing to maximum extent practicable before treatment.

E. Label preservative-treated wood with marking as required by AWPA U1 and ICC (IBC). Unless otherwise permitted by standard U1 and the building code, marking shall include the phrase: AWPA U1, accredited inspection agency's mark, and shall identify treating plant, type of preservative, retention, and end use.

F. Field Treatment for Cuts and Holes in Preservative-Treated Wood: Comply with AWPA M4.

2.6 ACCESSORIES

A. Metal and Finish of Fasteners:

1. Fire-Retardant-Treated Wood:
    a. Nails, timber rivets, wood screws, and lag screws: Hot-dip galvanized steel complying with ASTM A153/A153M Class D.
    b. Staples: Type 304 stainless steel.
    c. Fasteners other than staples, nails, timber rivets, wood screws, and lag screws: Mechanically deposited zinc-coated steel, ASTM B695 Class 55 or better.
2. Preservative-Treated Wood:
    a. Nails, timber rivets, wood screws, and lag screws - general use: Hot-dip galvanized steel complying with ASTM A153/A153M Class D.
3. Untreated Wood: Unfinished steel.
4. Metal and Finish: Hot-dip galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
5. Anchors: Toggle bolt type for anchorage to hollow masonry.

B. Die-Stamped Connectors: Hot-dip galvanized steel, sized to suit framing conditions.
1. For contact with preservative-treated wood in exposed locations, provide minimum G185 galvanizing complying with ASTM A653/A653M.
2. Manufacturers:
    a. Cleveland Steel Specialty Co.
    b. KC Metal Products, Inc.
    c. Phoenix Metal Products, Inc.
    d. Simpson Strong-Tie Co., Inc.
    e. USP Structural Connectors.

C. Construction Adhesives: Adhesives complying with ASTM C557 or ASTM D3498.

PART 3 EXECUTION

3.1 PREPARATION

A. Coordinate installation of rough carpentry members specified in other sections.

3.2 INSTALLATION - GENERAL

A. 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 and similar supports to comply with requirements for attaching other construction.

B. Select material sizes to minimize waste.

C. Reuse scrap to greatest extent possible; clearly separate scrap for use on-site as accessory components, including shims, bracing, and blocking.

D. Do not splice structural members between supports unless otherwise indicated.

E. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

F. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

G. 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.

H. Use steel common 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 between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

I. Recess bolts and nuts flush with surfaces unless otherwise indicated.

3.3 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches on center.

C. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code to close concealed draft openings between floors and between top story and roof and attic space; other material acceptable to code authorities may be used in lieu of solid wood blocking.

D. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.

E. In walls, provide blocking attached to studs as backing and support for wall-mounted items unless item can be securely fastened to two or more studs or another method of support is explicitly indicated.

F. Where ceiling mounting is indicated, provide blocking and supplementary supports above ceiling unless another method of support is explicitly indicated.

3.4 ROOF-RELATED CARPENTRY

A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

B. Provide blocking and nailers required by roofing assembly.

C. Provide wood curb at roof openings except where prefabricated curbs are specified and where specifically indicated otherwise. Form corners by alternating lapping side members.

3.5 INSTALLATION OF CONSTRUCTION PANELS

A. Construction Panels - General: Install in accordance with APA E30.

B. Communications and Electrical Room Mounting Boards: Secure with screws to studs; space fasteners at maximum 24 inches on center.
   1. At fire-rated walls, install board over wallboard indicated as part of fire-rated assembly.
   2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
   3. Install adjacent boards without gaps.
   4. Size and Location: As indicated on drawings.

3.6 SITE-APPLIED WOOD TREATMENT

A. Apply preservative treatment to field-cut surfaces in accordance with manufacturer's instructions wherever cuts, holes, sawing, or other fabrication of wood members is required after pressure-preservative treatment.

B. Apply preservative treatment in accordance with manufacturer's instructions.

C. Allow preservative to dry prior to erecting members.

3.7 CLEANING

A. Waste Disposal:
   1. Comply with applicable regulations.
   2. Do not burn scrap on project site.
   3. Do not burn scraps that have been pressure treated.
   4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

B. Do not leave wood, shavings, sawdust, etc. on ground or buried in fill.

C. Prevent sawdust and wood shavings from entering storm drainage system.

END OF SECTION 06 1053

SECTION 06 1600 - SHEATHING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wall and Parapet Plywood Sheathing.

1.2 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. Provide technical data on sheathing, wood preservative materials, application instructions, and fire-retardant treatments.
   2. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
   3. 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.
   4. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency in accordance with ASTM D5516.
   5. For products receiving waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.3 INFORMATIONAL SUBMITTALS

A. Certificate: Certify that products of this section meet or exceed specified requirements.

B. Evaluation Reports: For the following, from ICC-ES:
   1. Wood-preservative-treated plywood.
   2. Fire-retardant-treated plywood.

C. Qualifications: for manufacturer and installer.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with minimum three years of documented experience and approved by manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store products above ground in dry ventilated space to protect against moisture. Support stacked products to prevent deformation and allow air circulation.

B. Store panels over stable soil capable of carrying load of pallets.

C. Protect materials from soiling and damage.

D. Deliver materials to site promptly without undue exposure to weather.

E. Deliver in manufacturer’s unopened containers, pallets, or panels fully identified with name, brand, type, and grade.

F. Do not stack panels over plus or minus 1/2 inch off pallet edge.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: As tested in accordance with 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. Wood Panel Products:
1. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.
2. Factory mark panels to indicate compliance with applicable standard.

2.2 SHEATHING

A. Wall and Parapet Sheathing: Plywood Sheathing, PS 2 type.
1. Bond Classification: Exterior.
2. Grade: Structural I Sheathing.
3. Span Rating: 24.
4. Performance Category: 5/16 PERF CAT.
5. Edge Profile: Square edge.

2.3 ACCESSORIES

A. Fasteners and Anchors:
1. General: Refer to manufacturer product information for fastener types and requirements.
2. High Humidity and Preservative-Treated Wood Locations: Hot dip galvanized.
3. Anchors: Toggle bolt type for anchorage to hollow masonry.

B. Panel Treatment: Use manufacturer-recommended sealant, transition strips, flashing sheets, termination bars, patching materials, and adhesive tapes at control joints, panel connections, and penetrations.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify roof and floor framing meet deflection criteria noted in drawings, as recommended by manufacturer and local building code requirements.

B. Examine substrates and adjoining construction.

C. Replace damaged framing before installation of cementitious panel subfloor. Proceed with installation only after unsatisfactory conditions corrected.

3.2 PREPARATION

A. Coordinate installation of roof and floor deck construction, framing of openings, and other assembly installation.

B. Coordinate installation of rough carpentry members specified in other sections.

3.3 INSTALLATION, GENERAL

A. Select material sizes to minimize waste.

B. Reuse and clearly separate scrap for use on-site as accessory components, including shims, bracing, and blocking.

C. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using screws.
1. Use plywood or other acceptable structural panels at building corners, ensure panels measure 96 inches horizontally.

3.4 INSTALLATION OF WOOD STRUCTURAL PANEL

A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.

B. Fastening Methods: Fasten panels as indicated below:
1. Screw to cold-formed metal framing.
2. Space panels 1/8 inch (3 mm) apart at edges and ends.

C. Wall and Roof Sheathing:
1. Nail and screw to wood framing.
2. Screw to cold-formed metal framing.
3. Space panels 1/8 inch (3 mm) apart at edges and ends.

3.5 TOLERANCES

A. Variation from Plane; Surfaces Other Than Floors: 1/4 inch in 10 feet, maximum, and 1/4 inch in 30 feet, maximum.

3.6 CLEANING

A. Waste Disposal:
1. Comply with applicable regulations.
2. Do not burn scrap on project site.
3. Do not burn pressure treated scraps.

B. Clean material debris, shavings, and sawdust prior to Substantial Completion of project.

3.7 PROTECTION

A. Cover sheathing panels by exterior cladding or other weather-resistive barrier. Do not expose panels to elements for more than 12 months after installation. If exposure anticipated past 12 months, apply joint treatments, weather-resistive barrier, or air barrier according to manufacturer's recommendations.

END OF SECTION 06 1600

SECTION 06 4116 - PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Plastic-laminate-clad architectural casework.
2. Casework hardware and accessories.
3. Shop finishing.

1.2 DEFINITIONS

A. ANSI/AWI 0641 Surface Categories:
1. Exposed Exterior: All exterior surfaces of casework exposed to view, including:
   a. All surfaces visible when doors and drawers are closed, including knee spaces.
   b. Underside of casework bottoms located over 42 inches above the finished floor, including casework bottoms behind light valances and the bottom edge of light valances.
   c. Casework tops located below 80 inches above the finished floor.
   d. Casework tops located 80 inches and over above finish floor and visible from an upper building level or floor.
   e. Front edges of stretchers, ends, divisions, partitions, tops, and bottoms.
   f. Visible sloping casework tops.
2. Exposed Interior: All interior surfaces exposed to view in open casework or behind transparent doors, including:
   a. Shelves, including edgebanding (i.e., front edges).
   b. Divisions and partitions (excluding front edges which are defined as Exterior surfaces).
   c. Interior faces of ends (sides), backs, and bottoms, including pull-out components.
   d. Interior surfaces of casework top members located 36 inches or more above the finished floor.
   e. Interior faces of doors.
   f. Interior face of applied drawer fronts.
3. Semi-Exposed: Interior surfaces only exposed to view when doors or drawers are opened, including:
   a. Tops and bottom of shelves, including front edges and edgebanding.
   b. Divisions and partitions (excluding front edges which are defined as Exterior surfaces).
   c. Interior faces of ends (sides), backs, and bottoms; including pull-out components.
   d. Interior surfaces of casework top members located 36 inches or more above finish floor.
   e. Drawer sides, sub-fronts, backs, and bottoms.
   f. Underside of casework bottoms located between 24 inches and 42 inches above finish floor.
   g. Security panels.
   h. Drawer stretchers.
4. Concealed: Exterior and interior surfaces that are covered or not normally exposed to view, including:
   a. Toe spaces, unless otherwise specified.
   b. Sleepers, stretchers, and solid sub-tops.
   c. Underside of casework bottoms located less than 24 inches above the finished floor.

d. Flat tops of casework located 80 inches or more above the finished floor, except if visible from an upper building level or floor.
e. The three non-visible edges of adjustable shelves.
f. Underside of knee spaces, aprons, and drawer boxes that are less than 36 inches above finish floor.
g. Faces of casework ends of adjoining units that butt together.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate sizes and locations of framing, blocking, furring, installation reinforcements, and other related Work specified in other Sections to support loads imposed by installed and fully-loaded casework.

B. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: Manufacturer's specifications and technical data for the following:
1. Core material.
2. High-pressure decorative laminate.
3. Glazing.
4. Hardware.
5. Shop finishing materials.

B. Shop Drawings: Comply with AWI 100 and as follows:
1. Include dimensioned plans, elevations, sections, and attachment details.
2. Show dimensions of rough-in openings.
3. Show elevations and locations of each assembly.
4. Indicate material thickness.
5. Indicate core materials and edge treatments.
6. Show drawer locations, door locations, door swings, and hinge locations.
7. Show large-scale details.
8. Show locations and sizes of cutouts and holes for items installed in architectural casework.
9. Show locations and sizes of furring, blocking, nailers, and anchor strips, including concealed blocking and reinforcement specified in other Sections.

C. Samples for Architect's Selection:
1. High-Pressure Decorative Laminate: Manufacturer's standard size, indicating full range of colors and patterns.
2. Edge Banding: 6-inch (152-mm) long strip of each type of edge banding required, indicating full range of colors and patterns.

D. Samples for Architects Final Approval:
1. High-Pressure Decorative Laminate Panels: 8 inches by 8 inches (200 mm by 200 mm), for each type, color, pattern, and finish selected.
2. For panel products, submit Sample with edge banding on one long edge.

1.5 INFORMATIONAL SUBMITTALS

A. Test Reports: Valid AWI "Performance Quality Test Report" indicating compliance with specified ANSI/AWI 0641 Structural Performance Duty Level.

B. Qualification Data: For manufacturer and installer.

1.6 QUALITY ASSURANCE

A. Manufacturer and Installer: 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 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.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver casework until overhead Work is completed, and painting and similar finish operations that might damage architectural casework have been completed in installation areas.

B. Store casework on a flat, level clean surface, elevated off the floor and protected from sunlight, excessive heat, cold, and moisture.

C. Store casework in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.8 FIELD CONDITIONS

A. Environmental Controls: Do not deliver or install casework until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 degrees F (16 and 32 degrees C) and relative humidity between 30 and 55 percent 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. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed/concealed by construction, and indicate measurements on Shop Drawings.

PART 2 PRODUCTS

2.1 PLASTIC-LAMINATE-CLAD CASEWORK

A. Performance Requirements:
1. Structural Performance: ANSI/AWI 0641 Duty Level 3.
2. Aesthetic Performance: ANSI/AWI 0641 Premium Grade.

B. Provide casework in sizes, profiles, and with interior clearances indicated on Drawings.
   1. Casework Construction Type: Frameless.
   2. Door and Drawer-Front Style: Flush overlay.
   3. Pattern Direction for High-Pressure Decorative Laminate:
      a. Casework Doors: Vertical, with continuous vertical pattern matching.
      b. Casework Drawers: Vertical, with continuous vertical pattern matching with doors.
      c. End Panels: Vertical.
      d. Bottoms: Side to side.
      e. Tops: Side to side.
      f. Knee Space Panels: Vertical.
      g. Aprons: Horizontal.

C. Box Construction:
   1. Exposed Exterior Surfaces: High-pressure decorative laminate.
      a. Thickness: Complying with structural performance requirements specified.
      b. Edgebanding: 0.12 inch PVC, color and pattern matching adjacent face surface, square edge.
   2. Exposed Interior Surfaces: Same material as exposed exterior surfaces.
      a. Thickness: Complying with structural performance requirements specified.
      b. Edgebanding: 0.12 inch PVC, color and pattern matching adjacent face surface, square edge.
   3. Semi-Exposed Surfaces: High-pressure decorative laminate.
      a. Thickness: Complying with structural performance requirements specified.
      b. Edgebanding: 0.12 inch PVC, color and pattern matching adjacent face surface, square edge.
   4. Base Cabinet Stretchers: Complying with structural performance requirements specified.
   5. Nailers and Anchor Strips: Complying with structural performance requirements specified.
   6. Aprons: Material and thickness to match adjacent exposed exterior casework material.
   7. Security Panels: 1/4-inch thick panel product.
      a. Location: Provide above each drawer indicated to have lock.
   8. Base Construction: Complying with structural performance requirements specified.
      a. Material: Manufacturer has option of the following, unless otherwise indicated on Drawings:
         1) Manufacturer's standard panel product, not less than 11/16-inch thick.
            a) Moisture Resistance: Swell factor of not more than 5 percent when tested in accordance with ASTM D1037.
         2) Leg levelers with panel product not less than 11/16-inch thick.
            a) Moisture Resistance: Swell factor of not more than 5 percent when tested in accordance with ASTM D1037.
      b. Height: 4 inches unless otherwise indicated on Drawings.
      c. Toe Kick Finish: Manufacturer’s standard.

D. Shelf Construction: Material and edge treatment to match semi-exposed surfaces.
   1. Thickness: Complying with structural performance requirements specified.

E. Drawer Construction: Provide drawers with exposed front fastened to sub-front of drawer box.
   1. Drawer Box: Construct to comply with structural performance requirements indicated using materials complying with ANSI/AWI 0641.
   2. Drawer Fronts: Matching exposed exterior surfaces.

F. Door Construction:
   1. Flush Doors: Material and edgebanding to match exposed exterior casework material.

a. Thickness:
1) Hinged Doors: Complying with structural performance requirements specified, but not less than 11/16-inch thick.
b. Inside Face of Door: Complying with aesthetic performance requirements specified.

G. Locks: Provide at locations indicated on Drawings.

2.2 MATERIALS

A. High-Pressure Decorative Laminate (HPDL) Panels:
1. High-Pressure Decorative Laminate (HPDL): ISO 4586.
a. Grades:
1) Horizontal Surfaces: HGS, HGL, or HGP.
2) Vertical Surfaces: HGS, VGS, or VGL.
3) Vertical Postformed Surfaces: VGP.
4) Concealed Backs of HPDL Panels: BKL.
b. PL-#, Color and Pattern: Refer to Material Finish Key.
2. Core: Comply with AWI 300 and structural performance requirements specified.

B. Panel Products:
1. Medium Density Fiberboard (MDF): ANSI A208.2, MR50.
a. Grade: Complying with structural performance requirements specified.
2. Medium Density Overlay (MDO): Softwood plywood, DOC PS 1, with medium-density overlay.
3. Hardwood Plywood: ANSI/HPVA HP-1.

C. Glass:
1. Clear Tempered Glass: ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality q3, complying with 16 CFR 1201, Category II and ANSI Z97.1.
a. Thickness: 0.12 inch.

2.3 HARDWARE

A. Acceptable Manufacturers: Provide Basis-of-Design product, if indicated below, or provide comparable product by one of the following:
1. Accuride.
2. Blum.
3. CompX Security Products.
4. Doug Mockett & Company.
5. Grass America.
6. Hafele America Co.
7. Hettich America.
8. Knape & Vogt.
9. C.R. Laurence.
10. Richelieu.
11. SOSS Door Hardware.
12. Sugatsune America.

B. Concealed European-Type Hinges: ANSI/BHMA A156.9, B01602, self-closing.

1. Opening Degree: Between 95 to 110.
2. Quantity:
    a. Provide not less than 2 hinges for each swinging door under 42 inches in height.
    b. Provide not less than 3 hinges for each swinging door 42 inches and over.

C. Door and Drawer Locks: Five-pin tumbler lock, with strike plates; key removable in both locked and unlocked positions.
1. Pull Force: Not less than 50 pounds (22.7 kg) in any direction when locked.
2. Door Locks: ANSI/BHMA A156.11, E07121.
3. Drawer Locks: ANSI/BHMA A156.11, E07041.
4. Finish: ANSI/BHMA A156.18, 613 or 640.
5. Keying: As directed by Architect, including master key system.

D. PU-1 and PU-2, Door and Drawer Pulls: As indicated on Material Finish Key.
1. Finish: ANSI/BHMA A156.18, 613 or 640.
2. Quantity: As indicated on Interior Elevations.

E. Door Catches: ANSI/BHMA A156.9, B03071, magnetic type.
1. At pairs of locked swinging doors, provide spring-loaded elbow catch with steel strike plate at one leaf.
2. Quantity:
    a. Provide 1 door catch for each swinging door 48 inches and less in height.
    b. Provide 2 door catches for each swinging door over 48 48.03 inch inches in height.

F. Door and Drawer Bumpers: ANSI/BHMA A156.16, L03011, self-adhering clear silicone.
1. Quantity:
    a. Swinging Doors: Provide 1 bumper at top and bottom of closing edge of each door.
    b. Drawers: Provide 1 bumper at back side of each drawer front corner.

G. Drawer Slides: ANSI/BHMA A156.9, Grade 1, with integral soft-close damper.
1. Mounting: Side mount, and extending under bottom of drawer.
2. Type: Full extension.
3. Material: Zinc-plate steel with polymer rollers
4. Load Capacity:
    a. For drawers not more than 3 inches high and not more than 24 inches wide, provide Grade 1.
    b. 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.
    c. For drawers more than 6 inches high or more than 24 inches wide, provide Grade 1HD-200.

H. Shelf Rests: ANSI/BHMA A156.9, B04013; metal.

I. Adjustable Shelf Supports: Complying with structural performance requirements specified.
1. Finish: Mill finish.

2.4 ACCESSORIES

A. Furring, Blocking, Nailers, Shims, Anchor Strips: Fire-retardant-treated softwood lumber, kiln-dried.
1. Maximum Moisture Content: 15 percent.

B. Anchors and Fasteners:
   1. Nails: Size and type to suit application; plain finish.
   2. Bolts, Nuts, Washers, Blind Fasteners, and Screws: Size and type to suit application.
      a. Drywall and bugle head screws are not allowed.
      b. Finish: Nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
   3. For fasteners through exposed interior surfaces, provide cover caps of color compatible with casework finish.

C. Adhesives: Do not use adhesives that contain urea formaldehyde.

2.5 FABRICATION

A. Shop-fabricate architectural casework, including installation of hardware, doors, and drawers, to maximum extent possible.

B. When necessary to cut and fit at Project site, provide materials with ample allowance for cutting.

C. Provide cutouts of casework to accommodate hardware, appliances, plumbing, mechanical, electrical, communications, audio visual, computer equipment, and similar items.
   1. Sand and seal edges of cutouts.

D. Install hardware in accordance with hardware manufacturer's written instructions using fasteners furnished by hardware manufacturer.

E. Install glass in doors in compliance with NGA's GANA Glazing Manual.

F. Fabrication Tolerances: Comply with ANSI/AWI 0641.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine areas and conditions under which Work is to be performed and identify conditions detrimental to proper and timely completion.
   1. Ensure rough-in openings, built-in anchorage, blocking, and reinforcing for proper installation of Work are correctly sized, installed, and located.
   2. Verify size and locations of cutouts for appliances, special equipment, sinks, plumbing, and other items to be mounted in or adjacent to casework.
   3. Verify casework and materials required for installation have been delivered, handled, and stored in accordance with AWI 200 and requirements specified in PART 1 "Delivery, Storage, and Handling" Article.
   4. Verify field conditions comply with AWI 200 and requirements specified in PART 1 "Field Conditions" Article.
   5. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Acclimate casework to the environment in which it will be installed for a minimum of 72 hours prior to installation. Comply with AWI 200.

3.3 INSTALLATION

A. Install casework in accordance with manufacturer's written instructions and ANSI/AWI 0620, complying with requirements for the aesthetic and structural performance specified.

B. Install casework level, plumb, square, and in true line.
   1. Shim as required with concealed wood or plastic shims.

C. Install casework without distortion, ensuring that doors and drawers are accurately aligned.
   1. Align doors and drawer fronts to achieve straight vertical and horizontal line with consistent width gaps complying with specified tolerances.
   2. Center doors and drawers in openings.

D. Anchor casework in accordance with manufacturer's written instructions. Where casework manufacturer does not have written installation instructions, anchor casework in accordance with recommendations of "AWI Installation Guidelines: Casework Wall Anchorage" and the following:
   1. Fasten base and wall cabinets through backs of casework, near top and bottom, at ends, and not more than 16 inches on center. Anchor wall cabinets over 48 inches wide at 12 inches on center.
      a. For casework taller than 60 inches, Provide additional fastener at mid height.
      b. At wood framing, wood blocking, wood nailers, and wood anchor strips, use No. 10 wafer-head screws, sized for 1-1/2-inch (38-mm) penetration into wood.
      c. At metal framing or metal backing, use No. 10 wafer-head sheet metal screws.
   2. Secure adjoining casework together using not less than two threaded steel, semi-concealed, joint fasteners, located at front of casework.

E. Install fillers and scribe and cut casework to fit adjacent construction in accordance with ANSI/AWI 0620.

F. Install hardware in accordance with hardware manufacturer's written instructions using fasteners furnished by hardware manufacturer.

G. Installation Tolerances: Comply with ANSI/AWI 0620 for aesthetic performance specified, including the following:
   1. Variation in Level: 1/8 inch in 8 feet.
   2. Variation in Plumb: 1/8 inch in 8 feet.

3.4 ADJUSTING

A. Adjust doors, drawers, hardware, and other moving or operating parts to function smoothly and correctly.

3.5 CLEANING

A. Clean exposed and semi-exposed surfaces, hardware, fittings, fixtures, and glass materials.

END OF SECTION 06 4116

SECTION 06 8316 - FIBERGLASS REINFORCED PANELING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fiberglass reinforced plastic panels.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Fiberglass Reinforced Plastic Panels: Provide Basis-of-Design Product as listed below or comparable product by one of the following:
   1. Crane Composites, Inc.
   2. Marlite, Inc.
   3. Nudo Products, Inc.
   4. Panolam Industries International, Inc.

2.2 PANEL SYSTEMS

A. Wall Panels:
   1. Basis-of-Design: Marlite; Standard FRP.
   2. Panel Size: 4 by 8 feet.
   3. Panel Thickness: 0.09 inch.
   4. Surface Design: Embossed.
   5. Color: White.
   6. Attachment Method: Adhesive only, sealant joints, no trim.

2.3 MATERIALS

A. Panels: Fiberglass reinforced plastic (FRP), complying with ASTM D5319.
   1. Surface Burning Characteristics: Maximum flame spread index of 25 and smoke developed index of 450; when system tested in accordance with ASTM E84.
   2. Class 1 fire rated when tested in accordance with FM 4880.

B. Adhesive: Type recommended by panel manufacturer.

C. Sealant: Type recommended by panel manufacturer; white.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions and substrate flatness before starting work.

B. Verify that substrate conditions are ready to receive the work of this section.

3.2 INSTALLATION

A. Install panels in accordance with manufacturer's instructions.

B. Cut and drill panels with carbide tipped saw blades, drill bits, or snips.

C. Apply adhesive to the back side of the panel using trowel as recommended by adhesive manufacturer.

D. Apply panels to wall with seams plumb and pattern aligned with adjoining panels.

E. Install panels with manufacturer's recommended gap for panel field and corner joints.

F. Seal gaps at floor, ceiling, and between panels with applicable sealant to prevent moisture intrusion.

G. Remove excess sealant after paneling is installed and prior to curing.

END OF SECTION 06 8316

SECTION 07 0543 - CLADDING SUPPORT SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Cladding support systems, insulation penetrating.

1.2 ABBREVIATIONS AND ACRONYMS

A. CMH: Composite metal hybrid.

B. FRP: Fiber-reinforced polymer.

C. PVDF: Polyvinylidene Fluoride.

D. Zn-Al-Mg: Zinc-aluminum-magnesium.

1.3 DEFINITIONS

A. Continuous Insulation: As defined by ASHRAE Std 90.1 I-P.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate cladding support system requirements with requirements of exterior structural wall assemblies and cladding system.

B. Preinstallation Meetings:
1. Schedule meeting to occur after final approval of submittals by Architect.
2. Agenda: Review exterior structural wall assembly requirements, cladding layout, cladding fastening requirements, unique details, installation procedures, and potential interference and conflicts with adjacent construction.
3. Required Attendees: Contractor, Owner, Architect, and Construction Manager, cladding support system subcontractors, cladding subcontractors, and exterior structural wall assembly subcontractors.

1.5 ACTION SUBMITTALS

A. Product Data: Manufacturer's published descriptive data, including product attributes.
1. Include data for cladding support system, wall fasteners, and wall anchors.

B. Shop Drawings: For each cladding support system; indicate:
1. Sections: Include column centers, elevations, and dimensions; indicate locations of system components, component spacings, and wall fasteners.
   a. Drawing Scale: 1/8 inch to 1 foot, minimum.
2. Details: Connection details between cladding support systems and substrates and adjacent construction; indicate fastener size and spacing.

a. Drawing Scale: 1-1/2 inches to 1 foot, minimum.

C. Delegated Design Documents: Submit signed and sealed documents by structural engineer of record responsible for comprehensive design package of cladding system, including wall fasteners and anchors. Submit structural design, rail spacing, and calculations sufficient to comply with structural design criteria of this section.

D. Design Data: Submit project-specific thermal performance values for above-grade walls; prepared by professional engineer; substantiate values based on alternative compliance methods described in ASHRAE Std 90.1 I-P or ICC (IECC) and acceptable by AHJ.
1. Submit comprehensive, three-dimensional, thermal modeling report indicating framing system's impact on continuous insulation U-factors.

E. Samples:
1. Rails Per Type: Two units, 12 inches long.
2. Clips Per Type: Two units.

1.6 INFORMATIONAL SUBMITTALS

A. Test Reports: Submit test reports for each type of cladding support system performed by qualified testing agency for manufacturer; indicate results that meet or exceed specified criteria.

B. Manufacturer's Instructions: Submit manufacturer's written installation instructions.

C. Manufacturer Reports: Manufacturer's field representative installation inspection reports.

D. Qualifications: for Delegated design engineer, manufacturer, installer, and testing agency.

E. Specimen warranty.

1.7 QUALITY ASSURANCE

A. Qualifications:
1. Delegated Designer Qualifications: Qualified professional structural engineer experienced in design of cladding support systems, associated wall fasteners and anchors, and licensed in the State in which the Project is located.
2. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least five years of documented experience.
3. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience and approved by manufacturer.
4. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of type specified in this section.

B. Documents at Project Site: Maintain at project site one copy of manufacturer's installation instructions and shop drawings.

1.8 MOCK-UPS

A. Construct cladding support system mock-up, 12 feet long by 8 feet high.
1. Include cladding support system, exterior structural wall assembly, and wall anchors.

B. Locate where directed.

C. Mock-up may remain as part of work.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to project site in wrapped, protected, unbroken packaging with product identification labeling.

B. Store products under cover and elevated above grade.

C. Handle products without damaging; prevent bending, warping, and twisting to surfaces, edges, or corners.

1.10 WARRANTY

A. Manufacturer Warranty: Provide 2-year manufacturer warranty against structural failure of cladding support system. Complete forms in Owner's name and register with manufacturer.

B. Manufacturer's Special Warranty: Provide 10-year warranty for cladding support system components, including structural failure of components, commencing on Date of Substantial Completion. Complete forms in Owner's name and register with warrantor.

C. Installer Warranty: Provide 2-year warranty against installation defects commencing on Date of Substantial Completion. Complete forms in Owner's name and register with installer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide Basis-of-Design Product or comparable product from one of the following manufacturers:
1. Advanced Architectural Products, LLC.
2. Armatherm.
3. Cascadia Windows.
4. Cladding Corp.
5. Hohmann & Barnard, Inc.
6. Knight Wall Systems.
7. Northern Facades.
8. SFS Group USA, Inc.

B. Source Limitations: Provide complete cladding support system including wall fasteners and wall anchors from single manufacturer.

2.2 PERFORMANCE CRITERIA

A. Surface Burning Characteristics: Provide cladding support systems with a flame spread index (FSI) of 25 or less, and a smoke developed index (SDI) of 450 or less, when tested in accordance with ASTM E84 or UL 723.

B. Fire Propagation Requirements of Exterior Wall Assemblies: Tested in accordance with, and comply with, the acceptance criteria of NFPA 285.

2.3 DESIGN CRITERIA

A. Structural Design Services: Provide Contractor's design-related professional services for structural design of cladding support systems based on the following criteria:
1. Design Loads: Exterior wall design loads as indicated on structural drawings.
2. Fastener Design Criteria: Minimum safety factor of three for both tension and shear values.
3. Thermal Movement Design Criteria: Cladding systems allow for thermal movements without overstressing components and evidence of permanent component defects, based on maximum ambient temperature of 120 degrees F.

2.4 EXTERIOR WALL ASSEMBLIES WITH CLADDING SUPPORT SYSTEMS

A. See drawings for assemblies and cladding support system substrates.

B. Depth of Air-Gap Cavity: As indicated on drawings.

C. Depth of Insulation: As indicated on drawings.

D. Cladding Support System Applications:
1. Insulation-penetrating cladding support system; with in-fill continuous insulation integrated within metal wall panel exterior wall cladding.

2.5 CLADDING SUPPORT SYSTEMS, INSULATION PENETRATING

A. Z-Shaped, Composite Metal Hybrid Thermally Improved Fiber-Reinforced Polymer (FRP) Girts With Steel Inserts:
1. Description: Z-shaped, FRP girts with outboard and inboard faces; reinforced with integral, continuous, zinc-coated, steel sheet inserts.
2. Attachment to Substrate: Girts penetrate continuous insulation; wall fasteners attach inboard faces of girts to mass exterior wall assemblies.
3. Girt Seals: Integral three-point compression seal and anti-siphon grooves on exterior and interior flanges.
4. Rigid Foam Insulation Applications:
   a. Zinc-coated steel sheet splines to stabilize insulation panels.
5. Steel Inserts and Splines: Zinc-coated steel sheets.
   a. Thickness: 16 gauge, 0.060 inch, minimum.
6. Girt Depth: As indicated on drawings.
7. Girt Length: Manufacturers standard length units; but less than 96 inches.
8. Orientation: Horizontal or vertical as required by cladding system manufacturer to support cladding system orientation indicated within drawings.
9. Rail Spacing: 24 inches on center.
10. Composite Trim Material for Openings:

a. Nonstructural Composite Material Trim: Provide manufacturer's standard trim, angles, and similar components at transitions and rough openings meeting performance requirements as indicated.
1) Trim Types: Provide angles and flat trim at locations as indicated on drawings and as required to create complete installation.
a) Angled Trim: 2 by 3 inches, nominal.
b) Flat Trim: 6 inches wide nominal.

11. Basis of Design Product: Subject to compliance with requirements, provide the following or comparable product by another manufacturer.
a. Advanced Architectural Products, LLC;GreenGirt CMH Sub Framing System.

2.6 MATERIALS

A. Zinc-Aluminum-Magnesium (Zn-Al-Mg)-Coated Steel Sheet:
1. ASTM A1046/A1046M, Designation SS, Grade 50, Class 2; Coating Designation ZM40.
2. Thickness: 18 gauge, 0.048 inch.
3. Finish: Superior performing organic coatings complying with AAMA 2605, multiple coats, thermally cured polyvinylidene fluoride system; finish one side only.
a. Color: Black.

B. Aluminum-Zinc-Alloy Coated Steel Sheet: ASTM A792/A792M, AZ50 coating designation.

C. Fiberglass Reinforced Polymer (FRP):
1. Polyester resin matrix with recycled materials and fire-retardant additives; reinforced with glass strand rovings for longitudinal strength and continuous strand glass mats or stitched reinforcements for transverse strength.

2.7 FABRICATION

A. Shop fabricate to greatest extent possible.

2.8 ACCESSORIES

A. Miscellaneous Nonstructural Accessories: Provide nonstructural accessories; flashings, sealants, tapes, and shims as recommended by manufacturer, suitable for project-specific applications, and compatible with system components.

B. Miscellaneous Structural Metal Accessories: For metal accessories under superimposed structural loads, provide corrosion-resistant-coated steel bracing, furring, and clips in accordance with manufacturer's recommendations.

C. Metal Accessories: Provide metal closure trim as recommended by manufacturer, suitable for project-specific applications, and compatible with system components.

D. Miscellaneous Thermal Isolation Accessories: Manufacturer's thermoplastic shims that do not decrease thermal or structural system performance, thickness, shape, and structural compressive strength suitable for project-specific applications.

E. Fasteners Between Claddings and Cladding Support Systems:

1. Standard self-tapping metal screws.

F. Wall Anchors:
1. Manufacturer's corrosion-resistant-coated steel wall anchors with recommended washers for anchoring cladding support systems to concrete masonry structural wall assemblies.
   a. Structural Performance: Manufacturer's wall anchors; type, spacing, and embedment in accordance with Contractor-provided structural design of cladding system.
   b. Thermal Performance: Manufacturer's wall anchors with thermally isolated polymer washers.
2. Concrete Masonry Wall Substrates: Manufacturers recommended masonry or concrete screw anchors in predrilled holes.

G. Wall Fasteners:
1. Manufacturer's corrosion-resistant-coated steel wall fasteners for attaching cladding support systems to steel-framed structural wall assemblies.
   a. Structural Performance: Manufacturer's wall fasteners; type, spacing, and embedment in accordance with Contractor-provided structural design of cladding system.
   b. Thermal Performance: Manufacturer's wall fasteners with thermally isolated polymer washers.
2. Cold-Formed Steel Substrates: Manufacturer's recommended self-tapping metal screws.

H. FRP-Steel Attachments: Comply with ANSI/ACMA/PIC (CSP).

PART 3 EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:
1. Verify substrates comply with contract documents, including specified tolerances, and are ready to receive work of this section.
2. Verify air barrier, wall flashing, and rigid insulation work comply with contract documents.

B. Do not commence installation until noncompliant conditions have been corrected.

3.2 PREPARATION

A. Protection of In-Place Conditions: Protect air barrier work from damage.

B. Surface Preparation:
1. Prepare substrate surfaces using methods in accordance with cladding support system manufacturer's written instructions.
2. Clean substrate surfaces before commencement of cladding support systems.

3.3 INSTALLATION

A. Install cladding support systems in accordance with Contractor-provided structural design and manufacturer's written instructions.
1. Do not us powder-, air-, or gas-actuated fasteners or actuated fastener tools; do not use impact wrenches when fastening to composite cladding support system members.

B. Installation of Wall Anchors in Concrete Masonry Wall Substrates: Install anchors in accordance with Contractor-provided structural design and manufacturer's published installation instructions.

3.4 TOLERANCES

A. Install cladding support systems plumb with noncumulative maximum variation of:
1. 1/4 inch in 20 feet.

B. Install cladding support systems level with noncumulative maximum variation of:
1. 1/4 inch in 20 feet.

3.5 FIELD QUALITY CONTROL

A. Manufacturer Services: Provide services of manufacturer's field representative to inspect installation of cladding support systems.

3.6 PROTECTION

A. Protect installed cladding support systems from subsequent construction operations.

END OF SECTION 07 0543

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SECTION 07 0553 - FIRE AND SMOKE ASSEMBLY IDENTIFICATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Identification markings for fire and smoke rated partitions, and fire rated walls.

1.2 ACTION SUBMITTALS

A. Product Data: Manufacturer's printed product literature for each type of marking, indicating font, foreground and background colors, wording, and overall dimensions.

B. Schedule: Completely define scope of proposed marking, and indicate location of affected walls and partitions, and number of markings.

C. Samples: Submit two samples of each type of marking proposed for use, of size similar to that required for project, illustrating font, wording, and method of application.

1.3 FIELD CONDITIONS

A. Do not install painted markings when ambient temperature is lower than recommended by coating manufacturer.

PART 2 PRODUCTS

2.1 FIRE AND SMOKE ASSEMBLY IDENTIFICATION

A. Regulatory Requirements: Comply with "Marking and Identification" requirements of "Fire-Resistance Ratings and Fire Tests" chapter of ICC (IBC).

B. Applied Fire and Smoke Assembly Identification: Identification markings applied to partition with paint and a code compliant stencil. See Section 09 9123 - Interior Painting for products.

C. Languages: Provide sign markings in English.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.2 PREPARATION

A. See Section 09 9123 - Interior Painting for substrate preparation for painted markings.

3.3 INSTALLATION

A. Locate markings as required by ICC (IBC).

B. Install applied markings in accordance with Section 09 9123 - Interior Painting.

C. Install neatly, with horizontal edges level.

D. Protect from damage until Date of Substantial Completion; repair or replace damaged markings.

END OF SECTION 07 0553

SECTION 07 1300 - SHEET WATERPROOFING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Self-adhered HDPE sheet membrane, post applied.

1.2 COORDINATION

A. Coordinate Work under this Section with adjacent concrete foundation work, including fill, other waterproofing systems, under-slab vapor retarders, under-slab insulation, and subdrainage systems.

B. Coordinate requirements for concrete formwork to provide suitable substrate for waterproofing and to minimize penetrations through waterproofing.

C. Coordinate formwork and form bracing requirements for blindside sheet waterproofing. Coordinate restrictions on use of form ties and other components as necessary to eliminate or minimize penetrations through blindside sheet waterproofing.

1.3 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 installation instructions for evaluating, preparing, and treating substrate.

B. Shop Drawings: Show locations and extent of waterproofing and details of substrate joints and cracks, expansion joints, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, air barrier, and other termination conditions.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturer's Installation Instructions: Indicate special procedures and acceptable installation temperatures.

B. Installer's qualification statement.

C. Field quality-control reports.

D. Specimen Warranty.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience and approved by manufacturer.

1.6 MOCK-UPS

A. Construct mock-up consisting of 100 sq ft of horizontal and vertical sheet waterproofing panel; to represent finished work including internal and external corners, seam jointing, attachment method, protective cover, and crack and joint treatments.

B. Locate where directed.

C. Mock-up may remain as part of work.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended in writing by waterproofing manufacturer. Do not apply waterproofing to frozen, damp, or wet substrates.
   1. Do not apply waterproofing when snow, rain, fog, or mist is present.

B. Maintain adequate ventilation during preparation and application of waterproofing materials.

1.8 WARRANTY

A. Contractor to correct defective Work within period of five years after Date of Substantial Completion; remove and replace materials concealing waterproofing at no extra cost to Owner.

B. Provide five year manufacturer warranty for waterproofing failing to resist penetration of water, except where such failures are the result of structural failures of building. Hairline cracking of concrete due to temperature change or shrinkage is not considered a structural failure.

PART 2 PRODUCTS

2.1 SHEET WATERPROOFING MATERIALS

A. Self-Adhered HDPE Sheet Membrane, Post-Applied: Recommended by manufacturer for placement on outside face of below grade concrete and concrete masonry unit (CMU) backfilled walls and select horizontal applications.
   1. Sheet Thickness: 30 mil, 0.030 inch, minimum, and with 20 mil, 0.020 inch thick adhesive.
   2. Hydrostatic Resistance: Resists pressure of 400 psi when tested in accordance with ASTM D751.
   3. Elongation at Break: 577 percent, minimum, measured in accordance with ASTM D412.
   4. Tensile Strength, Film: 5,000 psi, minimum, measured in accordance with ASTM D882.
   5. Water Vapor Permeance: Less than 0.1 perm, measured in accordance with ASTM E96/E96M.
   6. Adhesives, Sealants, Tapes, and Accessories: As recommended by membrane manufacturer.
   7. Products:
      a. GCP Applied Technologies; Preprufe 800PA.
      b. Polyguard Products, Inc; 650 Sheet Membrane.
      c. Tremco Commercial Sealants & Waterproofing; TREMproof 560A.
      d. W. R. Meadows, Inc; MEL-ROL.

2.2 ACCESSORIES

A. Furnish accessory materials as recommended in writing by waterproofing manufacturer for intended use and compatibility with sheet waterproofing.
   1. Furnish liquid-type accessory materials that comply with VOC limits of authorities having jurisdiction.

B. Sealant for Cracks and Joints In Substrates: Resilient elastomeric joint sealant compatible with substrates and waterproofing materials.

C. Flexible Flashings: Type recommended by membrane manufacturer.

D. Counterflashings: see Section 07 6200.

E. Termination Bars: Aluminum or Stainless steel; compatible with membrane and adhesives.

F. Surface Conditioner: Liquid, waterborne surface conditioner as recommended in writing for substrate by sheet waterproofing material manufacturer.

G. Substrate Patching Membrane: Low-viscosity, two-component, modified asphalt coating.

H. Cant Strips: Premolded composition material.

2.3 PROTECTION COURSE

A. Protection Board: Rigid insulation; see Section 07 2100 - Thermal Insulation.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions are acceptable prior to starting work.

B. Verify substrate surfaces are durable; free of matter detrimental to adhesion or application of waterproofing system.

C. Verify that items penetrating surfaces to receive waterproofing are securely installed.

D. Where existing conditions are responsibility of another installer, notify Architect of unsatisfactory conditions.

E. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protect adjacent surfaces from damage not designated to receive waterproofing.

B. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions.

C. Do not apply waterproofing to surfaces unacceptable to membrane manufacturer.

D. Fill nonmoving joints and cracks with a filler compatible with waterproofing materials.

E. Seal moving cracks with sealant and nonrigid filler, using procedures recommended by sealant and waterproofing manufacturers.

F. Prepare building expansion joints at locations as indicated on drawings.

G. Surfaces for Adhesive Bonding: Apply surface conditioner at a rate recommended by manufacturer, and protect conditioner from rain or frost until dry.

H. Concrete Surfaces for Adhesive Bonding: Prepare concrete substrate in accordance with ASTM D5295/D5295M.
1. Remove substances that inhibit adhesion including form release agents, curing compounds admixtures, laitance, moisture, dust, dirt, grease and oil.
2. Repair surface defects including honeycombs, fins, tie holes, bug holes, sharp offsets, rutted cracks, ragged corners, deviations in surface plane, spalling and delaminations, as described in reference standard.
3. Remove and replace areas of defective concrete; see Section 03 3000.
4. Prepare concrete for adhesive bonded waterproofing using mechanical or chemical methods described in referenced standard.
5. Test concrete surfaces as described in referenced standards, and verify surfaces are ready to receive adhesive bonded waterproofing membrane system.

3.3 INSTALLATION - MEMBRANE

A. Install membrane waterproofing in accordance with manufacturer's instructions.

B. Roll out membrane, and minimize wrinkles and bubbles.

C. Self-Adhering Membrane: Remove release paper layer, and roll out onto substrate with a mechanical roller to provide full contact bond.

D. Overlap edges and ends, minimum 3 inches, seal permanently waterproof by method recommended by manufacturer, and apply uniform bead of sealant to joint edge.

E. Reinforce membrane with multiple thickness of membrane material over joints, whether joints are static or dynamic.

F. Weather lap joints on sloped substrate in direction of drainage, and seal joints and seams.

G. Flexible Flashings: Seal items watertight that penetrate through waterproofing membrane with flexible flashings.

H. Seal membrane and flashings to adjoining surfaces.
1. Install termination bar along edges.
2. Install counterflashing over exposed edges.

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 site 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.

3.5 PROTECTION

A. Do not permit traffic over unprotected or uncovered membrane.

END OF SECTION 07 1300

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SECTION 07 1900 - WATER REPELLENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Water repellents applied to exterior, masonry and concrete surfaces.

1.2 ACTION SUBMITTALS

A. Product Data: Provide product description, details of tests performed, limitations, chemical composition, and VOC content.
   1. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention; cautionary procedures required during application.

B. Samples: For each type of water repellent and substrate indicated, 12 by 12 inches (300 by 300 mm) in size, with specified water-repellent treatment applied to half of each Sample.

1.3 INFORMATIONAL

A. Preconstruction Testing Reports: For water-repellent-treated substrates.

B. Manufacturer's Field Reports: Report whether manufacturer's "best practices" are being followed; if not, state corrective recommendations. Email report to Architect the same day as inspection occurs; mail report on manufacturer's letterhead to Architect within 2 days after inspection.

C. Installer's Qualification Statement.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience and approved by manufacturer

B. Owner reserves the right to provide continuous independent inspection of surface preparation and application of water repellent.

1.5 MOCK-UPS

A. Prepare representative surface 36 by 36 inches in size using specified materials and preparation and application methods on surfaces identical to those to be coated; approved mock-up constitutes standard for workmanship.

B. For proposed substitutions, prepare side-by-side mock-ups of specified and substitute products.

C. Locate where directed.

D. Mock-up may remain as part of work.

1.6 FIELD CONDITIONS

A. Limitations: Proceed with application only when the following existing and forecasted weather and substrate conditions permit water repellents to be applied according to manufacturers' written instructions and warranty requirements:
   1. Protect liquid materials from freezing.
   2. Concrete surfaces and mortar have cured for not less than 28 days.
   3. Building has been closed in for not less than 30 days before treating wall assemblies.
   4. Ambient temperature is above 40 deg F (4.4 deg C) and below 100 deg F (37.8 deg C) and will remain so for 24 hours.
   5. Substrate is not frozen and surface temperature is above 40 deg F (4.4 deg C) and below 100 deg F (37.8 deg C).
   6. Rain or snow is not predicted within 24 hours.
   7. Not less than 24 hours have passed since surfaces were last wet.
   8. Windy conditions do not exist that might cause water repellent to be blown onto vegetation or surfaces not intended to be treated.

1.7 WARRANTY

A. Correct defective Work within a five year period after Date of Substantial Completion.

B. Special Warranty: Manufacturer's standard form in which Applicator agree(s) to repair or replace materials that fail to maintain water repellency due to materials and/or workmanship as specified within specified warranty period. Warranty does not include deterioration or failure of coating due to unusual weather phenomena, failure of prepared and treated substrates, and new substrate cracks in excess of 1/16 inch wide, fire, vandalism, or abuse by maintenance equipment.
   1. Warranty Period: Five years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Water repellents shall meet performance requirements indicated without failure due to defective manufacture, fabrication, or installation.

B. Water Absorption: Minimum 90 percent reduction of water absorption after 24 hours in comparison of treated and untreated specimens.
   1. Cast-in Place Concrete: ASTM C 642.
   2. Concrete Masonry Units: ASTM C 140.

C. Water Penetration and Leakage through Masonry: Minimum 90 percent reduction in leakage rate in comparison of treated and untreated specimens, according to ASTM E 514.

D. Durability: Maximum 5 percent loss of water-repellent properties after 2500 hours of weathering according to ASTM G 154 in comparison to water-repellent-treated specimens before weathering.

E. Chloride-Ion Intrusion in Concrete: NCHRP Report 244, Series II tests.
   1. Reduction of Water Absorption: 80 percent.

2.2 MATERIALS

A. Water Repellent: Non-glossy, colorless, penetrating, water-vapor-permeable, non-yellowing sealer, that dries invisibly leaving appearance of substrate unchanged.
   1. Applications: Exterior, horizontal surfaces.
   2. Number of Coats: Two.
   3. VOC Content: See Section 01 6116.
   4. Solvent-based, silane, siloxane, silane-siloxane blend, or siliconate that reacts chemically with concrete, masonry.
      a. Manufacturers:
         1) Diedrich Technologies Inc.; Diedrich 303 WB.
         2) Euclid Chemical; Chemstop WB Heavy Duty.
         3) PROSOCO, Inc.; Sure Klean Weather Seal H40.
         4) Sika USA; Sikagard-200 Enviroseal.
         5) SpecChem; White Roc 10 WB.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify joint sealants are installed and cured.

C. Verify surfaces to be coated are dry, clean, and free of efflorescence, oil, or other matter detrimental to application of water repellent.

3.2 PREPARATION

A. Protection of Adjacent Work:
   1. Protect adjacent landscaping, property, and vehicles from drips and overspray.
   2. Protect adjacent surfaces not intended to receive water repellent.

B. Prepare surfaces to be coated as recommended by water repellent manufacturer for best results.

C. Do not start work until masonry mortar substrate is cured a minimum of 60 days.

D. Remove loose particles and foreign matter.

E. Remove oil and foreign substances with a chemical solvent that will not affect water repellent.

F. Scrub and rinse surfaces with water and let dry.

3.3 APPLICATION

A. Apply water repellent in accordance with manufacturer's instructions, using procedures and application methods recommended as producing the best results.
   1. Precast Concrete: At Contractor's option, first application of water repellent on units may be completed before installing them. Mask mortar and sealant bond surfaces to prevent water repellent from migrating onto joint surfaces.

B. Apply at rate recommended by manufacturer, continuously over entire surface.

C. Apply two coats, minimum.

D. Remove water repellent from unintended surfaces immediately by a method instructed by water repellent manufacturer.

E. Provide manufacturer's field service representative to inspect preparation and application work continuously during entire application period to ensure that manufacturer's "best practices" for preparation and application are being followed.

3.4 CLEANING

A. Immediately clean water repellent from adjoining surfaces and surfaces soiled or damaged by water-repellent application as work progresses. Correct damage to work of other trades caused by water-repellent application, as approved by Architect.

B. Comply with manufacturer's written cleaning instructions.

END OF SECTION 07 1900

SECTION 07 2100 - THERMAL INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Extruded polystyrene foam-plastic board insulation.

B. Polyisocyanurate foam-plastic board insulation.

C. Mineral-wool batt insulation.

1.2 ACTION SUBMITTALS

A. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

B. Shop Drawings: Submit drawings that indicate location of joint or termination detail conditions, conditions of interface with other materials, and setting plan for insulation.

1.3 INFORMATIONAL SUBMITTALS

A. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

B. Installer's Certification: Listing type, manufacturer, and R-value of insulation installed in each element of the building thermal envelope.
   1. Sign, date, and post the certification in a conspicuous location on Project site.

C. Product Test Reports: For each product, for tests performed by a qualified testing agency.

D. Research Reports: For foam-plastic insulation, from ICC-ES.

1.4 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

1.5 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.

B. Protect foam-plastic board insulation as follows:
   1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
   2. Protect against ignition. Do not deliver foam-plastic board materials to Project site until just before installation time.

3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 PRODUCTS

2.1 FOAM BOARD INSULATION MATERIALS

A. Extruded Polystyrene (XPS) Board Insulation: Comply with ASTM C578 with either natural skin or cut cell surfaces.
   1. Type and Compressive Resistance: Type IV, 25 psi (173 kPa), minimum.
   2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
   3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   4. Type and Thermal Resistance, R-value: Type IV, 5.0 (0.88), minimum, per 1 inch thickness at 75 degrees F mean temperature.
   5. Board Edges: Square.
   6. Basis-of-Design Product: provide Owens Corning Corporation; FOAMULAR NGX Next Generation Extruded or comparable product by one of the following:
      a. DuPont de Nemours, Inc.
      b. Kingspan Insulation LLC.
   7. Application: Foundation/below grade walls.

B. Extruded Polystyrene (XPS) Board Insulation: Comply with ASTM C578 with either natural skin or cut cell surfaces.
   1. Type and Compressive Resistance: Type VII, 60 psi (414 kPa), minimum.
   2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
   3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   4. Type and Thermal Resistance, R-value: Type IV, 5.0 (0.88), minimum, per 1 inch thickness at 75 degrees F mean temperature.
   5. Board Edges: Square.
   6. Type and Water Absorption: Type XII, 0.3 percent by volume, maximum, by total immersion.
   7. Application: Underslab.

C. Extruded Polystyrene (XPS) Board Insulation: Comply with ASTM C578 with either natural skin or cut cell surfaces.
   1. Type and Compressive Resistance: Type V, 100 psi (690 kPa), minimum.
   2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
   3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   4. Type and Thermal Resistance, R-value: Type IV, 5.0 (0.88), minimum, per 1 inch thickness at 75 degrees F mean temperature.
   5. Board Edges: Square.
   6. Basis-of-Design Product: provide Owens Corning Corporation; FOAMULAR NGX Next Generation Extruded or comparable product by one of the following:
      a. DuPont de Nemours, Inc.
      b. Kingspan Insulation LLC.
   7. Application: High load underslab (appratus bay).

D. Polyisocyanurate (ISO) Board Insulation: Rigid cellular foam, comply with ASTM C1289.

1. Classifications:
   a. Type II: Faced with either cellulosic facers or glass fiber mat facers on both major surfaces of the core foam.
      1) Class 1 - Faced with glass fiber reinforced cellulosic facers on both major surfaces of core foam.
      2) Compressive Strength: Classes 1-2-3, Grade 1 - 16 psi (110 kPa), minimum.
      3) Thermal Resistance, R-value: At 1-1/2 inch thick; Class 2 - 8.0 (1.41), minimum, at 75 degrees F.
2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
4. Water Vapor Permeance: 1.2 perm, maximum, at 1 inch thickness, and when tested in accordance with ASTM E96/E96M, desiccant method.
5. Comply with fire resistance requirements indicated on drawings as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285.
6. Board Size: 48 inch by 96 inch.
7. Board Thickness: 1.5 inch.
8. Board Edges: Square.
9. Basis-of-Design Product: provide Sika USA, Rmax Inc; Durasheath or comparable product by one of the following:
   a. Atlas Roofing Corporation.
   b. Henry, a Carlisle Company.
   c. Ox Engineered Products.
10. Application: Continous and cavity insulation at Exterior walls (Type I-IV): Masonry, steel stud, FRTW stud; exterior stucco, re-siding; vaulted-ceilings; attics and crawls spaces.

E. Structural Insulating Block: High-compressive strength, rigid insulating block. Continuous structural thermal break block.
   1. Compressive Strength: 210 psi, minimum, in accordance with ASTM D1621 test methods.
   2. Compressive Modulus: 6,155 psi, minimum, in accordance with ASTM D1621 test methods.
   3. Water Absorption: 0.5 percent by volume, maximum.
   4. Complies with fire-resistance requirements indicated on drawings as part of exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285.
   5. Thermal Resistance: R-value of 3.85 per inch, minimum, at 75 degrees F, minimum, in accordance with ASTM C518 test methods.
   6. Basis-of-Design Product: provide Armatherm; Armatherm 500 Foundation Wall Thermal Break or comparable product by the following:
      a. Thermal Bridging Solutions.
      b. Fabreeka.
   7. Application: at masonry shelf angle, foundation to wall transition and cladding/facade connections.

2.2 MINERAL FIBER BATTS INSULATION MATERIALS

A. Flexible Glass Fiber or Mineral Wool BattsThermal Insulation: Preformed insulation, complying with ASTM C665; friction fit.
   1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
   2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.

3. Combustibility: Non-combustible, when tested in accordance with ASTM E136.
4. Formaldehyde Content: Zero.
5. Thermal Resistance: R-15, at 3-1/2-inches thick, per ASTM C518 on 16-inches o.c. in metal stud assembly.
6. Facing: Unfaced.
7. Products:
   a. Knauf Insulation; Performance+ EcoBatt Insulation.
   b. Owens Corning Corporation; PINK Next Gen FIBERGLAS Insulation.
   c. Nu-Wool; ECOCELL.
   d. ROCKWOOL; COMFORTBATT.
8. Application: Framed exterior wall cavitites, soffits, and attic cavity spaces.

2.3 ACCESSORIES

A. Mineral Wool Insulation Attachment:
   1. Basis-of-Design Products: provide product indicated below or comparable product submitted for Architect's review.
      a. TruFast Walls, a Division of Altenloh, Brinck & Co. US, Inc; Grip-Lok MW Plate.

B. Rigid Insulation Pronged Attachment Washers: Solid plastic cap washer with prongs and flexible perimeter seal attached with screws to substrate for attachment of rigid insulation and to help seal against air and moisture penetration through weather barrier assembly.
   1. Basis-of-Design Products: provide product indicated below or comparable product submitted for Architect's review.
      a. TruFast Walls, a Division of Altenloh, Brinck & Co. US, Inc; Thermal-Grip ci Prong Washer.

C. Gas-Actuated Insulation Fasteners: Galvanized steel pins driven through polypropylene anchor with 2-1/4-inch diameter washer head; suitable for fastening insulation to concrete, CMU, or steel studs, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.
   1. Basis-of-Design Products: provide product indicated below or comparable product submitted for Architect's review.
      a. TruFast Walls, a Division of Altenloh, Brinck & Co. US, Inc; Thermal-Grip Insulation Pin.

D. Insulation Fasteners: Impaling clip of galvanized steel with washer retainer and clips, to be adhered to surface to receive insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.

E. Nails or Staples: Steel wire; electroplated or galvanized; type and size to suit application.

F. Protection Board for Below Grade Insulation: Cementitious, 1/4 inch thick.

G. Adhesive: Type recommended by insulation manufacturer for application.

H. Flashing and Sealant: Provide tape, spray or trowel applied flashing for sealing joints, seams and veneer tie penetrations through board insulation as recommended by insulation manufacturer.

I. Stud Cavity Foam Insulation: Provide two component spray polyurethane foam (SPF) insulation applied to interior face of board insulation wall sheathing and interior studs, complies with ASTM C1029.
   1. Thickness: 1 inch minimum.

2. Thermal Resistance (R-value): At least 6.5, for thickness indicated at 75 degrees F.
3. Products: BASF; SPRAYTITE 81206.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.2 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products, applications and applicable codes.

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. First paragraph below is required by the International Energy Conservation Code unless insulation Installer is providing certification specified in "Informational Submittals" Article.

D. Install insulation with manufacturer's R-value label exposed after insulation is installed.

E. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

F. 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 FOUNDATION WALL INSULATION

A. Butt panels together for tight fit.

B. Adhesive Installation: Install with adhesive in accordance with manufacturer's written instructions.

3.4 INSTALLATION OF CAVITY-WALL INSULATION

A. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately 24 inches o.c. both ways on inside face and as recommended in writing by manufacturer.
   1. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions, and with faces flush.
   2. Press units firmly against inside substrates.
   3. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose and specified in Section 04 2000 - Unit Masonry.

B. Structural Insulating Blocks:

1. Verify manufacturer-recommended cure time for air and water barrier system and waterproofing before installing structural insulating block.
2. Install a single layer of cellular-glass structural insulating block with facers on top and bottom surfaces fully embedded into mortar set on brick ledge in accordance with manufacturer's written instructions.
3. Install cellular-glass structural insulating block maximum sizes to minimize joints.
4. Locate joints square to framing members. Do not cantilever cellular-glass structural insulating block.
5. Butt joints of cellular-glass structural insulating block with no gaps or mortar between joints.
6. Insulation board edges are to be butted together tightly and fit around openings and penetrations. Install square edges to fit square and tight.
7. Extend insulation in single course to cover entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Do not drill.

3.5 BOARD INSTALLATION USING CLADDING AND CONTINUOUS INSULATION SUPPORTS

A. Install supports in accordance with manufacturer's installation instructions.

B. Install supports in compliance with system orientation, sizes, and locations as indicated on drawings and in accordance with approved shop drawings.

C. Install supports to fill in exterior wall spaces without gaps or voids in insulation.

D. Trim insulation neatly to fit spaces and provide a continuous thermal layer.

3.6 BOARD INSTALLATION UNDER CONCRETE SLABS

A. Place insulation under slabs on grade after base for slab has been compacted.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

C. Prevent insulation from being displaced or damaged while placing vapor retarder and placing slab.

3.7 BATT INSTALLATION

A. Install insulation in accordance with manufacturer's instructions.

B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

E. Retain insulation batts in place with spindle fasteners at 12 inches on center.

3.8 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION 07 2100

SECTION 07 2119 - FOAMED-IN-PLACE INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Foamed-in-place insulation.
   1. At junctions of dissimilar wall and roof materials.

B. Thermal barrier protective coating.

1.2 ACTION SUBMITTALS

A. Product Data: Provide product description, insulation properties, overcoat properties, and preparation requirements.

1.3 INFORMATIONAL SUBMITTALS

A. Certificates: Certify that products of this section meet or exceed specified requirements, including ICC Evaluation.

B. Installer Qualification: Submit documentation of current contractor accreditation and current installer certification. Keep copies of all contractor accreditation and installer certification on site during and after installation. Present on-site documentation upon request.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified, with minimum three years documented experience, and approved by manufacturer or be certified by the Spray Polyurethane Foam Alliance (SPFA) Professional Certification Program (PCP).

1.5 FIELD CONDITIONS

A. Do not apply foam when temperature is below that specified by the manufacturer for ambient air and substrate.

B. Do not apply foam when temperature is within 5 degrees F of dew point.

PART 2 PRODUCTS

2.1 MATERIALS

A. Foamed-In-Place Insulation: Medium-density, 1.8 - 2.2lb/cu ft, rigid or semi-rigid, closed cell polyurethane foam; foamed on-site, using blowing agent of water or non-ozone-depleting gas.
   1. Regulatory Requirements: Comply with applicable code for flame and smoke, concealment, and fire protection requirements.

a. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
b. Fire Protection: Provide 15-minute thermal barrier of 1/2 inch gypsum board or equivalent material complying with NFPA 275 test method, or foamed-in-place insulation either exposed or with covering that complies with FM 4880, NFPA 286, UL 1040, or UL 1715.

2. Thermal Resistance: R-value of 7.1, minimum, per 1-inch thickness at 75 degrees F mean temperature when tested in accordance with ASTM C518.
3. Water Vapor Permeance: Vapor retarder; 2 perms, maximum, when tested at intended thickness in accordance with ASTM E96/E96M, desiccant method.
4. Water Absorption: Less than 2 percent by volume, maximum, when tested in accordance with ASTM D2842.
5. Air Permeance: 0.04 cfm per square foot, maximum, when tested at intended thickness in accordance with ASTM E2178 at 1.57 psf.
6. Closed Cell Content: At least 90 percent.
7. Surface Burning Characteristics: Flame spread/smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.
8. Products:
   a. BASF Corporation; WALLTITE US.
   b. Carlisle Spray Foam Insulation; SealTite PRO HFO.
   c. Enverge; Nexseal LE.
   d. Thermoseal USA; Thermoseal 5G.
   e. or comparable substitution submitted for approval
      1) Comparable Substitution must show compliance with NFPA 285 including submitted SPF within the cavity and air barrier specified in other sections. Contractor shall be responsible for supply product specific NFPA 285 documentations including required signed and sealed engineering judgements within the State of the Work.

2.2 ACCESSORIES

A. Primer: As required by insulation manufacturer.

B. Thermal Barrier Protective Coating: Material barrier intended to prevent flame-source access to foam and delay temperature-rise of foam during a fire event.
   1. Materials tested in accordance with and complying with acceptance criteria of both the Temperature Transmission Fire Test and the Integrity Fire Test of NFPA 275.
   2. Thermal Barrier Coating: Fire-protective intumescent coating formulated for application over polyurethane foam plastics, compatible with insulation, and passes NFPA 275 testing as part of an approved assembly.
      a. Products:
         1) International Cellulose Corporation; Ure-K 15-Minute Thermal Barrier.
         2) International Fireproof Technology Inc; DC315 Intumescent Coating.
         3) Flame Seal, LLC; TB-Pro Spray Foam Thermal Barrier.
   3. Flame Spread/Smoke Developed Index: 5/5, Class A, when tested in accordance with ASTM E84.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify work within construction spaces or crevices is complete before insulation application.

B. Verify that surfaces are clean, dry, and free of matter that may inhibit insulation or overcoat adhesion.

3.2 PREPARATION

A. Mask and protect adjacent surfaces from over spray or dusting.

B. Apply primer in accordance with manufacturer's instructions.

3.3 APPLICATION

A. Apply insulation in accordance with manufacturer's instructions to cured thickness required to achieve thermal resistance required.

B. Apply insulation by spray method, to a uniform monolithic density without voids.

C. Patch damaged areas.

D. Where applied to voids and gaps assure space for expansion to avoid pressure on adjacent materials that may bind operable parts.

E. Trim excess away for applied trim or remove as required for continuous sealant bead.

F. Install protective coating barrier material.
1. Do not cover insulation prior to required spray foam insulation inspections.

G. Apply protective coatings in accordance with manufacturer's written instructions and to comply with requirements for listing and labeling for fire-propagation characteristics and surface-burning characteristics specified.
1. Use equipment and techniques best suited for substrate and type of material applied as recommended by coating manufacturer.
2. Apply coatings to prepared surfaces as soon as practical after preparation and before subsequent surface soiling or deterioration.
3. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Produce sharp lines and color breaks.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect spray foam insulation installation, including accessories. Report results in writing.
1. Inspection will include verification of insulation and protective coating thickness and density.

3.5 PROTECTION

A. Do not permit subsequent construction work to disturb applied insulation.

END OF SECTION 07 2119

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SECTION 07 2726 - FLUID-APPLIED MEMBRANE AIR BARRIERS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Vapor-permeable, fluid-applied air barriers.

1.2 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.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
1. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. Include manufacturer's written instructions for evaluating, preparing, and treating each substrate; technical data; dry film thickness; 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.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer. Include list of ABAA-certified installers and supervisors employed by Installer, who work on Project.

B. 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 the barrier.

C. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.

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.
   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 and for preconstruction testing.
   1. Build integrated mockups of exterior wall assembly , 150 sq. ft. (14 sq. m), 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. Include junction with roofing membrane, building corner condition,and foundation wall intersection.
      b. 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.

1.7 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.

1.8 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 0.0002 cfm/sq. ft. of surface area at 75 Pa, when tested according to ASTM E2357.

2.3 MEDIUM-BUILD AIR BARRIERS, VAPOR PERMEABLE

A. Medium-Build, Vapor-Permeable Air Barrier: Synthetic polymer material with an installed dry film thickness, according to manufacturer's written instructions, of 17 to 30 mils (0.4 to 0.03 inch) over smooth, void-free substrates.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. DuPont Building Innovations: E. I. du Pont de Nemours and Company; DuPont Tyvek Fluid Applied WB.
      b. Rubber Polymer Corporation, Inc.; Rub-R-Wall Airtight VP.
      c. Sto Corp; StoGuard AirSeal.
      d. Sika USA; Sikagard-535.
      e. TK Products; TK-Airmax 2104 Vapor Permeable.
      f. W.R. Meadows, Inc; Air-Shield LMP.
   2. Physical and Performance Properties:
      a. Vapor Permeance: Minimum 22 perms; ASTM E96/E96M, Desiccant Method, Procedure A.
      b. Ultimate Elongation: Minimum 320 percent; ASTM D412, Die C.
      c. Adhesion to Substrate: Minimum 25 lbf/sq in when tested according to ASTM D4541.
      d. 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 reinforcing fabric and 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.

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 material.

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 expansion 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 ACCESSORIES INSTALLATION

A. Install accessory 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.
1. Coordinate the installation of air barrier 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.
3. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
4. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.

B. Connect and seal exterior wall air-barrier material 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.

C. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.

D. 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.

E. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply preformed silicone extrusion 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.
   1. Transition Strip: Roll firmly to enhance adhesion.

F. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air-barrier material with foam sealant.

G. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.

H. Seal top of through-wall flashings to air barrier with an additional 6-inch- (150-mm-) wide, transition strip.

I. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

J. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches beyond repaired areas in strip direction.

3.4 PRIMARY AIR-BARRIER MATERIAL INSTALLATION

A. Apply air-barrier material to form a seal with strips and transition strips and to achieve a continuous air barrier according to air-barrier manufacturer's written instructions and details. Apply air-barrier material within manufacturer's recommended application temperature ranges.
   1. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
   2. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.
   3. Where multiple prime coats are needed to achieve required bond, allow adequate drying time between coats.

B. Medium-Build Air Barriers: Apply continuous unbroken air-barrier material to substrates according to the following thickness. Apply an increased thickness of air-barrier material in full contact around protrusions such as masonry ties.
   1. Vapor-Permeable, Medium-Build Air Barrier: Total dry film thickness as recommended in writing by manufacturer to comply with performance requirements, applied in one or more equal coats. Apply additional material as needed to achieve void- and pinhole-free surface, but do not exceed thickness on which required vapor permeability is based.

C. Do not cover air barrier until it has been tested and inspected by testing agency.

D. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.5 FIELD QUALITY CONTROL

A. 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. Air-barrier dry film thickness.
   3. Continuous structural support of air-barrier system has been provided.
   4. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
   5. Site conditions for application temperature and dryness of substrates have been maintained.
   6. Maximum exposure time of materials to UV deterioration has not been exceeded.
   7. Surfaces have been primed, if applicable.
   8. 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.
   9. Termination mastic has been applied on cut edges.
   10. Strips and transition strips have been firmly adhered to substrate.
   11. Compatible materials have been used.
   12. Transitions at changes in direction and structural support at gaps have been provided.
   13. Connections between assemblies (air-barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
   14. All penetrations have been sealed.

3.6 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.

C. Remove masking materials after installation.

END OF SECTION 07 2726

SECTION 07 4113 - METAL ROOF PANELS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Insulated metal roof panel system of preformed steel panels.

B. Metal roof panel system of preformed steel panels.

1.2 ACTION SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Summary of test results, indicating compliance with specified requirements.
2. Storage and handling requirements and recommendations.
3. Installation methods.
4. Specimen warranty.

B. Shop Drawings: Include layouts of roof panels, details of edge and penetration conditions, spacing and type of connections, flashings, underlayments, and special conditions.
1. Show work to be field-fabricated or field-assembled.

C. Selection Samples: For each roofing system specified, submit color chips representing manufacturer's full range of available colors and patterns.

D. Verification Samples: For each roofing system specified, submit samples of minimum size 12 inches square, representing actual roofing metal, thickness, profile, color, and texture.

1.3 INFORMATIONAL SUBMITTALS

A. Installer's qualification statement.

B. Test Reports: Indicate compliance of metal roofing system to specified requirements.

C. Warranty: Submit specified manufacturer's warranty and ensure that forms have been completed in Owner's name and are registered with manufacturer.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Provide strippable plastic protection on prefinished roofing panels for removal after installation.

B. Store roofing panels on project site as recommended by manufacturer to minimize damage to panels prior to installation.

1.6 FIELD CONDITIONS

A. Do not install metal roof panels, underlayment when surface, ambient air, or wind chill temperatures are below 45 degrees F.

1.7 WARRANTY

A. Finish Warranty: Provide 20-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Owner's name and register with warrantor.

B. Special Warranty: Provide 2-year warranty for weathertightness of roofing system, including agreement to repair or replace metal roof panels that fail to keep out water commencing on the Date of Substantial Completion. Complete forms in Owner's name and register with warrantor.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. EF-8, Structural Metal Roof Insulated Panel Manufacturers: Provide indicated Basis-of-Design indicated on Exterior Finish Key Schedule or comparable product by one of the listed manufacturers:
1. ATAS International, Inc.
2. Centria, a Nucor Company.
3. Kingspan Insulated Panels.

B. RA-2, Architectural Metal Roof Panel Manufacturers: Provide indicated Basis-of-Design indicated on Exterior Finish Key Schedule or comparable product by one of the listed manufacturers:
1. Berridge Manufacturing Company.
2. Metl-Span, a Nucor Company.
3. Petersen Aluminum Corporation.

2.2 PERFORMANCE REQUIREMENTS

A. Metal Roof Panels: Provide complete roofing assemblies, including roof panels, clips, fasteners, connectors, and miscellaneous accessories, tested for compliance with the following minimum standards:
1. Structural Design Criteria: Provide panel assemblies designed to safely support design loads at support spacing indicated, with deflection not to exceed L/180 of span length(L) when tested in accordance with ASTM E1592.
2. Overall: Complete weathertight system tested and approved in accordance with ASTM E1592.
3. Air Infiltration: Maximum 0.06 cfm/sq ft at air pressure differential of 6.24 lbf/sq ft, when tested according to ASTM E1680.
4. Water Penetration: No water penetration when tested in accordance with procedures and recommended test pressures of ASTM E1646; perform test immediately following air infiltration test.
5. Thermal Movement: Design system to accommodate without deformation anticipated thermal movement over ambient temperature range of 100 degrees F.

6. Thermal Resistance: Provide throughout system, R-value of 15 (2.6) at 2 inch (51 mm) thick, minimum, when tested in accordance with ASTM C1363.

2.3 STRUCTURAL METAL ROOF PANELS

A. General: Provide complete engineered system complying with specified requirements and capable of remaining weathertight while withstanding anticipated movement of substrate and thermally induced movement of roofing system.

B. Structural Insulated Metal Panels: Factory-formed panels with factory-applied finish.
1. Type: Double-skin, factory assembled with foamed-in-place polyurethane insulation.
2. Steel Panels:
   a. Zinc-coated SS (structural steel) sheet complying with ASTM A653/A653M; minimum G60 galvanizing.
   b. Aluminum-zinc alloy-coated SS (structural steel) sheet complying with ASTM A792/A792M; minimum AZ50 coating.
   c. Steel Thickness: Minimum 24 gauge, 0.024 inch.
3. Profile: Standing seam, with minimum 2-inch seam height; concealed fastener system for integral standing seam-shaped lap seam.
4. Texture: Embossed.
5. Length: As indicated on drawings.
6. Width: Maximum panel coverage of 42 inches.

2.4 ARCHITECTURAL METAL ROOF PANELS

A. Metal Roof Panels: Provide complete engineered system complying with specified requirements and capable of remaining weathertight while withstanding anticipated movement of substrate and thermally induced movement of roofing system.

B. Metal Panels: Factory-formed panels with factory-applied finish.
1. Steel Panels:
   a. Zinc-coated steel complying with ASTM A653/A653M; minimum G60 galvanizing.
   b. Aluminum-zinc alloy-coated steel complying with ASTM A792/A792M; minimum AZ50 coating.
   c. Steel Thickness: Minimum 24 gauge, 0.024 inch.
2. Profile: Batten seam, with integral batten-shaped lap seam; concealed fastener system.
3. Texture: Smooth.
4. Length: Full length of roof slope, without lapped horizontal joints.
5. Width: Maximum panel coverage of 16 inches.

2.5 ATTACHMENT SYSTEM

A. Concealed System: Provide manufacturer's standard stainless steel or nylon-coated aluminum concealed anchor clips designed for specific roofing system and engineered to meet performance requirements, including anticipated thermal movement.

2.6 SECONDARY FRAMING

A. Miscellaneous Secondary Framing: Light gauge steel framing incidental to structural supports; fabricated from steel sheet.

B. Framing Material: ASTM A1011/A1011M Designation SS steel sheet.
1. Profile: Manufacturer's standard cee, zee, asymmetrical zee, hat channel, plain channel, single slope eave strut, double slope eave strut, and angle.
2. Thickness: 12 gauge, 0.1046 inch.
3. Finish: Galvanized per ASTM A653/A653M, G90.

C. Framing Connectors: Factory-made formed steel sheet, ASTM A653/A653M SS Grade 50, with G60/Z180 hot dipped galvanized coating and factory punched holes.

2.7 FABRICATION

A. Panels: Provide factory fabricated panels with applied finish and accessory items, using manufacturer's standard processes as required to achieve specified appearance and performance requirements.

B. Joints: Provide captive gaskets, sealants, or separator strips at panel joints to ensure weathertight seals, eliminate metal-to-metal contact, and minimize noise from panel movements.

2.8 FINISHES

A. Fluoropolymer Coil Coating System: Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent PVDF resin, and at least 80 percent of coil coated metal surfaces having minimum total dry film thickness (DFT) of 0.9 mil, 0.0009 inch; color and gloss as indicated on drawings.

2.9 ACCESSORIES

A. Miscellaneous Sheet Metal Items: Provide flashings, gutters, downspouts, trim, moldings, closure strips, preformed crickets, caps, and equipment curbs of the same material, thickness, and finish as used for the roofing panels. Items completely concealed after installation may optionally be made of stainless steel.

B. Rib and Ridge Closures: 2 inches high, narrow batten, close-fitting cap of steel with corrosion resistant finish, closed-cell synthetic rubber, neoprene, or PVC, combination steel and closed-cell foam, copper, or prefinished aluminum.

C. Sealants:
1. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.
2. Concealed Sealant: Non-curing butyl sealant or tape sealant.
3. Seam Sealant: Factory-applied, non-skinning, non-drying type.

D. Thermal Insulation: Provide batt type, faced with white, flexible, non-dusting vapor retarder tested for maximum flame spread index of 50, per ASTM E84; for installation using spacer blocks.
1. Thermal Resistance: Minimum, as indicated on Assembly Drawing.

E. Underlayment: Self-adhering polymer modified asphalt sheet complying with ASTM D1970/D1970M, with strippable release film and top surface of woven polypropylene sheet.

1. Minimum Requirements: Comply with requirements of ICC-ES AC188 for non-self-adhesive sheet.
2. Sheet Thickness: 22 mils, 0.022 inch, minimum.
3. Water Vapor Permeance: 0.1 perm, maximum, when tested in accordance with ASTM E96/E96M using Desiccant Method (Method A).
4. Products: provide one of the following or comparable product submitted for Architect's review.
   a. Certainteed Roofing; WinterGuard HT - High Temperature Waterproofing Underlayment.
   b. Henry, a Carlisle Company; Blueskin PE200HT.
   c. Polyglass USA, Inc; Polystick MTS Self-Adhered High Temperature Roof Underlayment.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation of preformed metal roof panels until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Coordinate roofing work with provisions for roof drainage, flashing, trim, penetrations, and other adjoining work to ensure that completed roof will be free of leaks.

B. Remove protective film from surface of roof panels immediately prior to installation; strip film carefully to avoid damage to prefinished surfaces.

C. Separate dissimilar metals by applying a bituminous coating, self-adhering rubberized asphalt sheet, or other permanent method approved by metal roof panel manufacturer.

D. At locations where metal will be in contact with wood or other absorbent material subject to wetting, seal joints with sealing compound and apply one coat of heavy-bodied bituminous paint.

3.3 INSTALLATION

A. Overall: Install roofing system in accordance with approved shop drawings and metal roof panel manufacturer's instructions and recommendations, as applicable to specific project conditions; securely anchor components of roofing system in place allowing for thermal and structural movement.
   1. Install roofing system with concealed clips and fasteners, except as otherwise recommended by manufacturer for specific circumstances.
   2. Minimize field cutting of panels. Where field cutting is required, use methods that will not distort panel profiles. Use of torches for field cutting is prohibited.

B. Accessories: Install necessary components that are required for complete roofing assembly, including flashings, gutters, downspouts, trim, moldings, closure strips, preformed crickets, caps, equipment curbs, rib closures, ridge closures, and similar roof accessory items.

C. Roof Panels: Install metal roof panels in accordance with manufacturer's installation instructions, minimizing transverse joints except at junction with penetrations.
   1. Form weathertight standing seams incorporating concealed clips, using an automatic mechanical seaming device approved by panel manufacturer.

2. Provide concealed clips at panel joints, and apply snap-on battens to provide weathertight joints.
3. Install sealant or sealant tape at end laps and side joints as recommended by metal roof panel manufacturer.

D. Insulation: Install insulation between roof covering and supporting members to present a neat appearance; fold, staple, and tape seams unless otherwise approved by Architect.

3.4 CLEANING

A. Clean exposed sheet metal work at completion of installation. Remove grease and oil films, excess joint sealer, handling marks, and debris from installation, leaving the work clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to the finish.

3.5 PROTECTION

A. Do not permit storage of materials or roof traffic on installed roof panels. Provide temporary walkways or planks as necessary to avoid damage to completed work. Protect roofing until completion of project.

B. Touch-up, repair, or replace damaged roof panels or accessories before Date of Substantial Completion.

END OF SECTION 07 4113

SECTION 07 4213 - METAL WALL PANELS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Manufactured metal panels for exterior wall panels, soffit panels, and subgirt framing assembly, with insulation and accessory components.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal 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 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 panels.
6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
7. Review temporary protection requirements for metal panel assembly during and after installation.
8. Review of procedures for repair of metal panels damaged after installation.
9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.3 ACTION SUBMITTALS

A. Product Data - Wall System: Manufacturer's data sheets on each product to be used, including:
1. Physical characteristics of components shown on shop drawings.
2. Storage and handling requirements and recommendations.
3. Installation instructions and recommendations.

B. Shop Drawings:
1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches (1:10).

C. Samples for Verification: For each type of exposed finish, prepared on Samples of size indicated below:

1. Metal Panels: 12 inches long by actual panel width. Include fasteners, closures, and other metal panel accessories.

1.4 INFORMATIONAL SUBMITTALS

A. Installer's qualification statement.

B. Testing agency's qualification statement.

C. Field quality-control reports.

D. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panels to include in maintenance manuals.

B. Warranties: Submit warranties and ensure that forms have been completed in Owner's name.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in installing products specified in this section with minimum three years of documented experience.

B. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

1.7 MOCK-UPS

A. Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
   1. Construct mock-up, as shown on Drawings; include panel and soffit system, glazing, attachments to building frame, associated vapor retarder and air seal materials, weep drainage system, sealants and seals, flashing, and related insulation in mock-up.
   2. Water-Spray Test: Conduct water-spray test of metal panel assembly mockup, testing for water penetration according to AAMA 501.2.

B. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

C. Locate as directed by Architect.

D. 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 panels from accelerated weathering by removing or venting sheet plastic shipping wrap.

B. Store prefinished material off the ground and protected from weather; prevent twisting, bending, or abrasion; provide ventilation; slope metal sheets to ensure proper drainage.

C. Prevent contact with materials that may cause discoloration or staining of products.

1.9 FIELD CONDITIONS

A. Do not install wall panels when air temperature or relative humidity are outside manufacturer's limits.

1.10 COORDINATION

A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.11 WARRANTY

A. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal 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 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. Provide 20-year from date of Substantial Completion. Complete forms in Owner's name and register with warrantor.

B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal 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: 2-years from date of Substantial Completion. Complete forms in Owner's name and register with warrantor.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Metal Wall Panels - Concealed Fasteners: Provide indicated Basis-of-Design product or comparable product by acceptable manufacturers for Architect's review.
   1. Basis-of-Design Product: ATAS International, Inc; Monarch Batten Seam.
   2. Berridge Manufacturing Company.
   3. Centria, a Nucor Company.
   4. MBCI, a Cornerstone Building Brands Company.
   5. Petersen Aluminum Corporation.

B. Metal Soffit Panels: Provide indicated Basis-of-Design product or comparable product by acceptable manufacturers for Architect's review.
   1. Basis-of-Design Product: Petersen Aluminum Corporation; Flush Solid Soffit.
   2. ATAS International, Inc.
   3. Berridge Manufacturing Company.

2.2 METAL WALL PANEL SYSTEM

A. Wall Panel System: Factory fabricated prefinished metal panel system, site assembled.
1. Provide exterior wall panels and subgirt framing assembly.
2. Design and size components to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of wall.
3. Design Pressure: In accordance with ASCE 7.
   a. Refer to Structural Drawings for wind and design loads.
4. 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:
   a. Test-Pressure Difference: 6.24 lbf/sq. ft..
5. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E331 at the following test-pressure difference:
   a. Test-Pressure Difference: 6.24 lbf/sq. ft..
6. Thermal Movements: Allow for thermal movements from ambient and surface
7. Fire Performance: Tested in accordance with, and complying with acceptance criteria of NFPA 285.
8. Maximum Allowable Deflection of Panel: L/180 for length(L) of span.
9. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.
10. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
11. Fabrication: Formed true to shape, accurate in size, square, and free from distortion or defects; pieces of longest practical lengths.
12. Corners: Factory-fabricated in one continuous piece with minimum 2-inch returns.
13. Provide continuity of air barrier seal at building enclosure elements in accordance with requirements; see Section 07 2726 - Fluid-Applied Membrane Air Barriers.

B. EF-4, Exterior Wall Panels:
1. Profile: Vertical; style as indicated.
2. Side Seams: Batten-covered, sealed with continuous gaskets.
3. Material: Precoated steel sheet, 22 gauge, 0.0299 inch minimum thickness.
4. Panel Width: 16 inches.
5. Color: As indicated on drawings.

C. CLG-8, Soffit Panels:
1. Profile: Style as indicated, with venting not provided.
2. Material: Precoated galvalume steel sheet, 24 gauge, 0.028 inch minimum thickness.
3. Color: As indicated on drawings.

D. Subgirt Framing Assembly:
1. 16 gauge, 0.0598 inch thick formed non-precoated steel sheet.

E. Internal and External Corners: Same material, thickness, and finish as exterior sheets; profile to suit system; shop cut and factory mitered to required angles.

F. Expansion Joints: Same material, thickness and finish as exterior sheets; manufacturer's standard brake formed type, of profile to suit system.

G. Trim, Closure Pieces, Flashings, and Infills: Same material, thickness and finish as exterior sheets; brake formed to required profiles.

H. Anchors: Galvanized steel.

2.3 MATERIALS

A. Precoated Steel Sheet: Hot-dipped galvanized steel sheet, ASTM A653/A653M, Structural Steel (SS) or Forming Steel (FS), with G90/Z275 coating; continuous coil-coated on exposed surfaces with specified finish coating and on panel back with specified panel back coating or Aluminum-zinc alloy-coated steel sheet, ASTM A792/A792M, Commercial Steel (CS)) or Forming Steel (FS), with AZ50/AZM150 coating; continuous-coil-coated on exposed surfaces with specified finish coating and on panel back with specified panel back coating.

B. Non-Precoated Steel Sheet: Hot-dipped galvanized steel sheet, ASTM A653/A653M, SS Grade 33/230, with G90 coating or Aluminum-zinc alloy-coated steel sheet, ASTM A792/A792M Commercial Steel (CS), with AZ50/AZM150 coating.

C. Select materials with surface flatness, smoothness, and lack of surface blemishes where exposed to view in finished system.

2.4 FABRICATION

A. Fabricate and finish metal 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. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

2.5 ACCESSORIES

A. Support for Cladding and Continuous Insulation: Refer to Section 07 0543 - Cladding Support Systems.

B. Gaskets: Manufacturer's standard type suitable for use with system, permanently resilient; ultraviolet and ozone resistant.

C. Concealed Sealants: Non-curing butyl sealant or tape sealant, see Section 07 9200.

D. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.

E. Fasteners: Manufacturer's standard type to suit application; with soft neoprene washers, steel, hot dip galvanized.
   1. Metal-to-Metal Fasteners: Self-drilling, self-tapping screws.

F. Field Touch-up Paint: As recommended by panel manufacturer.

2.6 FINISHES

A. Exposed Surface Finish: Panel manufacturer's standard polyvinylidene fluoride (PVDF) coating, top coat over epoxy primer.

B. Panel Backside Finish: Panel manufacturer's standard siliconized polyester wash coat.

C. Fluoropolymer Coil Coating System: Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent PVDF resin, and at least 80 percent of coil coated metal surfaces having minimum total dry film thickness (DFT) of 0.9 mil, 0.0009 inch; color and gloss as indicated on drawings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that building framing members are ready to receive panels.

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C754 and metal panel manufacturer's written recommendations.

B. Protect surrounding areas and adjacent surfaces from damage during execution of this work.

3.3 INSTALLATION

A. Support for Cladding and Continuous Insulation: Refer to Section 07 0543 - Cladding Support Systems.

B. Install panels on walls and soffits in accordance with manufacturer's instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal 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 panels.
   2. Flash and seal metal 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 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 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 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.

C. Protect surfaces in contact with cementitious materials and dissimilar metals with bituminous paint; allow to dry prior to wall panel installation.

D. Locate joints over supports.

E. Lap panel ends 2 inches, minimum.

F. Provide expansion and control joints where indicated.

G. Use concealed fasteners unless otherwise indicated by Architect.

H. Seal and place gaskets to prevent weather penetration. Maintain neat appearance.

I. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
   1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal wall panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.

3.4 TOLERANCES

A. Offset From True Alignment Between Adjacent Members Abutting or In Line: 1/16 inch, maximum.

B. Variation from Plane or Location As Indicated on Drawings: 1/4 inch, maximum.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform 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 wall panel installation, including accessories.

D. Remove and replace metal wall panels where tests and inspections indicate that they do not comply with specified requirements.

E. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

F. Prepare test and inspection reports.

3.6 CLEANING

A. Remove site cuttings from finish surfaces.

B. Remove protective material from wall panel surfaces.

C. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

3.7 PROTECTION

A. Protect metal wall panels until completion of project.

B. Touch-up, repair, or replace damaged wall panels or accessories before Date of Substantial Completion.

END OF SECTION 07 4213

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SECTION 07 5423 - THERMOPLASTIC POLYOLEFIN (TPO) MEMBRANE ROOFING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Adhered system with thermoplastic polyolefin (TPO) roofing membrane.

B. Insulation, flat and tapered.

C. Roofing walkway pads.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.
1. Review preparation and installation procedures and coordinating and scheduling required with related work.

1.3 ACTION SUBMITTALS

A. Product Data: Provide manufacturer's written information listed below.
1. Product data indicating membrane materials, flashing materials and insulation.
2. Preparation instructions and recommendations.
3. Storage and handling requirements.

B. Shop Drawings: Indicate joint or termination detail conditions, conditions of interface with other materials, and include the following:
1. Base and sheet flashings and membrane termination details.
2. Flashing details at penetrations.
3. Tapered insulation layout, thickness, and slopes.
4. Roof plan showing orientation of roof deck and orientation of roofing membrane, fastening spacings, and pattern for corner, perimeter, and field-of-roof locations.
5. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
6. Crickets, saddles, and tapered edge strips, including slopes.
7. Tie-in with adjoining wall system air barrier.

C. Samples for Verification: For the following products:

D. Roofing membrane and flashings, of color required.
1. Walkways, of color required.

E. Wind-Uplift-Resistance Submittal: For roofing system indicating compliance with wind-uplift performance requirements.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

B. Manufacturer's Installation Instructions: Indicate membrane seaming precautions and perimeter conditions requiring special attention.

C. Specimen Warranty: For approval.

D. Installer's Qualification Statement.

E. Field quality-control reports, including the following:
   1. Manufacturer's Field Reports: Indicate procedures followed, ambient temperatures, humidity, wind velocity during application, and supplementary instructions given.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing system.

B. Certified statement from existing roofing system manufacturer stating that existing roof warranty has not been affected by the Work performed under this Section.

C. Warranty:
   1. Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
   2. Submit installer's certification that installation complies with all warranty conditions for the waterproof membrane.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section:
   1. With minimum five (5) years documented experience.
   2. Approved by membrane manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in manufacturer's original containers, dry, undamaged, with seals and labels intact.

B. Protect products in weather protected environment, clear of ground and moisture.

C. Protect foam insulation from direct exposure to sunlight.

D. Provide Safety Data Sheets (SDS) at the project site at all times during transportation, storage, and installation of materials.

E. Comply with requirements from Owner to prevent overloading or disturbance of the structure when loading materials onto the roof.

1.8 FIELD CONDITIONS

A. Do not apply roofing membrane during unsuitable weather. Refer to manufacturer's written instructions.

B. Do not apply roofing membrane when ambient temperature is below 40 degrees F or above 95 degrees F.

C. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

D. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

E. Proceed with work so new roofing materials are not subject to construction traffic as work progresses.

F. Do not allow grease, oil, fats, or other contaminants to come into direct contact with membrane.

1.9 WARRANTY

A. Special Project Warranty: Submit roofing Installers warranty, signed by Installer, covering the Work of this Section, including all components of roofing system such as roof membrane, base flashing, roof insulation, fasteners, cover boards, and walkway products. Correct defective work within 2-year period commencing on Date of Substantial Completion.

B. System Warranty: Manufacturer's limited warranty covering membrane, roof insulation, and other specified system components for term indicated.
   1. Warranty Period: 25-year from the date of Substantial Completion.
   2. Liability Limit: No dollar limitation.
   3. Scope of Coverage: Repair leaks in roofing system caused by:
      a. Ordinary wear and tear of elements.
      b. Manufacturing defect in materials.
      c. Defective workmanship used to install materials.
      d. Damage due to winds up to indicated minimum requirements or roofing system.
      e. Hail up to 2 inches in diameter or otherwise indicated or implied by minimum hail resistance rating indicated.
   4. Not Covered:
      a. Damage caused by winds in excess of specified speed.
      b. Damage due to hurricanes or tornadoes.
      c. Intentional damage.
      d. Unintentional damage due to normal rooftop inspections, maintenance, or service performed by other than roof warrantor employee or warrantor approved contractor.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Basis-of-Design Manufacturer: provide Carlisle SynTec Systems or comparable system by one of the following:
   1. Elevate; Holcim Building Envelope.
   2. GAF.
   3. Johns Manville.
   4. Versico Roofing Systems.
   5. Mule-Hide Products Co, Inc.

2.2 ROOFING APPLICATIONS

A. TPO Membrane Roofing: One ply membrane, fully adhered, over insulation.

B. Roofing Assembly Performance Requirements and Design Criteria:
1. Material Compatibility: Roofing system materials to be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roofing membrane manufacturer based on testing and field experience.
2. Roof Covering External Fire Resistance Classification: Class A when tested per UL 790.
3. Wind Uplift:
   a. Designed to withstand wind uplift forces calculated with ASCE 7 and when tested in accordance with FM Approvals 4474, UL 580, or UL 1897.
   b. Design Wind Speed: As indicated on drawings.
4. Insulation Thermal Resistance (R-Value): Provide R-Value over entire roof deck in accordance with local building code requirements.
5. Drainage: No standing water within 48 hours after precipitation.

2.3 ROOFING MEMBRANE AND ASSOCIATED MATERIALS

A. Single Source Responsibility: Provide and install products from single source.

B. Membrane:
1. Material: Thermoplastic Polyolefin (TPO) complying with ASTM D6878/D6878M.
2. Reinforcing: Internal fabric.
3. Thickness: 60 mil (0.060 inch), minimum.
4. Sheet Width: Factory fabricated into largest sheets possible.
5. Color: To be selected by Architect from manufacturer's full color range.
6. Products:
   a. Carlisle SynTec Systems; Sure-Weld.

C. Seaming Materials: As recommended by membrane manufacturer.

D. Flexible Flashing Material: Same material as membrane.

E. Base Flashing: Provide waterproof, fully adhered base flashing system at all penetrations, plane transitions, and terminations.

2.4 INSULATION

A. Polyisocyanurate (ISO) Board Insulation: Complies with ASTM C1289, Type II, Class 1 - Faced with glass-reinforced felt on both surfaces of core foam.
1. Tapered Board: Slope as indicated; minimum thickness 1/2 inch; fabricate of fewest layers possible.
2. Grade and Compressive Strength: Grade 2, 20 psi, minimum.
3. Board Thickness: as required to achieve R-value for roof system. .
4. Product: Carlisle InsulBase.

B. Composite Polyisocyanurate (ISO) Board Insulation: Composite insulation panel comprised of 1/2 inch thick high-density ISO cover board laminated to ISO base insulation, complying with ASTM C1289.
1. Base Insulation: Type II, Class 2, Grade 2, with Grade 2, 20 psi, minimum, compressive strength.

2. Cover Board: Type II, Class 4, Grade 1, with 109 psi, maximum, compressive strength, 1/2 inch thick.
3. Overall Board Thickness: As indicated on Drawings.
4. Product: Carlisle SecurShield HD Composite.

2.5 ACCESSORIES

A. Prefabricated Flashing Accessories:
1. Corners and Seams: Same material as membrane, in manufacturer's standard thicknesses.
2. Penetrations: Same material as membrane, with manufacturer's standard cut-outs, rigid inserts, clamping rings, and flanges.
3. Sealant Pockets: Same material as membrane, with manufacturer's standard accessories, in manufacturer's standard configuration.
4. Pressure Sensitive Cover Strips: 6 inches wide, 45 mil, 0.045 inch thick, non-reinforced TPO membrane laminated to 35 mil, 0.035 inch thick cured synthetic rubber with pressure sensitive adhesive.
5. Walkway Rolls: Slip-resistant TPO membrane, with diamond plate tread pattern; 80 mil (0.080 inch) thick.
   a. Width: 34 inches, nominal.
   b. Length: 50 feet, nominal.
   c. Tensile Strength: 600 psi, minimum, in accordance with ASTM D638 test method.
   d. Color: As selected by Architect.
   e. Product: Carlisle Sure-Weld TPO Walkway Rolls.
6. Miscellaneous Flashing: Non-reinforced TPO membrane; 80 mil, 0.080 inch thick, in manufacturer's standard lengths and widths.

B. Insulation Adhesive: Two-component polyurethane, expanding foam.
1. Products: as recommended by manufacturer.

C. Insulation Joint Tape: Glass fiber reinforced type as recommended by insulation manufacturer, compatible with roofing materials; 6 inches wide; self adhering.

D. Membrane Adhesive: As recommended by membrane manufacturer.
1. Product:
   a. Carlisle Sure-Weld Bonding Adhesive.
   b. Carlisle Low VOC Bonding Adhesive.

E. Surface Conditioner for Adhesives: Compatible with membrane and adhesives.

F. Sealants: As recommended by membrane manufacturer.
1. Product:
   a. Carlisle SynTec Systems; Thermoplastic, One-Part Pourable Sealant.

G. Cleaner: Manufacturer's standard, clear, solvent-based cleaner.
1. Product: Carlisle Weathered Membrane Cleaner.

H. Edgings and Terminations: Manufacturer's standard edge and termination accessories.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and site conditions are ready to receive work.

B. Verify deck is supported and secure.

C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.

D. Verify deck surfaces are dry and free of snow or ice.

E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and cant strips are in place.

3.2 PREPARATION, GENERAL

A. Clean substrate thoroughly prior to roof application.

B. Do not begin work until other work that requires foot or equipment traffic on roof is complete.

3.3 CONCRETE DECK PREPARATION

A. Verify adjacent precast concrete roof members do not vary more than 1/4 inch in height. Verify grout keys are filled flush.

B. Fill surface honeycomb and variations with latex filler.

C. Confirm dry deck by moisture meter with 12 percent moisture maximum when tested per ASTM D4263.

3.4 METAL DECK PREPARATION

A. Install deck sheathing on metal deck:
1. Lay with long side at right angle to flutes; stagger end joints; provide support at ends.
2. Cut sheathing cleanly and accurately at roof breaks and protrusions to provide smooth surface.
3. Tape joints.
4. Fasten sheathing to roof deck with continuous mopping of adhesive on each flute.

3.5 INSTALLATION - GENERAL

A. Perform work in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.

B. Do not apply roofing membrane during unsuitable weather.

C. Do not apply roofing membrane when ambient temperature is outside the temperature range recommended by manufacturer.

D. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

E. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

F. Coordinate the work with installation of associated counterflashings installed by other sections as the work of this section proceeds.

G. When substrate preparation is responsibility of another installer, notify Architect of unsatisfactory conditions before proceeding.

3.6 INSULATION APPLICATION

A. Attachment of Insulation: Embed each layer of insulation in adhesive in full contact, in accordance with roofing and insulation manufacturers' instructions.

B. Do not install wet, damaged, or warped insulation boards.

C. Lay subsequent layers of insulation with joints staggered minimum 6 inch from joints of preceding layer.

D. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.

E. On metal deck, place boards parallel to flutes with insulation board edges bearing on deck flutes.

F. Lay boards with edges in moderate contact without forcing, and gap between boards no greater than 1/4 inch. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.

G. Tape joints of insulation in accordance with roofing and insulation manufacturers' instructions.

H. At roof drains, use factory-tapered boards to slope down to roof drains over a distance of 18 inches.

I. Do not apply more insulation than can be completely waterproofed in the same day.

3.7 MEMBRANE APPLICATION

A. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.

B. Shingle joints on sloped substrate in direction of drainage.

C. Fully Adhered Application: Apply adhesive at manufacturer's recommended rate. Fully embed membrane in adhesive except in areas directly over or within 3 inches of expansion joints. Fully adhere one roll before proceeding to adjacent rolls.

D. Seam Welding:
1. Seam Welding: Overlap edges and ends and seal seams by heat welding, minimum 2 inches.
2. Cover seams with manufacturer's recommended joint covers.
3. Probe seams once welds have thoroughly cooled, in approximately 30 minutes.
4. Repair deficient seams within the same day.
5. Seal cut edges of reinforced membrane after seam probe is complete.

E. At intersections with vertical surfaces:
1. Extend membrane over cant strips and up a minimum of 4 inches onto vertical surfaces.
2. Fully adhere flexible flashing over membrane and up to reglets.
3. Insert flashing into reglets and secure.

F. Install roofing expansion joints where indicated. Make joints watertight.

G. Install prefabricated joint components in accordance with manufacturer's instructions.

H. Coordinate installation of roof drains and sumps and related flashings. Locate all field splices away from low areas and roof drains. Lap upslope sheet over downslope sheet.

I. Flexible Walkways: Install walkway products in accordance with manufacturer's written installation instructions.
   1. Install flexible walkways at the following locations:
      a. Perimeter of each rooftop unit.
      b. Between each rooftop unit location, creating a continuous path connecting rooftop unit locations.
      c. Between each roof hatch and each rooftop unit location or path connecting rooftop unit locations.
      d. Top and bottom of each roof access ladder.
      e. Between each roof access ladder and each rooftop unit location or path connecting rooftop unit locations.
      f. Locations indicated on Drawings.
      g. As required by roofing membrane manufacturer's warranty requirements.
   2. Provide 6-inch (75-mm) clearance between adjoining pads.
   3. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive in accordance with roofing system manufacturer's written instructions.

J. Daily Seal: Install daily seal per manufacturers instructions at the end of each work day. Prevent infiltration of water at incomplete flashings, terminations, and at unfinished membrane edges.

3.8 FIELD QUALITY CONTROL

A. Require site attendance of roofing and insulation material manufacturers daily during installation of this Work.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspect substrate conditions, surface preparation, and installation of roofing membrane, flashings, protection, and drainage components, and to furnish reports to Architect.

C. Perform the following tests:
   1. Infrared Thermography Testing: Testing agency surveys entire roof area using infrared color thermography in accordance with ASTM C1153. Perform tests before overlying construction is placed.
      a. After infrared scan, locate specific areas of leaks by electrical capacitance/impedance testing or nuclear hydrogen detection testing.
      b. After testing, repair leaks, repeat tests, and make further repairs until roofing and flashing installations are watertight.
         1) Cost of retesting is Contractor's responsibility.
      c. Testing agency to prepare survey report of initial scan indicating locations of entrapped moisture, if any.

D. 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.
   1. Notify Architect 48 hours in advance of date and time of inspection.

E. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.

F. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.9 CLEANING

A. Remove wrappings, empty containers, paper, and other debris from the roof daily. Dispose of debris in compliance with local, State, and Federal regulations.

B. Remove bituminous markings from finished surfaces.

C. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and conform to their documented instructions.

D. Repair or replace defaced or damaged finishes caused by work of this section.

3.10 PROTECTION

A. Protect installed roofing and flashings from construction operations.

B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION 07 5423

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SECTION 07 6200 - SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counterflashings, gutters, downspouts, and exterior penetrations.

B. Sealants for joints within sheet metal fabrications.

C. Precast concrete splash pads.

1.2 SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:
1. Plans, elevations, sections, and attachment details.
2. Fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled Work.
3. Identification of material, thickness, weight, and finish for each item and location in Project.
4. Details for forming, including profiles, shapes, seams, and dimensions.
5. Details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
6. Details of termination points and assemblies.
7. Details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
8. Details of roof-penetration flashing.
9. Details of edge conditions, including crickets, flashings, and counterflashings.
10. Details of special conditions.
11. Details of connections to adjoining work.
12. Formed flashing and trim at scale of not less than 1-1/2 inches per 12 inches.

C. Samples: For each exposed product and for each color and texture specified, 12 inches (300 mm) long by actual width.

D. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of exposed finish.

E. Samples for Verification: Actual sample of finished products for each type of exposed finish for sheet metal and other metal accessories.
1. Sheet Metal Flashing and Trim: Manufacturers' standard size. Include finished seam with required profile. Include fasteners, cleats, clips, closures, and other attachments.

1.3 INFORMATIONAL SUBMITTALS

A. Certificates: For each type of coping and roof edge flashing that is ANSI/SPRI/FM 4435/ES-1 tested and FM Approvals approved.

B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

C. Research Reports: For copings and roof edge flashing, from an agency acceptable to authority having jurisdiction showing compliance with ANSI/SPRI/FM 4435/ES-1.

D. Qualification Statements: For fabricator and installer.

E. Sample warranties.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sheet metal flashing and trim, and its accessories.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) requirements and standard details, except as otherwise indicated.

B. Fabricator Qualifications: Entity that 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.

C. Installer Qualifications: Entity that employs a supervisor who is an NRCA ProCertified Roofing Foreman or installers who are NRCA ProCertified Architectural Metal Flashings and Accessories Installers.

D. For roof edge flashings and copings that are ANSI/SPRI/FM 4435/ES-1 tested, and FM Approvals approved, shop is to be listed as able to fabricate required details as tested and approved.

1.6 MOCKUPS

A. 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, approximately 10 ft. (3.0 m) long, including supporting construction cleats, seams, attachments, and accessories.
   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.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

C. COORDINATION

D. 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.

E. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.8 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 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. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Sheet metal flashing and trim assemblies, including cleats, anchors, and fasteners, are to 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 are not to rattle, leak, or loosen, and are to remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual: Architectural Metal Flashing, Condensation and Air Leakage Control, and Reroofing" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. SPRI Wind Design Standard: Manufacture and install roof edge flashings and copings tested in accordance with ANSI/SPRI/FM 4435/ES-1 and capable of resisting the following design pressure:
   1. Design Pressure: As indicated on Drawings.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
   1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 SHEET MATERIALS

A. Stainless Steel: ASTM A666/A666M, Type 304 alloy, soft temper.
   1. Surface Texture: Smooth, flat.
   2. Exterior Finish: ASTM A480/A480M; No. 2D (dull, cold rolled).
      a. Surface Preparation: Remove tool and dire marks and stretch lines, or blend into finish.
      b. Polished Finishes: Grind and polish 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 surface. Remove embedded foreign matter and leave surfaces chemically clean.

2.3 PREFINISHED ALUMINUM SHEETS

A. Description: Factory-applied topcoat systems applied to aluminum flat sheet substrates prior to fabrication by coil coating; topcoat systems consist of primers and organic topcoats on exposed side and backing coats on unexposed side.

B. Aluminum Sheet Substrates: ASTM B209/B209M, alloy and temper as recommended by manufacturer for application.

C. Superior Performance Organic Coating System: Comply with AAMA 2605 for aluminum preparation, pretreatment, primer and finish coat system; provide thermally cured 70-percent PVDF fluoropolymer systems; tested for weathering for 10 years with 5 delta units color change maximum.
1. Clear Topcoat: Manufacturer's clear topcoat applied over finish coat system.

D. Color: As selected by Architect from manufacturer's full colors.

2.4 FABRICATION

A. Custom fabricate sheet metal flashing and trim to comply with details indicated and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required.

B. Fabricate sheet metal flashing and trim in shop to greatest extent possible.

C. 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.

D. Verify shapes and dimensions of surfaces to be covered and obtain field measurements for accurate fit before shop fabrication.

E. 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.

F. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

G. Fabrication Tolerances:
1. Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 ft. (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.
2. Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified.

H. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal in accordance with cited sheet metal standard to provide for proper installation of elastomeric sealant.

I. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

J. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standardfor application, but not less than thickness of metal being secured.

K. Seams:

1. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints where necessary for strength.

L. Do not use graphite pencils to mark metal surfaces.

M. Form pieces in longest possible lengths.

N. Hem exposed edges on underside 1/2 inch; miter and seam corners.

O. Fabricate corners from one piece with minimum 18-inch long legs; seam for rigidity, seal with sealant.

P. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.

Q. Fabricate flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.

2.5 GUTTERS AND DOWNSPOUTS

A. Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required.

B. Fabricate in minimum 96 inch long sections.

C. Fabricate expansion joints, expansion joint covers, gutter bead reinforcing bars, and gutter accessories from same metal as gutters.
1. Expansion Joints: Butt type with cover plate.

D. Gutters: SMACNA (ASMM) Rectangular profile.

E. Downspouts: Rectangular profile.

F. Gutters and Downspouts: Size indicated on drawings.

G. Accessories: Profiled to suit gutters and downspouts.
1. Gutter Supports: Furnish flat-stock gutter brackets and flat-stock or twisted gutter spacers and straps fabricated from same metal as gutters, of size in accordance with SMACNA (ASMM) requirements, but with thickness not less than twice the gutter thickness.
2. Miscellaneous Gutter Accessories: Provide wire-ball downspout strainer.
3. Downspout Supports: Furnish metal hangers from same material as downspouts and anchors.

H. Splash Pads: Precast concrete type, of size and profiles indicated; minimum 3,000 psi at 28 days, with minimum 5 percent air entrainment.

I. Downspout Extenders: Same material and finish as downspouts.

J. Seal metal joints.

2.6 ROOF DRAINAGE SHEET METAL FABRICATIONS

A. Hanging Gutters:
1. Gutters with Girth up to 15 inches: Fabricate from the following material(s):
a. Stainless Steel: 28-gauge, 0.016-inch
b. Pre-finishes Aluminum: 0.032 inch

2. Gutters with Girth between 16 and 20 inches: Fabricate from the following material(s):
    a. Stainless Steel: 26-gauge, 0.019-inch
    b. Pre-finishes Aluminum: 0.040 inch
3. Gutters with Girth between 21 and 25 inches: Fabricate from the following material(s):
    a. Stainless Steel: 24-gauge, 0.025-inch
    b. Pre-finishes Aluminum: 0.032 inch
4. Gutters with Girth between 26 and 30 inches: Fabricate from the following material(s):
    a. Stainless Steel: 22-gauge, 0.031-inch
    b. Pre-finishes Aluminum: 0.032 inch
5. Gutters with Girth between 31 and 35 inches: Fabricate from the following material(s):
    a. Stainless Steel: 20-gauge, 0.038-inch

B. Built-in Gutters
1. Fabricate from the following material(s):
    a. Stainless Steel: 28-gauge, 0.016-inch

C. Downspouts
1. Fabricate from the following materia
    a. Stainless Steel: 28-gauge, 0.016-inch
    b. Pre-finishes Aluminum: 0.032 inch

D. Parapet Scuppers
1. 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.
2. Fabricate from the following materials:
    a. Pre-finishes Aluminum: 0.032 inch
    b. Pre-painted Metallic Coated Steel: 24-gauge, 0.028-inch

E. Conductor Heads
1. Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape required, complete with outlet tubes exterior flange trim and built-in overflows.
2. Fabricate from the following materials:
    a. Stainless Steel: 28-gauge, 0.016-inch
    b. Pre-finishes Aluminum: 0.032 inch

2.7 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof Edge Flashing (Gravel Stop) and Fascia Cap:
1. Furnish with 6-inch wide joint cover plates.
2. Joint Style: Butted with expansion space and 6 inch wide, concealed backup plate.
3. Fabricate with scuppers spaced 10 feet apart, to dimensions required with 4 inch wide flanges and base extending 4 inches beyond cant or tapered strip into field of roof. Fasten gravel guard angles to base of scupper.
4. Fabricate from the following materials:
    a. Stainless Steel: 26-gauge, 0.019-inch
    b. Pre-finishes Aluminum: 0.050 inch

B. Copings:

1. 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.
2. Coping Profile: SMACNA (ASMM) ; Fig. 3-4A
3. Joint Style: Butted with expansion space and 6 inch wide, concealed backup plate.
4. Fabricate from the following materials:
    a. Stainless Steel: 26-gauge, 0.019-inch
    b. Pre-finishes Aluminum: 0.050 inch

C. Expansion Joint Cover: Fabricate roof, roof-to-wall transition, roof-to-roof edge flashing (gravel stop) transition, and roof-to-roof edge flashing (gravel stop) and fascia-cap transition expansion joint cover from the following materials:
1. Fabricate from the following materials:
    a. Stainless Steel: 24-gauge, 0.025-inch
    b. Pre-finishes Aluminum: 0.050 inch

D. Base Flashing:
1. Fabricate from the following materials:
    a. Stainless Steel: 26-gauge, 0.019-inch
    b. Pre-finishes Aluminum: 0.040 inch

E. Counterflashing:
1. Fabricate from the following materials:
    a. Stainless Steel: 26-gauge, 0.019-inch
    b. Pre-finishes Aluminum: 0.040 inch

F. Flashing Receivers:
1. Fabricate from the following materials:
    a. Stainless Steel: 28-gauge, 0.016-inch
    b. Pre-finishes Aluminum: 0.032 inch

G. Roof Penetration Flashing:
1. Fabricate from the following materials:
    a. Stainless Steel: 26-gauge, 0.019-inch

H. Roof Drain Flashing:
1. Fabricate from the following materials:
    a. Stainless Steel: 28-gauge, 0.016-inch

2.8 WALL SHEET METAL FABRICATIONS

A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96 inch long, but not exceeding 12 feet long, sections, under copings, and at shelf angles. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings; and form with 2 inches 2-inch- (50-mm-) high, end dams
1. Fabricate from the following materials:
    a. Stainless Steel: 28-gauge, 0.016-inch

B. Opening Flashing in Framed Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2 inches high, end dams.
   1. Fabricate from the following materials:
      a. Stainless Steel: 28-gauge, 0.016-inch
      b. Pre-finishes Aluminum: 0.032 inch

C. Wall Expansion Joint Cover:
   1. Fabricate from the following materials:
      a. Stainless Steel: 26-gauge, 0.019-inch
      b. Pre-finishes Aluminum: 0.040 inch

2.9 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Equipment Support Flashing:
   1. Fabricate from the following materials:
      a. Stainless Steel: 26-gauge, 0.019-inch

B. Overhead Piping Safety Pans:
   1. Fabricate from the following materials:
      a. Stainless Steel: 24-gauge, 0.025-inch

2.10 ACCESSORIES

A. Fasteners:
   1. 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 or manufactured item.
   2. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
      a. Blind Fasteners: High-strength aluminum or stainless steel rivets suitable for metal being fastened.
      b. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
   3. 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.
   4. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
   5. Fasteners for Stainless Steel Sheet: Series 300 stainless steel.

B. Underlayments
   1. Synthetic Underlayment: Laminated or reinforced, woven polyethylene or polypropylene, synthetic roofing underlayment; bitumen free; slip resistant; suitable for high temperatures over 220 deg F (111 deg C); and complying with physical requirements of ASTM D226/D226M for Type I and Type II felts.
      a. Produc
         1) Epilay; Protectite Plasfelt.
         2) PrimeSource Building Products, Inc; Grip-Rite Shinglelayment-HT.
         3) Or comparable product submitted to Architect for review.

2. Self-Adhering, High-Temperature Sheet Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 30 mils (0.76 mm) thick, specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer when recommended by underlayment manufacturer.
    a. Products:
        1) Henry; Blueskin PE200HT High Temperature Roof Underlayment.
        2) Owens Corning; Titanium PSU30.
        3) Polyguard; Deckguard HT Roofing & Watershield Underlayment.
        4) Or comparable product submitted to Architect for review.
3. Underlayment: ASTM D226/D226M, organic roofing felt, Type II, No. 30.
4. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. (0.16 kg/sq. m) minimum, of type required for application.

C. Protective Backing Paint: Asphaltic mastic, ASTM D4479 Type I.

D. Concealed Sealants: Non-curing butyl sealant.

E. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.

F. Asphalt Roof Cement: ASTM D4586/D4586M, Type I, asbestos-free.

G. Reglets: Recessed type, galvanized steel.
1. Units of type, material, and profile required, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and -welded corners and junctions and with interlocking counterflashing on exterior face, of same metal as reglet.
2. Material: Match flashing material.
3. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
4. Concrete Type: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.
5. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.
6. Accessories:
    a. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
    b. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing's lower edge.
7. Finish: With manufacturer's standard color coatingt finish>.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.2 INSTALLATION OF UNDERLAYMENT

A. Self-Adhering, High-Temperature Sheet Underlayment:
1. Install self-adhering, high-temperature sheet underlayment; wrinkle free.
2. Prime substrate if recommended by underlayment manufacturer.
3. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures.
4. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses.
5. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller.
6. Roll laps and edges with roller.
7. Cover underlayment within 14 days.

B. Install slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.

C. Install in shingle fashion to shed water.
1. Lap joints not less than 4 inches.

3.3 INSTALLATION OF SHEET METAL FLASHING AND TRIM, GENERAL

A. Install sheet metal flashing and trim to comply with details indicated and recommendations of cited sheet metal standard that apply to installation characteristics required unless otherwise indicated on Drawings.
1. Install fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
2. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
3. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement.
4. Install sheet metal flashing and trim to fit substrates and to result in watertight performance.
5. Install continuous cleats with fasteners spaced not more than 12 inches o.c.
6. Install exposed sheet metal flashing and trim with limited oil-canning, and free of buckling and tool marks.
7. Do not field cut sheet metal flashing and trim by torch.
8. 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 uncoated-aluminum and 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 or wood substrates, install underlayment and cover with slip sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.
1. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
2. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
3. 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.
    a. Embed hooked flanges of joint members not less than 1 inch into sealant.
    b. Form joints to completely conceal sealant.
    c. When ambient temperature at time of installation is between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way.
    d. Adjust setting proportionately for installation at higher ambient temperatures.
        1) Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).
2. Prepare joints and apply sealants to comply with requirements in Section 07 9200 - Joint Sealants.

3.4 INSTALLATION OF ROOF-DRAINAGE SHEET METAL FABRICATIONS

A. Install sheet metal roof-drainage items to produce complete roof-drainage system in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.

B. Hanging Gutters:
1. Join sections with joints sealed with sealant.
2. Provide for thermal expansion.
3. Attach gutters at eave or fascia to firmly anchor them in position.
4. Provide end closures and seal watertight with sealant.
5. Slope to downspouts.
6. Fasten gutter spacers to front and back of gutter.
7. Anchor and loosely lock back edge of gutter to continuous eave or apron flashing.
8. Anchor gutter with gutter brackets spaced not more than 36 inches apart to roof deck unless otherwise indicated, and loosely lock to front gutter bead.
9. Anchor gutter with spikes and ferrules spaced not more than 24 inches apart.
10. Install gutter with expansion joints at locations indicated on Drawings, but not exceeding, 50 feet apart. Install expansion-joint caps.
11. Install continuous gutter screens on gutters with noncorrosive fasteners, removable or hinged to swing open for cleaning gutters.

C. Downspouts:
1. Join sections with 1-1/2 inches telescoping joints.
2. Provide hangers with fasteners designed to hold downspouts securely to walls.
3. Locate hangers at top and bottom and at approximately 60 inches o.c.
4. Provide elbows at base of downspout to direct water away from building.
5. Connect downspouts to underground drainage system.

3.5 INSTALLATION OF WALL SHEET METAL FABRICATIONS

A. Install sheet metal wall flashing to intercept and exclude penetrating moisture in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings.

3.6 INSTALLATION OF MISCELLANEOUS SHEET METAL FABRICATIONS

A. Equipment Support Flashing:
1. Coordinate installation of equipment support flashing with installation of roofing and equipment.
2. Weld or seal flashing with elastomeric sealant to equipment support member.

B. Overhead-Piping Safety Pans:
1. Suspend pans from structure above, independent of other overhead items such as equipment, piping, and conduit, unless otherwise indicated on Drawings.
2. Pipe and install drain line to plumbing waste or drainage system.

3.7 INSTALLATION TOLERANCES

A. 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.

3.8 CLEANING

A. Clean off excess sealants.

3.9 PROTECTION

A. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.

B. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended in writing by sheet metal flashing and trim manufacturer.

C. Maintain sheet metal flashing and trim in clean condition during construction.

D. 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, as determined by Architect.

END OF SECTION 07 6200

SECTION 07 7100 - ROOF SPECIALTIES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Copings.
2. Roof-edge specialties.
3. Roof-edge drainage systems.
4. Reglets and counterflashings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For roof specialties.
1. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work.
2. Include details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
3. Indicate profile and pattern of seams and layout of fasteners, cleats, clips, and other attachments.
4. Detail termination points and assemblies, including fixed points.
5. Include details of special conditions.

C. Samples: For each type of roof specialty and for each color and texture specified.

D. Samples for Initial Selection: For each type of roof specialty indicated with factory-applied color finishes.

E. Samples for Verification:
1. Include Samples of each type of roof specialty to verify finish and color selection, in manufacturer's standard sizes.
2. Include copings made from 12-inch (300-mm) lengths of full-size components in specified material, and including fasteners, cover joints, accessories, and attachments.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

B. Product Certificates: For each type of roof specialty.

C. Product Test Reports: For copings, for tests performed by a qualified testing agency.

D. Sample Warranty: For manufacturer's special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing specialties to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and set quality standards for fabrication and installation.
   1. Build mockup of typical roof edge as part of Integrated Exterior Mockup specified in Section 01 4000 "Quality Requirements"
   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 roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.

B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof-specialty installation.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify profiles and tolerances of roof-specialty substrates by field measurements before fabrication, and indicate measurements on Shop Drawings.

B. Coordination: Coordinate roof specialties with flashing, trim, and construction of parapets, roof deck, roof and wall panels, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.8 WARRANTY

A. Special Warranty on Painted Finishes: Manufacturer agrees to repair finish or replace roof specialties 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 specialties 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.

B. SPRI Wind Design Standard: Manufacture and install roof-edge specialties tested according to SPRI ES-1 and capable of resisting the following design pressures:
   1. Design Pressure: As indicated on Drawings.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change (Range): 120 degrees Fahrenheit, ambient; 180 degrees Fahrenheit, material surfaces.

2.2 COPINGS, EF-6

A. Metal Copings: Manufactured coping system consisting of metal coping cap in section lengths not exceeding 12 feet, concealed anchorage; with corner units, end cap units, and concealed splice plates with finish matching coping caps.
   1. Basis of Design Product: Subject to compliance with requirements, provide basis of design product indicated on Exterior Finish Key Schedule or comparable product by another manufacturer.
      a. Coping Cap Cover Material
         1) Aluminum Sheet: Coil-coated sheet, ASTM B209/B209M, alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.
            a) Thickness: 0.050 inch.
            b) Surface Texture: Smooth, flat finish.
            c) Exterior Finish: Two-coat fluoropolymer.
            d) Color: As selected by Architect from manufacturer's full range.
      b. Coping-Cap Attachment Method: Intermittent; 12 inch wide metallic coated steel chair/cleat with gutter/splices and integral cleats; with face and back heights to suit cover face and back heights; with cover support between attachment points. Where dissimilar metal cover, provide protection against deterioration.
      c. Top: Sloped, 0.50 inches min.
      d. Coping Cap Front Height: As indicated within Drawings.
      e. Parapet Wall Thickness: As indicated within Drawings.
      f. Coping Cap Back Height: As indicated within Drawings.
      g. Corners: Factory mitered and continuously welded.

2.3 ROOF-EDGE SPECIALTIES

A. EF-5, Canted Roof-Edge Fascia: Manufactured, two-piece, roof-edge fascia consisting of snap-on metal fascia cover in section lengths not exceeding 12 feet.
   1. Basis of Design Product: Subject to compliance with requirements, provide basis of design product indicated in Exterior Finish Key Schedule or comparable product by another manufacturer.
      a. Fascia Cap Cover Material
         1) Aluminum Sheet: Coil-coated sheet, ASTM B209/B209M, alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.
            a) Thickness: 0.050 inch.

b) Surface Texture: Smooth, flat finish.
c) Exterior Finish: Two-coat fluoropolymer.
d) Color: As selected by Architect from manufacturer's full range.

b. Fascia-Cap Attachment Method: Continuous extruded aluminum retainer/cleat; with face height to suit cover face height. Where dissimilar metal cover, provide protection against deterioration.
c. Fascia Cap Front Height: As indicated within Drawings.
d. Corners: Factory mitered and cinched and sealed.

2. Splice Plates: Concealed, of same material, finish, and shape as fascia cover.
3. Fascia Accessories: Fascia extenders with continuous hold-down cleats.

2.4 ROOF-EDGE DRAINAGE SYSTEMS

A. EF-5, Gutters: Manufactured in uniform section lengths not exceeding 12 feet, with matching corner units, ends, outlet tubes, and other accessories. Elevate back edge at least 1 inch above front edge. Furnish flat-stock gutter straps, gutter brackets, expansion joints, and expansion-joint covers fabricated from same metal as gutters.

1. Basis of Design Product: Subject to compliance with requirements, provide basis of design product indicated in Exterior Finish Key Schedule or comparable product by another manufacturer.
   a. Gutter Material
      1) Aluminum Sheet: Coil-coated sheet, ASTM B209/B209M, alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.
         a) Thickness: 0.050 inch.
         b) Surface Texture: Smooth, flat finish.
         c) Exterior Finish: Two-coat fluoropolymer.
         d) Color: As selected by Architect from manufacturer's full range.
   b. Gutter Attachment Method: Manufacturers standard straps with integral retention brackets of thickness and length to support indicated gutter sizes; Spacing minimum 30 inches o.c..
   c. Gutter Profile: As indicated within Drawings.
   d. Gutter Front Height: As indicated within Drawings.
   e. Gutter Bottom Depth: As indicated within Drawings.
   f. Corners: Factory mitered and continuously welded.

B. EF-5, Downspouts: Plain, rectangular complete with mitered elbows, manufactured from the following exposed metal. Furnish with metal hangers, from same material as downspouts, and anchors.

1. Basis of Design Product: Subject to compliance with requirements, provide basis of design product indicated in Exterior Finish Key Schedule or comparable product by another manufacturer.
   a. Downspout Material
      1) Aluminum Sheet: Coil-coated sheet, ASTM B209/B209M, alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.
         a) Thickness: 0.050 inch.
         b) Surface Texture: Smooth, flat finish.
         c) Exterior Finish: Two-coat fluoropolymer.
         d) Color: As selected by Architect from manufacturer's full range.
   b. Downspout Width: As indicated within Drawings.
   c. Downspout Depth: As indicated within Drawings.

C. Parapet Scuppers: Manufactured with closure flange trim to exterior, 3 inchwide wall flanges to interior, and base extending 4 inches beyond cant or tapered strip into field of roof.
   1. Basis of Design Product: Subject to compliance with requirements, provide basis of design product indicated or comparable product by another manufacturer.
      a. Basis of Design: ATAS International; Scupper.
      b. Scupper Material
         1) Aluminum Sheet: Coil-coated sheet, ASTM B209/B209M, alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.
            a) Thickness: 0.050 inch.
            b) Surface Texture: Smooth, flat finish.
            c) Exterior Finish: Two-coat fluoropolymer.
            d) Color: As selected by Architect from manufacturer's full range.
      c. Size: As indicated within Drawings.

D. Conductor Heads: Manufactured conductor heads, each with flanged back and stiffened top edge, and of dimensions and shape indicated, complete with outlet tube that nests into upper end of downspout, exterior flange trim,.
   1. Basis of Design Product: Subject to compliance with requirements, provide basis of design product indicated or comparable product by another manufacturer.
      a. Basis of Design: ATAS International; Collector Box.
      b. Collector Box/Conductor Head Material
         1) Aluminum Sheet: Coil-coated sheet, ASTM B209/B209M, alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.
            a) Thickness: 0.050 inch.
            b) Surface Texture: Smooth, flat finish.
            c) Exterior Finish: Two-coat fluoropolymer.
            d) Color: As selected by Architect from manufacturer's full range.
      c. Size: As indicated within Drawings.

E. Splash Pans: Fabricate from the following exposed metal:
   1. Stainless Steel: 0.0188 inch thick.

2.5 REGLETS AND COUNTERFLASHINGS

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. Berridge Manufacturing Company.
   2. Castle Metal Products.
   3. Cheney Flashing Company.
   4. Drexel Metals.
   5. Exceptional Metals.
   6. Fry Reglet Corporation.
   7. Heckmann Building Products, Inc.
   8. Hickman Company, W. P.
   9. Keystone Flashing Company, Inc.

10. Metal-Era, Inc.

B. Reglets: Manufactured units formed to provide secure interlocking of separate reglet and counterflashing pieces, from the following exposed metal:
   1. Stainless Steel: 0.0188 inch thick.
   2. Corners: Factory mitered and soldered.
   3. Surface-Mounted Type: Provide reglets with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
   4. Masonry Type, Embedded: Provide reglets with offset top flange for embedment in masonry mortar joint.

C. Counterflashings: Manufactured units of heights to overlap top edges of base flashings by 4 inches and in lengths not exceeding 12 feet designed to snap into reglets and compress against base flashings with joints lapped, from the following exposed metal:
   1. Formed Aluminum: 0.032 inch thick.
      a. Use in conjunction with aluminum roof specialties, and where exposed to view from ground level or out of windows from the interior of the building.
   2. Stainless Steel: 0.0250 inch thick.
      a. Use at rooftop locations where not exposed to view from ground level.

D. Aluminum Finish: Two-coat fluoropolymer.
   1. Color: As selected by Architect from manufacturer's full range.

E. Stainless Steel Finish: ASTM A480/A480M No. 2B (bright, cold rolled, unpolished).

2.6 MATERIALS

A. Aluminum Sheet: ASTM B209 (ASTM B209M), alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.

B. Aluminum Extrusions: ASTM B221 (((ASTM B221M))), alloy and temper recommended by manufacturer for type of use and finish indicated, finished as follows:

C. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666/A666M, Type 304.

2.7 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils (0.76 to 0.04 inch 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.
   1. Products:
      a. Henry; Blueskin PE200HT High Temperature Roof Underlayment.
      b. Owens Corning; Titanium PSU30.
      c. Polyguard; Deckguard HT Roofing & Watershield Underlayment.
      d. Or comparable product submitted to Architect for review.
   2. Thermal Stability: ASTM D1970/D1970M; stable after testing at 240 degrees Fahrenheit.
   3. Low-Temperature Flexibility: ASTM D1970/D1970M; passes after testing at minus 20 degrees Fahrenheit.

B. Felt: ASTM D226/D226M, Type II (No. 30), asphalt-saturated organic felt, nonperforated.

C. Slip Sheet: Rosin-sized building paper, 3-lb/100 sq. ft. (0.16-kg/sq. m) minimum.

2.8 MISCELLANEOUS MATERIALS

A. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:
   1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.
   2. Fasteners for Aluminum: Aluminum or Series 300 stainless steel.
   3. Fasteners for Stainless Steel Sheet: Series 300 stainless steel.

B. Elastomeric Sealant: ASTM C920, elastomeric polyurethane polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.

C. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type joints with limited movement.

D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

E. Asphalt Roofing Cement: ASTM D4586, asbestos free, of consistency required for application.

2.9 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted 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.

D. Coil-Coated Aluminum Sheet Finishes:
   1. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
      a. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (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.
      b. Concealed Surface Finish: Apply pretreatment and manufacturer's standard acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

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. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.

C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage where applicable, and securely anchored.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF UNDERLAYMENT

A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply wrinkle free, in shingle fashion to shed water, and 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 with roller. Cover underlayment within 14 days.
1. Coordinate application of self-adhering sheet underlayment under roof specialties with requirements for continuity with adjacent air barrier materials.

B. Felt Underlayment: Install with adhesive for temporary anchorage to minimize use of mechanical fasteners under roof specialties. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.

C. Slip Sheet: Install with tape or adhesive for temporary anchorage to minimize use of mechanical fasteners under roof specialties. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.

3.3 INSTALLATION, GENERAL

A. Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, underlayments, sealants, and other miscellaneous items as required to complete roof-specialty systems.
1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
2. Provide uniform, neat seams with minimum exposure of solder and sealant.
3. Install roof specialties to fit substrates and to result in weathertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
4. Torch cutting of roof specialties is not permitted.
5. Do not use graphite pencils to mark metal surfaces.

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 uncoated aluminum and stainless steel roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.

C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.
1. Space movement joints at a maximum of 12 feet with no joints within 18 inches of corners or intersections unless otherwise indicated on Drawings.
2. When ambient temperature at time of installation is between 40 and 70 degrees Fahrenheit, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.

D. Fastener Sizes: Use fasteners of sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Seal concealed joints with butyl sealant as required by roofing-specialty manufacturer.

F. Seal joints as required for weathertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 degrees Fahrenheit.

3.4 INSTALLATION OF COPINGS

A. Install cleats, anchor plates, and other anchoring and attachment accessories and devices with concealed fasteners.

B. Anchor copings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.
1. Interlock face and back leg drip edges of snap-on coping cap into cleated anchor plates anchored to substrate at manufacturer's required spacing that meets performance requirements.
2. Interlock face-leg drip edge into continuous cleat anchored to substrate at manufacturer's required spacing that meets performance requirements. Anchor back leg of coping with screw fasteners and elastomeric washers at manufacturer's required spacing that meets performance requirements.

3.5 INSTALLATION OF ROOF-EDGE SPECIALITIES

A. Install cleats, cants, and other anchoring and attachment accessories and devices with concealed fasteners.

B. Anchor roof edgings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

3.6 INSTALLATION OF ROOF-EDGE DRAINAGE-SYSTEM

A. Install components to produce a complete roof-edge drainage system according to manufacturer's written instructions. Coordinate installation of roof perimeter flashing with installation of roof-edge drainage system.

B. Gutters: Join and seal gutter lengths. Allow for thermal expansion. Attach gutters to firmly anchored gutter supports spaced not more than 30 inches apart. Attach ends with rivets and seal with sealant to make watertight. Slope to downspouts.
1. Install gutter with expansion joints at locations indicated but not exceeding 50 feet apart. Install expansion-joint caps.

C. Downspouts: Join sections with manufacturer's standard telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls and 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c.
1. Provide elbows at base of downspouts at grade to direct water away from building.
2. Connect downspouts to underground drainage system indicated.

D. Splash Pans: Install where downspouts discharge on low-slope roofs. Set in elastomeric sealant.

E. Parapet Scuppers: Install scuppers through parapet where indicated. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.
   1. Anchor scupper closure trim flange to exterior wall and seal or solder to scupper.
   2. Loosely lock front edge of scupper with conductor head.
   3. Seal or solder exterior wall scupper flanges into back of conductor head.

F. Conductor Heads: Anchor securely to wall with elevation of conductor top edge 1 inch below scupper discharge.

3.7 INSTALLATION OF REGLETS AND COUNTERFLASHINGS

A. Coordinate installation of reglets and counterflashings with installation of base flashings.

B. Embedded Reglets: See Section 04 2000 "Unit Masonry" for installation of reglets.

C. Surface-Mounted Reglets: Install reglets to receive flashings where flashing without embedded reglets is indicated on Drawings. Install at height so that inserted counterflashings overlap 4 inches over top edge of base flashings.

D. Counterflashings: Insert counterflashings into reglets or other indicated receivers; ensure that counterflashings overlap 4 inches over top edge of base flashings. Lap counterflashing joints a minimum of 4 inches and bed with butyl sealant. Fit counterflashings tightly to base flashings.

3.8 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.

C. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 07 7100

SECTION 07 7253 - SNOW GUARDS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Rail-type, seam-mounted snow guards.

B. ASTM B85/B85M - Standard Specification for Aluminum-Alloy Die Castings.

C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

1.2 ACTION SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
   1. Rail-type, seam-mounted snow guards.

B. Shop Drawings: Include roof plans showing layouts and attachment details of snow guards.
   1. Include details of rail-type snow guards.

C. Samples:
   1. Rail-Type Snow Guards: Bracket, 12-inch-long rail, and installation hardware.
      a. For units with factory-applied finishes, submit manufacturer's standard color selections.

D. Delegated Design Submittals: For snow guards, include analysis reports signed and sealed by the qualified professional engineer responsible for their preparation.
   1. Include calculation of number and location of snow guards.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer's experience with providing delegated design engineering services of the kind indicated, including documentation that the engineer is licensed in the state in which the Project is located.

B. Product Test Reports: For each type of snow guard, for tests performed by a qualified testing agency, indicating load at failure of attachment to roof system identical to roof system used on this Project.

1.4 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit adhesive-mounted snow guards to be installed, and adhesive cured, according to adhesive manufacturer's written instructions.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 4000 "Quality Requirements," to design snow guards, including attachment to roofing material and roof deck, as applicable for attachment method, based on the following:
1. Roof snow load.
2. Snow drifting
3. Roof slope.
4. Roof type.
5. Roof dimensions.
6. Roofing substrate type and thickness.
7. Snow guard type.
8. Snow guard fastening method and strength.
9. Snow guard spacing.
10. Coefficient of Friction Between Snow and Roof Surface: 0.
11. Factor of Safety: 2.

B. Performance Requirements: Provide snow guards that withstand exposure to weather and resist thermally induced movement without failure, rattling, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.
1. Temperature Change: 120 degrees Fahrenheit , ambient; 180 degrees Fahrenheit , material surfaces.

C. Structural Performance: Snow guards to withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
1. Snow Loads: As indicated on Drawings.

2.2 RAIL-TYPE SNOW GUARDS

A. Rail-Type, Seam-Mounted Snow Guards:
1. Basis-of-Design Product: Provide Pac-Clad; S-5! ColorGard Snow Retention System or provide comparable, for Architect's review, by one of the following:
a. Alpine SnowGuards.
b. Berger; division of OmniMax International, Inc.
c. IceBlox Inc.
d. LMCurbs.
e. PMC Industries, Inc.
f. Rocky Mountain Snow Guards, Inc.
g. S-5! Metal Roof Innovations, Ltd.
h. TRA Snow and Sun, Inc.
2. Description: Snow guard rails fabricated from metal pipes, bars, or extrusions, anchored to brackets and equipped with two rails with integral track to accept color-matching inserts of material and finish used for metal roof.
3. Brackets and Baseplate: Manufactured from 6000-series alloy and temper-aluminum extrusions conforming to ASTM B221 and AA Aluminum Standards and Data.

a. Screws for attachment of brackets to roof: as specifically tested to the substrate used on the project, and furnished by snow guard manufacturer. All fastener portions exposed to the weather shall be stainless steel or Zinc/Aluminum cap.

4. Bars: ASTM B221 (ASTM B221M) aluminum, clear anodized.
   a. Profile: with integral track to accept color-matching inserts of material and finish used for metal roof.
   b. Provide splice connectors ensuring alignment and structural continuity at end joints.
5. Seam Clamps: ASTM B221 (ASTM B221M) aluminum extrusion or ASTM B85/B85M aluminum casting with stainless steel set screws incorporating round nonpenetrating point; designed for use with applicable roofing system to which clamp is attached.
6. Snow and Ice Clips:
   a. Aluminum, with rubber foot extending to and resting at surface of metal panels; minimum 3 inches wide.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, snow guard attachment, and other conditions affecting performance of the Work.
   1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean and prepare substrates for bonding snow guards.

B. Prime substrates according to snow guard manufacturer's written instructions.

3.3 INSTALLATION

A. Install snow guards according to manufacturer's written installation instructions.
   1. Space rows as recommended by manufacturer.

B. Attachment for Standing-Seam Metal Roofing:
   1. Do not use fasteners that will penetrate metal roofing or fastening methods that void metal roofing finish warranty.
   2. Rail-Type, Seam-Mounted Snow Guards:
      a. Install brackets to vertical ribs in straight rows.
      b. Secure with stainless steel set screws, incorporating round nonpenetrating point, on same side of standing seam.
      c. Torque set screw in accordance with manufacturer's written instructions.
      d. Install cross members to brackets.

END OF SECTION 07 7253

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SECTION 07 8413 - PENETRATION FIRESTOPPING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Penetration firestopping systems.
2. Penetrations in fire-resistance-rated walls.
3. Penetrations in smoke barriers.
4. Exposed penetration firestopping systems.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Listed System Designs: For each penetration firestopping system, for tests performed by a qualified testing agency.

1.4 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Entity that has been approved by FM Approvals in accordance with FM Approvals 4991 and evaluated by UL and found to comply with UL's "UL Solutions Qualified Firestop Contractor Program."

B. Manufacturer Qualifications: Entity that has received UL's "Firestop Movement Certification," which demonstrates that manufacturer's firestopping products designated with M-Ratings are based on exposure to cyclic movement and UL 1479 fire test evaluation when tested in accordance with ASTM E3037.

1.6 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 mockup of each penetration firestopping system type required for Project, including supporting construction substrates, attachments, and accessories.
2. Where one penetration firestopping system type may be used for different penetrating items or in different wall or floor constructions, install one assembly for each different combination.
3. Obtain approval of mockups from authorities having jurisdiction before proceeding.
4. 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.
5. 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 install penetration firestopping systems 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 system materials in accordance with manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be accessed and installed in accordance with 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 SOURCE LIMITATIONS

A. Obtain penetration firestopping systems for each type of opening indicated from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:
1. A qualified testing agency, acceptable to authorities having jurisdiction, will perform penetration firestopping system tests.
2. Test in accordance with testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:
    a. Penetration firestopping systems installed with products bearing the classification marking of a qualified testing agency.
        1) UL in its online directory "Product iQ."
        2) Intertek Group in its "Directory of Building Products."
        3) FM Approvals in its "Approval Guide."

B. Provide components for each penetration firestopping system that, upon curing, do not re-emulsify, dissolve, leach, break down, or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water, or other forms of moisture characteristic during and after construction.

C. Provide components for each penetration firestopping system that do not contain ethylene glycol.

D. Provide components for each penetration firestopping system that are sufficiently flexible to accommodate movement, such as pipe vibration, water hammer, thermal expansion, and other normal building movement without damage.

E. Provide components for each penetration firestopping system that are appropriately tested for the thickness and type of insulation utilized.

2.3 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 must be compatible with one another, with the substrates forming openings, and with penetrating items if any.
   1. Manufacturers: Subject to compliance with requirements, provide products by the following:
      a. 3M Building and Construction.
      b. Balco; a CSW Industrials Company.
      c. Everkem Diversified Products, Inc.
      d. FireShield; Fire Rated Solutions LLC.
      e. Grabber Construction Products, Inc.
      f. Hilti, Inc.
      g. Holdrite; a division of Reliance Worldwide Corporation.
      h. International Fireproof Technology Inc.
      i. NUCO Inc.
      j. Passive Fire Protection Partners.
      k. Roxtec Inc.
      l. Specified Technologies Inc.
      m. STC Sound Control.
      n. Tremco Incorporated.
      o. Unique Fire Stop Products.

B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined in accordance with ASTM E814 or UL 1479.
   1. F-Rating: Not less than the fire-resistance rating of the wall penetrated.
   2. Membrane Penetrations: Install recessed fixtures such that the required fire resistance will not be reduced.
   3. M-Rating: Provide penetration firestopping systems meeting specified F-Rating after being tested in accordance with ASTM E3037.

C. Penetrations in Smoke Barriers: Penetration firestopping systems with ratings determined in accordance with UL 1479.
   1. L-Rating: Not exceeding 5.0 cfm/sq. ft. (0.025 cu. m/s per sq. m) of penetration opening and no more than 50-cfm (0.024-cu. m/s) cumulative total for any 100 sq. ft. (9.3 sq. m) at both ambient and elevated temperatures.
   2. M-Rating: Provide penetration firestopping systems meeting specified L-Rating after being tested in accordance with ASTM E3037.

D. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested in accordance with ASTM E84 or UL 723.
   1. Sealant shall have a VOC content of 250 g/L or less.

2.4 ACCESSORIES

A. 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, including but not limited to:
   1. Permanent forming/damming/backing materials.
   2. Substrate primers.
   3. Collars.
   4. Steel sleeves.

2.5 FILL MATERIALS

A. Cast-in-Place Firestopping Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer sleeve lined with an intumescent strip, a flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

C. Firestopping Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced intumescent elastomeric sheet bonded to galvanized-steel sheet.

E. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.

F. Intumescent Wrap Strips: Single-component intumescent elastomeric strips for use around combustible penetrants.

G. 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.

H. Pillows/Bags: Compressible, removable, and reusable intumescent pillows encased in fire-retardant polyester or glass-fiber cloth. Where exposed, and when required by a listed system, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed or dislodged.

I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.

K. Thermal and Endothermic Wraps: Flexible, insulating, and fire-resistant protective wraps tested and listed for up to 2-hour fire ratings in accordance with ASTM E814 or UL 1479; for protecting membrane penetrations of utility boxes, critical electrical circuits, communications lines, and fuel lines, and for thermal barrier and circuit integrity protection in accordance with ASTM E1725 or UL 1724.

L. Fire-Rated Cable Sleeve Kits: Complete kits designed for new or existing cable penetrations through walls which accept standard accessories.

M. Fire-Rated Cable Pathways: Single or gangable device modules composed of a steel raceway with integral intumescent material and requiring no additional action in the form of plugs, twisting closure, putty, pillows, sealant, or otherwise to achieve fire and air-leakage ratings.
1. Fire-rated cable pathway devices are the preferred product for data, video, and communications cable penetrations. Install these devices in locations where frequent cable moves, add-ons, and changes will occur. Such devices must be:
   a. Capable of retrofit around existing cables.
   b. Designed so that two or more devices can be ganged together.
   c. Maintenance-free so no action is required to activate the smoke- and fire-sealing mechanism.
2. Where fire-rated cable pathway devices are not practical, openings within walls and floors designed to accommodate data, video, and communications cabling must be provided with re-enterable products specifically designed for retrofit, such as retrofit devices for cable bundles, firestopping putty, plugs, or pillows.

N. Retrofit Device for Cable Bundles: Factory-made, intumescent, collar-like device for firestopping existing over-filled cable sleeves and capable of being installed around projecting sleeves and cable bundles.

O. Wall-Opening Protective Materials: Intumescent, non-curing putty pads or self-adhesive inserts for protection of electrical switch and receptacle boxes.

P. Fire-Rated HVAC Retaining Angles: Steel angle system with integral intumescent firestopping gasket for use around rectangular steel HVAC ducts without fire dampers.

Q. Firestopping Plugs: Flexible, re-enterable, intumescent, foam-rubber plug for use in blank round openings and cable sleeves.

R. Fire-Rated Cable Grommet: Molded two-piece grommet made of plenum-grade polymer and foam inner core for sealing small cable penetrations in gypsum walls up to 1/2 inch in diameter.

S. Closet Flange Gasket: Molded, single-component, flexible, intumescent gasket for use beneath a water closet (toilet) flange in floor applications.

2.6 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 in accordance with manufacturer's written instructions and with the following requirements:
   1. Remove foreign materials from substrate surfaces 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 in accordance with penetration firestopping system manufacturer's written installation instructions, 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 in accordance 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 indicated.
   1. 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 (9.5-mm) strokes.
   1. 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 MANAGMENT 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. Owner will engage a qualified inspection agency to conduct and report on inspections in accordance with ASTM E2174.

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 07 8413

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SECTION 07 8443 - JOINT FIRESTOPPING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Intumescent gypsum wall framing gaskets.
2. Joints in or between fire-resistance-rated construction.
3. Joints in smoke barriers.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data:
1. For each type of product.

B. Product Schedule: For each joint firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing agency.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Listed System Designs: For each joint firestopping system, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that joint firestopping systems have been installed in compliance with requirements and manufacturer's written installation instructions.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Approvals in accordance with FM Approvals 4991 and evaluated by UL and found to comply with UL's "UL Solutions Qualified Firestop Contractor Program."

1.7 FIELD 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 in accordance with manufacturer's written installation instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

A. Coordinate construction of joints to ensure that joint firestopping systems can be installed in accordance with specified firestopping system design.

B. Coordinate sizing of joints to accommodate joint firestopping systems.

PART 2 PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain joint firestop systems for each type of joint opening indicated from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:
1. A qualified testing agency, acceptable to authorities having jurisdiction, will perform joint firestopping system tests.
2. Test in accordance with testing standards referenced in "Joint Firestopping Systems" Article. Provide rated systems complying with the following requirements:
    a. Joint firestop systems installed with products bearing the classification marking of a qualified product certification agency in accordance with listed system designs published by a qualified testing agency.
        1) UL in its online directory "Product iQ."
        2) Intertek Group in its "Directory of Building Products."

B. Rain/Water Resistance: For perimeter fire-barrier system applications, where inclement weather or greater-than-transient water exposure is expected, use products that dry rapidly and cure in the presence of atmospheric moisture sufficient to pass ASTM D6904 early rain-resistance test (24-hour exposure).

2.3 JOINT FIRESTOPPING SYSTEM TYPES

A. General: 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 must accommodate building movements without impairing their ability to resist the passage of fire and hot gases.
1. Joint firestopping systems that are compatible with one another, with the substrates forming openings, and with penetrating items, if any.
2. Provide products that, upon curing, do not re-emulsify, dissolve, leach, break down, or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture.
3. Provide firestop products that do not contain ethylene glycol.

B. Intumescent Gypsum Wall Framing Gaskets: Applied to steel tracks, runners, and studs prior to framing installation. Provide products with fire, smoke, and acoustical ratings that allow movement of up to 100 percent compression and/or extension when tested in accordance with UL 2079 or ASTM E1966; have an L Rating of less than 1 cfm/ft. (0.00115 cu. m/s x m) when tested in accordance with UL 2079; and a minimum Sound Transmission Class (STC) rating of 56 when tested in accordance with ASTM E90 or ASTM C919.
   1. Manufacturers: Subject to compliance with requirements, provide products by the following:
      a. CEMCO; California Expanded Metal Products Co.
      b. ClarkDietrich.
      c. International Fireproof Technology Inc.
      d. Specified Technologies, Inc.

C. Joints in or between Fire-Resistance-Rated Construction: Provide joint firestopping systems with ratings determined in accordance with ASTM E1966 or UL 2079, with published L-Ratings for ambient and elevated temperatures as evidence of the ability of the fire-resistive joint system to restrict the movement of smoke.
   1. Manufacturers: Subject to compliance with requirements, provide products by the following:
      a. 3M Building and Construction.
      b. Balco; a CSW Industrials Company.
      c. CEMCO; California Expanded Metal Products Co.
      d. ClarkDietrich.
      e. Everkem Diversified Products, Inc.
      f. Grabber Construction Products, Inc.
      g. Hilti, Inc.
      h. International Fireproof Technology Inc.
      i. Marino\\WARE.
      j. Nelson; Emerson Electric Co., Automation Solutions.
      k. NUCO Inc.
      l. Owens Corning.
      m. Passive Fire Protection Partners.
      n. RectorSeal Firestop; a CSW Industrials Company.
      o. ROCKWOOL.
      p. Specified Technologies, Inc.
      q. Tremco Incorporated.
      r. Willseal LLC.
   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.

D. Joints in Smoke Barriers: Provide joint firestopping systems with ratings determined in accordance with UL 2079 based on testing at a positive pressure differential of 0.30 inch wg (74.7 Pa).
   1. Manufacturers: Subject to compliance with requirements, provide products by the following:
      a. 3M Building and Construction.
      b. Balco; a CSW Industrials Company.
      c. CEMCO; California Expanded Metal Products Co.
      d. Everkem Diversified Products, Inc.
      e. Hilti, Inc.
      f. International Fireproof Technology Inc.
      g. Marino\\WARE.

h. Nelson; Emerson Electric Co., Automation Solutions.
i. NUCO Inc.
j. Owens Corning.
k. Passive Fire Protection Partners.
l. Polyset.
m. RectorSeal Firestop; a CSW Industrials Company.
n. ROCKWOOL.
o. Specified Technologies, Inc.
p. Tremco Incorporated.
q. Willseal LLC.

2. L-Rating: Not exceeding 5.0 cfm/ft. (0.00775 cu. m/s x m) of joint at both ambient and elevated temperatures.

E. Exposed Joint Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined in accordance with ASTM E84.

2.4 ACCESSORIES

A. Provide components of joint firestopping 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 joint firestopping systems, clean joints in accordance with fire-resistive joint system manufacturer's written installation instructions and the following requirements:
1. Remove foreign materials from substrate surfaces 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 in accordance with joint firestopping system manufacturer's written installation instructions, using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Apply a suitable bond breaker to prevent three-sided adhesion in applications where condition occurs.

3.3 INSTALLATION

A. General: Install joint firestopping systems in accordance 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.
   1. 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 joint firestopping systems by proven techniques to produce the following results:
   1. Apply elastomeric fill in 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. Wall Identification: Permanently label walls containing 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 (9.5-mm) strokes.
   1. 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. 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 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. Owner will engage a qualified testing agency to perform tests and inspections in accordance with ASTM E2393.

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 joint firestopping systems immediately and install new materials to produce joint firestopping systems complying with specified requirements.

3.7 JOINT FIRESTOPPING SYSTEM SCHEDULE

A. Where UL-classified systems are indicated, they refer to system numbers in UL's online directory "Product iQ" under product Category XHBN or Category XHDG.
   1. Refer to Drawings for selected UL systems.

END OF SECTION 07 8443

SECTION 07 9200 - JOINT SEALANTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Self-leveling pourable joint sealants.

C. Joint backings and accessories.

1.2 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's technical datasheets for each product to be used; include the following:
1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
2. List of backing materials approved for use with the specific product.
3. Backing material recommended by sealant manufacturer.
4. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
5. Substrates the product should not be used on.
6. Substrates for which use of primer is required.
7. Substrates for which laboratory adhesion and/or compatibility testing is required.
8. Installation instructions, including precautions, limitations, and recommended backing materials and tools.
9. Sample product warranty.
10. Certification by manufacturer indicating that product complies with specification requirements.
11. SWRI Validation: Provide currently available sealant product validations as listed by SWRI (VAL) for specified sealants.

B. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

C. Samples for Verification: Where custom sealant color is specified, obtain directions from Architect and submit at least two physical samples for verification of color of each required sealant.

1.3 INFORMATIONAL SUBMITTALS

A. Preconstruction Laboratory Test Reports: Submit at least four weeks prior to start of installation.

B. Preinstallation Field Adhesion Test Plan: Submit at least two weeks prior to start of installation.

C. Field Quality Control Plan: Submit at least two weeks prior to start of installation.

D. Preinstallation Field Adhesion Test Reports: Submit filled out Preinstallation Field Adhesion Test Reports log within 10 days after completion of tests; include bagged test samples and photographic records.

E. Field Quality Control Log: Submit filled-out log for each length or instance of sealant installed, within 10 days after completion of inspections/tests; include bagged test samples and photographic records, if any.

F. Installer's qualification statement.

1.4 CLOSEOUT SUBMITTALS

A. Executed warranty.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.

B. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

C. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.
1. Adhesion Testing: In accordance with ASTM C794.
2. Compatibility Testing: In accordance with ASTM C1087.
3. Stain Testing: In accordance with ASTM C1248.
4. Allow sufficient time for testing to avoid delaying the work.
5. Deliver sufficient samples to manufacturer for testing.
6. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.
7. Testing is not required if sealant manufacturer provides data showing previous testing, not older than 24 months, that shows satisfactory adhesion, lack of staining, and compatibility.

D. Preinstallation Field Adhesion Test Plan: Include destructive field adhesion testing of one sample of each combination of sealant type and substrate, except interior acrylic latex sealants, and include the following for each tested sample.
1. Identification of testing agency.
2. Preinstallation Field Adhesion Test Log Form: Include the following data fields, with known information filled out.
    a. Substrate; if more than one type of substrate is involved in a single joint, provide two entries on form, for testing each sealant substrate side separately.
    b. Test date.
    c. Location on project.
    d. Sealant used.
    e. Test method used.
    f. Date of installation of field sample to be tested.
    g. Date of test.
    h. Copy of test method documents.
    i. Age of sealant upon date of testing.
    j. Test results, modeled after the sample form in the test method document.
    k. Indicate use of photographic record of test.

E. Field Quality Control Plan:

1. Visual inspection of entire length of sealant joints.
2. Destructive field adhesion testing of sealant joints, except interior sealant joints.
    a. For each different sealant and substrate combination, allow for one test every 100 feet in the first 1,000 linear feet, and one test per 1,000 linear feet thereafter, or once per floor on each elevation.
    b. If any failures occur in the first 1,000 linear feet, continue testing at frequency of one test per 500 linear feet at no extra cost to Owner.
3. Field testing agency's qualifications.
4. Field Quality Control Log Form: Show same data fields as on Preinstallation Field Adhesion Test Log, with known information filled out and lines for multiple tests per sealant/substrate combinations; include visual inspection and specified field testing; allow for possibility that more tests than minimum specified may be necessary.

F. Field Adhesion Test Procedures:
1. Allow sealants to fully cure as recommended by manufacturer before testing.
2. Have a copy of the test method document available during tests.
3. Take photographs or make video records of each test, with joint identification provided in the photos/videos; for example, provide small erasable whiteboard positioned next to joint.
4. Record the type of failure that occurred, other information required by test method, and the information required on the Field Quality Control Log.
5. When performing destructive tests, also inspect the opened joint for proper installation characteristics recommended by manufacturer, and report any deficiencies.
6. Deliver the samples removed during destructive tests in separate sealed plastic bags, identified with project, location, test date, and test results, to Owner.
7. If any combination of sealant type and substrate does not show evidence of minimum adhesion or shows cohesion failure before minimum adhesion, report results to Architect.

G. Destructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Destructive Tail Procedure.
1. Sample: At least 18 inches long.
2. Minimum Elongation Without Adhesive Failure: Consider the tail at rest, not under any elongation stress; multiply the stated movement capability of the sealant in percent by two; then multiply 1 inch by that percentage; if adhesion failure occurs before the 1-inch mark is that distance from the substrate, the test has failed.
3. If either adhesive or cohesive failure occurs before minimum elongation, take necessary measures to correct conditions and retest; record each modification to products or installation procedures.
4. Record results on Field Quality Control Log.
5. Repair failed portions of joints.

H. Field Adhesion Tests of Joints: Test for adhesion using most appropriate method in accordance with ASTM C1521, or another applicable method as recommended by manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials in original undamaged packaging, within temperature limits recommended by manufacturer; protect from direct sunlight.

B. Remove and replace sealants that cannot be installed within their stated shelf life.

1.7 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.
   2. When joint substrates are wet.
   3. Where contaminants capable of interfering with adhesion have not been removed from joint substrates.

1.8 WARRANTY

A. Installer's Warranty: Provide installer's standard form in which installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this section within the specified warranty period commencing at date of Substantial Completion.
   1. Warranty Period: 2 years.

B. Manufacturer's Warranty: Provide manufacturer's standard material warranty commencing at date of Substantial Completion.
   1. Polyurethane Joint Sealants: 5 years.
   2. Silicone Joint Sealants: 20 years.

C. Specified warranties exclude deterioration or failure of joint sealants from the following:
   1. Movement of the structure resulting in stresses on the sealant exceeding the sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
   2. Disintegration of joint substrates from natural causes (lightening, hurricane, tornado, fire, etc.) 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 MANUFACTURERS

A. Basis-of-Design Products: Provide products indicated or by comparable acceptable manufacturer listed below.

B. Comparable manufacturers:
   1. Adfast USA Inc.
   2. Adhesives Technology Corporation.
   3. Dow.
   4. Everkem Diversified Products, Inc.
   5. Franklin International, Inc.
   6. Henry, a Carlisle Company.
   7. Hilti, Inc.
   8. Momentive Performance Materials, Inc (formerly GE Silicones).
   9. Pecora Corporation.
   10. Sika Corporation.

11. Specified Technologies Inc.
12. Tremco Commercial Sealants & Waterproofing.
13. W. R. Meadows, Inc.

2.2 JOINT SEALANTS - GENERAL

A. Sealants and Primers: Provide products with acceptable levels of volatile organic compound (VOC) content; see Section 01 6116.

B. Colors: As selected by Architect from manufacturer's full range of colors.

2.3 NONSAG JOINT SEALANTS

A. SLNT-01, Nonstaining Silicone Sealant: ASTM C920, Grade NS, Uses M, A, G, and O; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 50 percent, minimum.
2. Nonstaining to Porous Stone: Nonstaining to light-colored natural stone when tested in accordance with ASTM C1248.
3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
4. Cure Type: Single-component, neutral moisture curing.
5. Basis-of-Design Product:
   a. Dow; DOWSIL 795 Silicone Building Sealant.

B. SLTN-02, Nonstaining Silicone Sealant: ASTM C920, Grade NS, Uses M, A, G, and O; Traffic Grade.
1. Movement Capability: Plus 100 percent and minus 50 percent, minimum.
2. Nonstaining to Porous Stone: Nonstaining to light-colored natural stone when tested in accordance with ASTM C1248.
3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
4. Cure Type: Single-component, neutral moisture curing.
5. Basis-of-Design Product:
   a. Dow; DOWSIL 790 Silicone Building Sealant.

C. SLNT-03A, Silicone Sealant: ASTM C920, Grade NS, Uses A, G, and O; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 25 percent, minimum.
2. Cure Type: Single component, neutral moisture curing.
3. Basis-of-Design Product:
   a. Dow; DOWSIL 758 Silicone Weather Barrier Sealant.

D. SLNT-03B, Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus 100 percent, minus 50 percent, minimum.
2. Basis-of-Design Product:
   a. Tremco Commercial Sealants & Waterproofing; Dymonic 100.

E. SLNT-04, Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.

1. Nonstaining to Porous Stone: Nonstaining to light-colored natural stone when tested in accordance with ASTM C1248.
2. Basis-of-Design Product:
    a. Pecora Corporation; Pecora 898 NST (Non-Staining Technology).

F. SLNT-05, Silyl-Terminated Polyurethane (STPU) Sealant: ASTM C920, Grade NS, Uses M and A; single component; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 50 percent, minimum
2. Hardness Range: 25 to 30, Shore A, when tested in accordance with ASTM C661.
3. Service Temperature Range: Minus 40 to 180 degrees F.
4. Basis-of-Design Product:
    a. Pecora Corporation; DynaTrol I-XL Hybrid.

G. SLNT-06, Nonsag Traffic-Grade Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; explicitly approved by manufacturer for continuous water immersion and traffic without the necessity to recess sealant below traffic surface.
1. Movement Capability: Plus and minus 50 percent, minimum.
2. Hardness Range: 20 to 30, Shore A, when tested in accordance with ASTM C661.
3. Basis-of-Design Product:
    a. Sika Corporation; Sikaflex NP 2.

H. SLNT-07, Epoxy Sealant: ASTM C881/C881M, Type I and III, Grade 3, Class B and C; two-component.
1. Hardness Range: 65 to 75, Shore D, when tested in accordance with ASTM C661.
2. Compressive Strength: 11,000 psi, when tested in accordance with ASTM D695.
3. Basis-of-Design Product:
    a. Pecora Corporation; DynaPoxy EP-1200 Two-Part Epoxy Security Sealant.

I. SLNT-08, Acrylic Emulsion Latex: Water-based; ASTM C834, single component, nonstaining, nonbleeding, nonsagging; not intended for exterior use.
1. Grade: ASTM C834; Grade 32 Degrees F (0 Degrees C).
2. Basis-of-Design Product:
    a. Pecora Corporation; AC-20 +Silicone.
    b. Tremco Commercial Sealants & Waterproofing; Tremflex 834.

J. SLNT-09, Acrylic Emulsion Latex: Water-based; ASTM C834, single component, nonstaining, nonbleeding, nonsagging; not intended for exterior use. Provide Fire rated comparable product in lieu of smoke rating where required.
1. Products:
    a. Franklin International, Inc; Titebond Acoustical Smoke & Sound Sealant.
    b. Hilti, Inc; CP 506 Smoke and Acoustical Sealant.
    c. Specified Technologies Inc; Smoke N' Sound Acoustical Sealant.

K. SLNT-10, Butyl Sealant: Solvent-based; ASTM C1311; single component, nonsag; not expected to withstand continuous water immersion or traffic. Single component, maximum joint movement +/- 5 percent.
1. Service Temperature Range: Minus 13 to 180 degrees F.
2. Basis-of-Design Products:
    a. C.R. Laurence, Co. Inc.; CRL 777 Butyl Rubber Sealant or CRL 888 Premium Grade Caulking Compound.

2.4 SELF-LEVELING JOINT SEALANTS

A. SLNT-11, Self-Leveling Polyurethane Sealant for Horizontal Expansion Joints: ASTM C920, Grade P, Uses T, M, and O; single or multicomponent; explicitly approved by manufacturer for horizontal expansion joints.
   1. Movement Capability: Plus and minus 25 percent, minimum.
   2. Hardness Range: 30 to 35, Shore A, when tested in accordance with ASTM C661.
   3. Basis-of-Design Product:
      a. Sika Corporation; Sikaflex SL 2.

B. SLNT-12, Self-Leveling Hybrid Silane Polyether Sealant: ASTM C920, Grade P, Uses M, O, and T2; single component; explicitly approved by manufacturer for traffic exposure; not expected to withstand continuous water immersion.
   1. Movement Capability: Plus and minus 25 percent.
   2. Basis-of-Design Product:
      a. CTS Cement Manufacturing Corporation; Rapid Set Self-Leveling Sealant - Hybrid Silane Polyether.

C. SLNT-13, High Quality Latex-Based Sound Sealant: ASTM C834, Type OP an opaque sealant, and Grade 0, 32 degrees F, meets requirements for low-temperature flexibility.
   1. Basis-of-Design Product:
      a. Everkem Diversified Products, Inc; Sound Seal 90.

2.5 ACCESSORIES

A. Sealant Backing Materials, General: Materials placed in joint before applying sealants; assists sealant performance and service life by developing optimum sealant profile and preventing three-sided adhesion; type and size recommended by sealant manufacturer for compatibility with sealant, substrate, and application.
   1. Sealant Backing Rod:
      a. Cylindrical flexible sealant backings complying with ASTM C1330:
         1) Type C: closed-cell polyethylene backer rod.
         2) Type O: open-cell polyurethane or soft reticulated polyethylene backer rod.
         3) Type B: bi-cellular combination backer rod with open- and closed-cell skin.
      b. Size: 25 to 50 percent larger in diameter than joint width.

B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

C. Masking Tape: Self-adhesive, nonabsorbent, nonstaining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.

D. Joint Cleaner: Noncorrosive and nonstaining type, type recommended by sealant manufacturer; compatible with joint forming materials.

E. Primers: Type recommended by sealant manufacturer to suit application; nonstaining.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

D. Preinstallation Adhesion Testing: Install a sample for each test location indicated in the test plan.
1. Test each sample as specified in PART 1 under QUALITY ASSURANCE article.
2. Notify Architect of date and time that tests will be performed, at least seven days in advance.
3. Record each test on Preinstallation Adhesion Test Log as indicated.
4. If any sample fails, review products and installation procedures, consult manufacturer, or take other measures that are necessary to ensure adhesion; retest in a different location; if unable to obtain satisfactory adhesion, report to Architect.
5. After completion of tests, remove remaining sample material and prepare joints for new sealant installation.

3.2 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

E. Concrete Floor Joints That Will Be Exposed in Completed Work: Test joint filler in an inconspicuous area to verify that it does not stain or discolor slab.

3.3 INSTALLATION

A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Provide joint sealant installations complying with ASTM C1193.

C. Install acoustical sealant application work in accordance with ASTM C919.

D. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.

E. Install bond breaker backing tape where backer rod cannot be used.

F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

G. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

H. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

I. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.

3.4 FIELD QUALITY CONTROL

A. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.

B. Destructive Adhesion Testing: If there are any failures in first 1,000 linear feet, notify Architect immediately.

C. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

D. Repair destructive test location damage immediately after evaluation and recording of results.

3.5 JOINT SEALANT APPLICATIONS

A. Exterior Joints:
1. Seal the following joints:
    a. Wall expansion and control joints.
    b. Joints between doors, windows, and other frames or adjacent construction.
    c. Joints between different exposed materials.

B. Interior Joints:
1. Do not seal through-penetrations in sound-rated assemblies that are also fire-rated assemblies.
2. Seal the following joints:
    a. Joints between door frames and window frames and adjacent construction.
    b. Joints between tops of non-load bearing unit masonry and concrete walls and partitions.
    c. Tile control and expansion joints
    d. Vertical control joints on exposed surfaces of interior unit masonry and concrete walls and partitions.
    e. In sound-rated wall and ceiling assemblies, gaps at electrical outlets, wiring devices, and piping penetrations.
    f. In sound-rated wall and ceiling assemblies, seal joints between wall assemblies and ceiling assemblies; between wall assemblies and other construction; between ceiling assemblies and other construction.

C. Exterior and interior joints in horizontal traffic surfaces:
1. Control, expansion and isolation joints in cast-in-place concrete slabs.
2. Joints between different materials.

D. Do Not Seal:
1. Intentional weep holes in masonry.

2. Joints indicated to be covered with manufactured expansion joint cover assemblies or other sealing devices.
3. Joints where sealant is specified to be furnished and installed by manufacturer of product to be sealed.
4. Joints where sealant installation is specified in other sections.
5. Joints between suspended ceilings and walls.

3.6 JOINT SEALANT SCHEDULE

A. SLNT-01: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
1. Joints between plant-precast architectural concrete units.
2. Joints between masonry.
3. Joints between metal panels.
4. Joints between different materials listed above.
5. Control and expansion joints in ceilings and other overhead surfaces.
6. Other joints as indicated.

B. SLNT-02: Exterior joints in vertical surfaces and horizontal nontraffic and traffic surfaces.
1. Expansion and control joints in cast-in-place concrete.
2. Joints between plant-precast architectural concrete units.
3. Control and expansion joints in unit masonry.
4. Perimeter joints between materials listed above and frames of doors windows and louvers.
5. Curtainwall and mullion weather seal joints.
6. High-movement construction joints.

C. SLNT-03A and SLNT-03B: Exterior transition joints between metals and self-adhered flashings and air barrier membranes.
1. Ensure compatibilty with membranes and sealants.

D. SLNT-04: Interior joints between plumbing fixtures and walls.

E. SLNT-05: Exterior joints at vertical non-traffic surfaces.
1. Expansion and control joints in concrete slabs.
2. Coping and Coping to Facade Joints.

F. SLNT-06: Miscellaneous exterior vertical and horizontal joints requiring weather sealing.

G. SLNT-07: Not Used.

H. SLNT-08: Interior vertical and horizontal miscellaneous caulking and sealing, requiring paint cover.

I. SLNT-09: Interior acoustic and smoke sealant, unexposed.

J. SLNT-10: Sealant joints at thresholds.

K. SLNT-11: Interior joints in horizontal and vertical substrates.
1. Interior exposed joints in slabs.
2. Interior exposed perimeter joints at walls and other vertical substrates.
3. Joints in floor tilework.

L. SLNT-12: Exterior and Interior joints in horizontal traffic surfaces.

1. Isolation and contraction joints in cast-in-place concrete slabs.
2. Joints between different materials listed above.
3. Other joints as indicated.

M. SLNT-13: Interior acoustic-rated partitions, exposed to view.

END OF SECTION 07 9200

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SECTION 08 0671 - DOOR HARDWARE SCHEDULE

PART 1 GENERAL

1.1 SUMMARY

A. This Section references specification sections relating to commercial door hardware for the following:
   1. Swinging doors.
   2. Sliding Doors.
   3. Other doors to the extent indicated.

B. Commercial door hardware includes, but is not necessarily limited to, the following:
   1. Mechanical door hardware.
   2. Electromechanical and access control door hardware.
   3. Electromechanical and access control door hardware power supplies, back-ups and surge protection.
   4. Automatic operators.
   5. Cylinders specified for doors in other sections.

C. Related Sections:
   1. Division 08 Section “Door Hardware”.

D. Codes and References: Comply with the version 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. State Building Codes, Local Amendments.

E. Standards: Reference Related Sections for requirements regarding compliance with applicable industry standards.

1.2 REFERENCE STANDARDS

A. ICC (IBC) - International Building Code.

B. NFPA 70 - National Electrical Code.

C. NFPA 80 - Standard for Fire Doors and Other Opening Protectives.

D. NFPA 101 - Life Safety Code.

E. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives.

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.
   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. Keying Schedule: Prepared under the supervision of the Owner, separate schedule detailing final keying instructions for locksets and cylinders in writing. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner to approve submitted keying schedule prior to the ordering of permanent cylinders.

D. 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.

E. 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 Submittals. The manual to include the name, address, and contact information of the manufacturers providing the hardware 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 the Related Sections.

1.4 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".

1.5 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.

1.6 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. Refer to “PART 3 – EXECUTION” for required specification sections.

PART 3 EXECUTION

3.1 DOOR HARDWARE SETS

A. The door 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. Products listed in the hardware sets shall be supplied by and in accordance with the requirements described in the specification section as noted for each item.
   1. Section 08 71 00 – Door Hardware.

C. Manufacturer's Abbreviations:
   1. MK - McKinney.
   2. PE - Pemko.
   3. SU - Securitron.
   4. RO - Rockwood.
   5. SA - Sargent.
   6. NO - Norton Rixson.
   7. LU - Lund Equipment Co.
   8. OT - Other.

HARDWARE SETS					
SET: 1.0					
DOORS: 100A, 100B					
2	CONTINUOUS HINGE	CFM__HD1 PT X LAR		PE	
2	ELECTRIC POWER TRANSFER	EL-CEPT	630	SU	⚡
1	CONCEALED VERT ROD EXIT, NIGHTLATCH	56 60 ADPE8610 106 (MELR)	US32D	SA	⚡
1	CONCEALED VERT ROD EXIT, EXIT ONLY	56 ADPE8610 EO (MELR)	US32D	SA	⚡
1	CORE	DG263 6300	US15	SA	
2	PULL	RM3131-12 MTG-TYPE 12	US32D	RO	
2	SURFACE CLOSER	CPS7500 (BRACKETS AND DROP PLATE AS REQUIRED)	689	NO	
1	GASKETING	BY DOOR MANUFACTURER		00	
2	SWEEP	307APK		PE	
1	THRESHOLD	273X3AFG MSES10SS		PE	
2	ELECTROLYNX HARNESS (FRAME)	QC-C1500P		MK	⚡

1	ELECTROLYNX HARNESS (DOOR)	QC-C*** (LENGTH / TYPE AS REQUIRED)		MK	⚡
1	WIRING DIAGRAM	WD-SYSPK (ELEVATIONS AND POINT TO POINT)		SA	
1	POSITION SWITCH	DPS-M-BK		SU	⚡
1	POWER SUPPLY W/ DISTRIBUTION BOARD	AQL4-R8E1		SU	⚡
NOTES: CARD READER BY SECURITY VENDOR. PRESENTING AUTHORIZED CREDENTIAL TO CARD READER OR INTERCOM BUZZER WILL UNLOCK EXIT DEVICE ALLOWING ACCESS. EGRESS IS BY EXIT DEVICE. EMERGENCY ACCESS BY KEY.					
SET: 2.0					
DOORS: 122B					
2	CONTINUOUS HINGE	CFM__HD1 PT X LAR		PE	
2	ELECTRIC POWER TRANSFER	EL-CEPT	630	SU	⚡
1	CONCEALED VERT ROD EXIT, NIGHTLATCH	56 60 ADPE8610 106 (MELR)	US32D	SA	⚡
1	CONCEALED VERT ROD EXIT, EXIT ONLY	56 ADPE8610 EO (MELR)	US32D	SA	⚡
1	CORE	DG263 6300	US15	SA	
2	PULL	RM3131-12 MTG-TYPE 12	US32D	RO	
2	SURFACE CLOSER	CPS7500 (BRACKETS AND DROP PLATE AS REQUIRED)	689	NO	
2	ARMOR PLATE	K1050 (F) 42" HIGH ARMOR PLATE NOTCH HVBEV CSK (FIRE LABEL IF REQUIRED)	US32D	RO	
1	GASKETING	BY DOOR MANUFACTURE		00	

		R			
2	SWEEP	307APK		PE	
1	THRESHOLD	273X3AFG MSES10SS		PE	
2	ELECTROLYNX HARNESS (FRAME)	QC-C1500P		MK	⚡
2	ELECTROLYNX HARNESS (DOOR)	QC-C*** (LENGTH / TYPE AS REQUIRED)		MK	⚡
1	WIRING DIAGRAM	WD-SYSPK (ELEVATIONS AND POINT TO POINT)		SA	
2	POSITION SWITCH	DPS-M-BK		SU	⚡
1	POWER SUPPLY W/ DISTRIBUTION BOARD	AQL4-R8E1		SU	⚡
NOTES: CARD READER BY SECURITY VENDOR. PRESENTING AUTHORIZED CREDENTIAL TO CARD READER WILL UNLOCK EXIT DEVICE ALLOWING ACCESS. EGRESS IS BY EXIT DEVICE. EMERGENCY ACCESS BY KEY.					
SET: 3.0					
DOORS: 156B					
1	CONTINUOUS HINGE	CFM__HD1 PT X LAR		PE	
1	ELECTRIC POWER TRANSFER	EL-CEPT	630	SU	⚡
1	RIM EXIT DEVICE, STOREROOM	56 60 8804 LESS PULL (MELR)	US32D	SA	⚡
1	CORE	DG263 6300	US15	SA	
1	PULL	RM3131-12 MTG-TYPE 12	US32D	RO	
1	SURFACE CLOSER (HOLD OPEN)	CPS7500T (BRACKETS AND DROP PLATE AS REQUIRED)	689	NO	
1	ARMOR PLATE	K1050 (F) 42" HIGH ARMOR PLATE NOTCH HVBEV CSK (FIRE LABEL IF	US32D	RO	

		REQUIRED)			
1	GASKETING	BY DOOR MANUFACTURER		00	
1	SWEEP	307APK		PE	
1	THRESHOLD	271A MSES10SS		PE	
1	ELECTROLYNX HARNESS (FRAME)	QC-C1500P		MK	⚡
1	ELECTROLYNX HARNESS (DOOR)	QC-C*** (LENGTH / TYPE AS REQUIRED)		MK	⚡
1	WIRING DIAGRAM	WD-SYSPK (ELEVATIONS AND POINT TO POINT)		SA	
1	POSITION SWITCH	DPS-M-BK		SU	⚡
1	POWER SUPPLY W/ DISTRIBUTION BOARD	AQL4-R8E1		SU	⚡
NOTES: CARD READER BY SECURITY VENDOR. PRESENTING AUTHORIZED CREDENTIAL TO CARD READER WILL UNLOCK EXIT DEVICE ALLOWING ACCESS. EGRESS IS BY EXIT DEVICE WHICH IS MONITORED BY REQUEST TO EXIT SWITCH. EMERGENCY ACCESS BY KEY.					
SET: 4.0					
DOORS: 122C, 126B, 126D, 144C, 144D					
1	CONTINUOUS HINGE	CFM__HD1 PT X LAR		PE	
1	ELECTRIC POWER TRANSFER	EL-CEPT	630	SU	⚡
1	RIM EXIT DEVICE, STOREROOM	56 60 8804 LESS PULL (MELR)	US32D	SA	⚡
1	CORE	DG263 6300	US15	SA	
1	PULL	RM3131-12 MTG-TYPE 12	US32D	RO	
1	SURFACE CLOSER (DELAYED ACTION)	CPS7500 DA (BRACKETS AND DROP PLATE AS REQUIRED)	689	NO	
1	ARMOR PLATE	K1050 (F) 42" HIGH ARMOR PLATE NOTCH	US32D	RO	

		HVBEV CSK (FIRE LABEL IF REQUIRED)			
1	GASKETING	BY DOOR MANUFACTURER		00	
1	SWEEP	307APK		PE	
1	THRESHOLD	273X3AFG MSES10SS		PE	
1	ELECTROLYNX HARNESS (FRAME)	QC-C1500P		MK	⚡
1	ELECTROLYNX HARNESS (DOOR)	QC-C*** (LENGTH / TYPE AS REQUIRED)		MK	⚡
1	WIRING DIAGRAM	WD-SYSPK (ELEVATIONS AND POINT TO POINT)		SA	
1	POSITION SWITCH	DPS-M-BK		SU	⚡
1	POWER SUPPLY W/ DISTRIBUTION BOARD	AQL4-R8E1		SU	⚡
NOTES: CARD READER BY SECURITY VENDOR. PRESENTING AUTHORIZED CREDENTIAL TO CARD READER WILL UNLOCK EXIT DEVICE ALLOWING ACCESS. EGRESS IS BY EXIT DEVICE WHICH IS MONITORED BY REQUEST TO EXIT SWITCH. EMERGENCY ACCESS BY KEY.					
SET: 4.1					
DOORS: 145B					
1	CONTINUOUS HINGE	CFM__HD1 PT X LAR		PE	
1	ELECTRIC POWER TRANSFER	EL-CEPT	630	SU	⚡
1	RIM EXIT DEVICE, STOREROOM	56 60 8804 LESS PULL (MELR)	US32D	SA	⚡
1	CORE	DG263 6300	US15	SA	
1	PULL	RM3131-12 MTG-TYPE 12	US32D	RO	
1	SURFACE CLOSER (DELAYED ACTION)	CPS7500 DA (BRACKETS AND DROP PLATE AS REQUIRED)	689	NO	

1	GASKETING	BY DOOR MANUFACTURER		00	
1	SWEEP	307APK		PE	
1	THRESHOLD	273X3AFG MSES10SS		PE	
1	ELECTROLYNX HARNESS (FRAME)	QC-C1500P		MK	⚡
1	ELECTROLYNX HARNESS (DOOR)	QC-C*** (LENGTH / TYPE AS REQUIRED)		MK	⚡
1	WIRING DIAGRAM	WD-SYSPK (ELEVATIONS AND POINT TO POINT)		SA	
1	POSITION SWITCH	DPS-M-BK		SU	⚡
1	POWER SUPPLY W/ DISTRIBUTION BOARD	AQL4-R8E1		SU	⚡
NOTES: CARD READER BY SECURITY VENDOR. PRESENTING AUTHORIZED CREDENTIAL TO CARD READER WILL UNLOCK EXIT DEVICE ALLOWING ACCESS. EGRESS IS BY EXIT DEVICE WHICH IS MONITORED BY REQUEST TO EXIT SWITCH. EMERGENCY ACCESS BY KEY.					
SET: 5.0					
DOORS: 102D					
1	CONTINUOUS HINGE	CFM__SLI-HD1 X LAR		PE	
1	RIM EXIT DEVICE, EXIT ONLY	LD PE8810 EO	US32D	SA	
1	SURFACE CLOSER (HOLD OPEN)	CPS7500T (BRACKETS AND DROP PLATE AS REQUIRED)	689	NO	
1	ARMOR PLATE	K1050 (F) 42" HIGH ARMOR PLATE NOTCH HVBEV CSK (FIRE LABEL IF REQUIRED)	US32D	RO	
1	GASKETING	BY DOOR MANUFACTURE		00	

		R			
1	SWEEP	307APK		PE	
1	THRESHOLD	273X3AFG MSES10SS		PE	
1	POSITION SWITCH	DPS-M-BK		SU	⚡
SET: 6.0					
DOORS: 144B					
1	CONTINUOUS HINGE	CFM__HD1 X LAR		PE	
1	CONTINUOUS HINGE	CFM__HD1 PT X LAR		PE	
1	ELECTRIC POWER TRANSFER	EL-CEPT	630	SU	⚡
1	SURFACE VERT ROD EXIT, EXIT ONLY	LD NB-PE8710 EO	US32D	SA	
1	SURFACE VERT ROD EXIT	56 60 NB-PE8706 WEL (MELR)	US32D	SA	⚡
1	CORE	DG263 6300	US15	SA	
2	SURFACE CLOSER	PR7500 (BRACKETS AND DROP PLATE AS REQUIRED)	689	NO	
2	ARMOR PLATE	K1050 (F) 42" HIGH ARMOR PLATE NOTCH HVBEV CSK (FIRE LABEL IF REQUIRED)	US32D	RO	
2	DOOR STOP	400/441CU	US26D	RO	
1	ASTRAGAL (SET)	(2) 297APK		PE	
1	GASKETING	S88BL (HEAD & JAMBS)		PE	
2	SWEEP	307APK		PE	
1	THRESHOLD	271A MSES10SS		PE	
2	ELECTROMAGNETIC HOLDER	998 X VOLTAGE AS REQUIRED	689	NO	⚡
1	ELECTROLYNX HARNESS (FRAME)	QC-C1500P		MK	⚡

1	ELECTROLYNX HARNESS (DOOR)	QC-C*** (LENGTH / TYPE AS REQUIRED)		MK	⚡
1	WIRING DIAGRAM	WD-SYSPK (ELEVATIONS AND POINT TO POINT)		SA	
1	POWER SUPPLY W/ DISTRIBUTION BOARD	AQL4-R8E1		SU	⚡
NOTES: CARD READER BY SECURITY VENDOR. PRESENTING AUTHORIZED CREDENTIAL TO CARD READER WILL UNLOCK EXIT DEVICE ALLOWING ACCESS. EGRESS IS BY EXIT DEVICE WHICH IS MONITORED BY REQUEST TO EXIT SWITCH. EMERGENCY ACCESS BY KEY.					
SET: 7.0					
DOORS: 144A					
1	CONTINUOUS HINGE	CFM__HD1 PT X LAR		PE	
1	ELECTRIC POWER TRANSFER	EL-CEPT	630	SU	⚡
1	RIM EXIT DEVICE, STOREROOM	56 60 PE8804 WEL (MELR)	US32D	SA	⚡
1	CORE	DG263 6300	US15	SA	
1	SURFACE CLOSER	PR7500 (BRACKETS AND DROP PLATE AS REQUIRED)	689	NO	
1	ARMOR PLATE	K1050 (F) 42" HIGH ARMOR PLATE NOTCH HVBEV CSK (FIRE LABEL IF REQUIRED)	US32D	RO	
1	GASKETING	S88BL (HEAD & JAMBS)		PE	
1	ELECTROMAGNETIC HOLDER	998 X VOLTAGE AS REQUIRED	689	NO	⚡
1	ELECTROLYNX HARNESS (FRAME)	QC-C1500P		MK	⚡
1	ELECTROLYNX HARNESS (DOOR)	QC-C*** (LENGTH / TYPE		MK	⚡

		AS REQUIRED)			
1	WIRING DIAGRAM	WD-SYSPK (ELEVATIONS AND POINT TO POINT)		SA	
1	POWER SUPPLY W/ DISTRIBUTION BOARD	AQL4-R8E1		SU	⚡
NOTES: CARD READER BY SECURITY VENDOR. PRESENTING AUTHORIZED CREDENTIAL TO CARD READER OR INTERCOM BUZZER WILL UNLOCK EXIT DEVICE ALLOWING ACCESS. EGRESS IS BY EXIT DEVICE WHICH IS MONITORED BY REQUEST TO EXIT SWITCH. EMERGENCY ACCESS BY KEY.					
SET: 8.0					
DOORS: 154C					
1	CONTINUOUS HINGE	CFM__HD1 PT X LAR		PE	
1	ELECTRIC POWER TRANSFER	EL-CEPT	630	SU	⚡
1	FAIL SECURE LOCK	60 10XG71 LL	US26D	SA	⚡
1	CORE	DG263 6300	US15	SA	
1	SURFACE CLOSER	CPS7500 (BRACKETS AND DROP PLATE AS REQUIRED)	689	NO	
1	ARMOR PLATE	K1050 (F) 42" HIGH ARMOR PLATE NOTCH HVBEV CSK (FIRE LABEL IF REQUIRED)	US32D	RO	
1	GASKETING	2891APK (HEAD)		PE	
1	GASKETING	290APK (JAMBS)		PE	
1	SWEEP	307APK		PE	
1	THRESHOLD	2009APK MSES10		PE	
1	ELECTROLYNX HARNESS (FRAME)	QC-C1500P		MK	⚡
1	ELECTROLYNX HARNESS (DOOR)	QC-C*** (LENGTH / TYPE AS REQUIRED)		MK	⚡

1	WIRING DIAGRAM	WD-SYSPK (ELEVATIONS AND POINT TO POINT)		SA	
1	POSITION SWITCH	DPS-M-BK		SU	⚡
1	POWER SUPPLY W/ DISTRIBUTION BOARD	AQL4-R8E1		SU	⚡
NOTES: CARD READER BY SECURITY VENDOR. PRESENTING AUTHORIZED CREDENTIAL TO CARD READER WILL UNLOCK EXTERIOR TRIM ALLOWING ACCESS. EGRESS IS BY INSIDE LEVER. EMERGENCY ACCESS BY KEY.					
SET: 9.0					
DOORS: 151A					
1	CONTINUOUS HINGE	CFM__HD1 X LAR		PE	
1	CONTINUOUS HINGE	CFM__HD1 PT X LAR		PE	
1	ELECTRIC POWER TRANSFER	EL-CEPT	630	SU	⚡
1	FLUSH BOLT (TOP)	555 (METAL) / 557 (WOOD)	US26D	RO	
2	DUST PROOF STRIKE	570	US26D	RO	
1	FAIL SECURE LOCK	60 10XG71 LL	US26D	SA	⚡
2	CORE	DG263 6300	US15	SA	
2	SURFACE CLOSER (HOLD OPEN)	PR7500H (BRACKETS AND DROP PLATE AS REQUIRED)	689	NO	
2	KICK PLATE	K1050 10" HIGH HVBEV CSK	US32D	RO	
2	DOOR STOP	400/441CU	US26D	RO	
1	ASTRAGAL	S771C		PE	
1	GASKETING	S88BL (HEAD & JAMBS)		PE	
2	SWEEP	307APK		PE	
1	THRESHOLD	271A MSES10SS		PE	
1	ELECTROLYNX HARNESS (FRAME)	QC-C1500P		MK	⚡

1	ELECTROLYNX HARNESS (DOOR)	QC-C*** (LENGTH / TYPE AS REQUIRED)		MK	⚡
1	WIRING DIAGRAM	WD-SYSPK (ELEVATIONS AND POINT TO POINT)		SA	
1	POWER SUPPLY W/ DISTRIBUTION BOARD	AQL4-R8E1		SU	⚡

NOTES: CARD READER BY SECURITY VENDOR. PRESENTING AUTHORIZED CREDENTIAL TO CARD READER WILL UNLOCK EXTERIOR TRIM ALLOWING ACCESS. EGRESS IS BY INSIDE LEVER. EMERGENCY ACCESS BY KEY.

Set: 9.1

Doors: 153A, 155A

1	Continuous Hinge	CFM__HD1 X LAR		PE	
1	Continuous Hinge	CFM__HD1 PT X LAR		PE	
1	Electric Power Transfer	EL-CEPT	630	SU	⚡
1	Flush Bolt (top)	555 (metal) / 557 (wood)	US26D	RO	
2	Dust Proof Strike	570	US26D	RO	
1	Fail Secure Lock	60 10XG71 LL	US26D	SA	⚡
2	Core	DG263 6300	US15	SA	
2	Surface Closer (Hold Open)	PR7500H (brackets and drop plate as required)	689	NO	
2	Kick Plate	K1050 10" high HVBEV CSK	US32D	RO	
2	Door Stop	400/441CU	US26D	RO	
1	Gasketing	S88BL (Head & Jambs)		PE	
2	Sweep	307APK		PE	
1	ElectroLynx Harness (frame)	QC-C1500P		MK	⚡
1	ElectroLynx Harness (door)	QC-C*** (Length / Type as Required)		MK	⚡
1	Wiring Diagram	WD-SYSPK (Elevations and Point		SA	

		to Point)			
1	Power Supply w/ Distribution Board	AQL4-R8E1		SU	⚡

Notes: CARD READER BY SECURITY VENDOR. PRESENTING AUTHORIZED CREDENTIAL TO CARD READER WILL UNLOCK EXTERIOR TRIM ALLOWING ACCESS. EGRESS IS BY INSIDE LEVER. EMERGENCY ACCESS BY KEY.

SET: 10.0

DOORS: 156C, 156D, 156E

1	CONTINUOUS HINGE	CFM__HD1 X LAR		PE	
1	DEADBOLT	60 485	US26D	SA	
2	CORE	DG263 6300	US15	SA	
1	PULL PLATE	BF 110X70C	US32D	RO	
1	WALL STOP	400	US26D	RO	
1	DOOR STOP & HOLDER	490	US26D	RO	
1	GASKETING	2891APK (HEAD)		PE	
2	GASKETING	290APK (JAMBS)		PE	
1	SWEEP	307APK		PE	
1	THRESHOLD	271A MSES10SS		PE	
1	POSITION SWITCH	DPS-M-BK		SU	⚡

NOTES: 490 DOOR HOLDER LOCATED AT TOP OF DOOR.

SET: 11.0

Doors: 127A

3	Hinge (heavy weight)	T4A3786 x NRP	US26D	MK		
1	Electric Power Transfer	EL-CEPT	630	SU		⚡
1	Fail Secure Lock	60 10XG71 LL	US26D	SA		⚡
1	Core	DG263 6300	US15	SA		
1	Surface Closer	7500 (brackets and drop plate as required)	689	NO		
1	Electromagnetic Holder	998 X voltage as required	689	NO		⚡
1	Kick Plate	K1050 10" high BEV CSK	US32D	RO		
1	Door Stop	400/441CU	US26D	RO		

1	Gasketing	S88BL (Head & Jambs)		PE	
1	ElectroLynx Harness (frame)	QC-C1500P		MK	⚡
1	ElectroLynx Harness (door)	QC-C*** (Length / Type as Required)		MK	⚡
1	Wiring Diagram	WD-SYSPK (Elevations and Point to Point)		SA	
1	Power Supply w/ Distribution Board	AQL4-R8E1		SU	⚡

Notes: CARD READER BY SECURITY VENDOR. PRESENTING AUTHORIZED CREDENTIAL TO CARD READER WILL UNLOCK EXTERIOR TRIM ALLOWING ACCESS. EGRESS IS BY INSIDE LEVER. EMERGENCY ACCESS BY KEY.

MAGNETIC HOLDER TO BE TIED INTO THE FIRE ALARM.

SET: 12.0

DOORS: 102A, 115A

6	HINGE (HEAVY WEIGHT)	T4A3786 X NRP	US26D	MK	
1	ELECTRIC POWER TRANSFER	EL-CEPT	630	SU	⚡
1	SURFACE VERT ROD EXIT, EXIT ONLY	LD NB-PE8710 EO	US32D	SA	

1	SURFACE VERT ROD EXIT	56 60 NB-PE8706 WEL (MELR)	US32D	SA	⚡
1	CORE	DG263 6300	US15	SA	
2	SURFACE CLOSER (HOLD OPEN)	PR7500H (BRACKETS AND DROP PLATE AS REQUIRED)	689	NO	
2	ARMOR PLATE	K1050 (F) 42" HIGH ARMOR PLATE NOTCH HVBEV CSK (FIRE LABEL IF REQUIRED)	US32D	RO	
2	DOOR STOP	400/441CU	US26D	RO	
1	ASTRAGAL	S771C		PE	
1	GASKETING	S88BL (HEAD & JAMBS)		PE	
2	ELECTROLYNX HARNESS (FRAME)	QC-C1500P		MK	⚡
2	ELECTROLYNX HARNESS (DOOR)	QC-C*** (LENGTH / TYPE AS REQUIRED)		MK	⚡
1	WIRING DIAGRAM	WD-SYSPK (ELEVATIONS AND POINT TO POINT)		SA	
1	POWER SUPPLY W/ DISTRIBUTION BOARD	AQL4-R8E1		SU	⚡
NOTES: CARD READER BY SECURITY VENDOR. PRESENTING AUTHORIZED CREDENTIAL TO CARD READER WILL UNLOCK EXIT DEVICE ALLOWING ACCESS. EGRESS IS BY EXIT DEVICE WHICH IS MONITORED BY REQUEST TO EXIT SWITCH. EMERGENCY ACCESS BY KEY.					
SET: 13.0					
DOORS: 115B					
3	HINGE (HEAVY WEIGHT)	T4A3786 X NRP	US26D	MK	
1	ELECTRIC POWER TRANSFER	EL-CEPT	630	SU	⚡
1	RIM EXIT DEVICE, STOREROOM	56 60 PE8804 WEL (MELR)	US32D	SA	⚡

1	CORE	DG263 6300	US15	SA	
1	SURFACE CLOSER (HOLD OPEN)	PR7500H (BRACKETS AND DROP PLATE AS REQUIRED)	689	NO	
1	ARMOR PLATE	K1050 (F) 42" HIGH ARMOR PLATE NOTCH HVBEV CSK (FIRE LABEL IF REQUIRED)	US32D	RO	
1	DOOR STOP	400/441CU	US26D	RO	
1	GASKETING	S88BL (HEAD & JAMBS)		PE	
1	ELECTROLYNX HARNESS (FRAME)	QC-C1500P		MK	⚡
1	ELECTROLYNX HARNESS (DOOR)	QC-C*** (LENGTH / TYPE AS REQUIRED)		MK	⚡
1	WIRING DIAGRAM	WD-SYSPK (ELEVATIONS AND POINT TO POINT)		SA	
1	POWER SUPPLY W/ DISTRIBUTION BOARD	AQL4-R8E1		SU	⚡
NOTES: CARD READER BY SECURITY VENDOR. PRESENTING AUTHORIZED CREDENTIAL TO CARD READER WILL UNLOCK EXIT DEVICE ALLOWING ACCESS. EGRESS IS BY EXIT DEVICE WHICH IS MONITORED BY REQUEST TO EXIT SWITCH. EMERGENCY ACCESS BY KEY.					
SET: 14.0					
DOORS: 126A, 126C					
3	HINGE (HEAVY WEIGHT)	T4A3786 X NRP	US26D	MK	
1	ELECTRIC POWER TRANSFER	EL-CEPT	630	SU	⚡
1	RIM EXIT DEVICE, STOREROOM	56 60 PE8804 WEL	US32D	SA	⚡
1	CORE	DG263 6300	US15	SA	
1	SURFACE CLOSER	(PR) 7500 (REG OR PA)	689	NO	

		(BRACKETS AND DROP PLATE AS REQUIRED)			
1	ARMOR PLATE	K1050 (F) 42" HIGH ARMOR PLATE NOTCH HVBEV CSK (FIRE LABEL IF REQUIRED)	US32D	RO	
1	ELECTROMAGNETIC HOLDER	998 X VOLTAGE AS REQUIRED	689	NO	⚡
1	GASKETING	S88BL (HEAD & JAMBS)		PE	
1	ELECTROLYNX HARNESS (FRAME)	QC-C1500P		MK	⚡
1	ELECTROLYNX HARNESS (DOOR)	QC-C*** (LENGTH / TYPE AS REQUIRED)		MK	⚡
1	WIRING DIAGRAM	WD-SYSPK (ELEVATIONS AND POINT TO POINT)		SA	
1	POWER SUPPLY W/ DISTRIBUTION BOARD	AQL4-R8E1		SU	⚡
NOTES: CARD READER BY SECURITY VENDOR. PRESENTING AUTHORIZED CREDENTIAL TO CARD READER WILL UNLOCK EXIT DEVICE ALLOWING ACCESS. EGRESS IS BY EXIT DEVICE WHICH IS MONITORED BY REQUEST TO EXIT SWITCH. EMERGENCY ACCESS BY KEY. MAGNETIC HOLD OPEN RELEASED WHEN FIRE ALARM IS ACTIVATED.					
SET: 15.0					
DOORS: 145A					

3	HINGE (HEAVY WEIGHT)	T4A3786 X NRP	US26D	MK	
1	ELECTRIC POWER TRANSFER	EL-CEPT	630	SU	⚡
1	RIM EXIT DEVICE, STOREROOM	12 56 PE8804 WEL (MELR)	US32D	SA	⚡
1	CORE	DG263 6300	US15	SA	
1	SURFACE CLOSER	PR7500 (BRACKETS AND DROP PLATE AS REQUIRED)	689	NO	
1	ARMOR PLATE	K1050 (F) 42" HIGH ARMOR PLATE NOTCH HVBEV CSK (FIRE LABEL IF REQUIRED)	US32D	RO	
1	GASKETING	S88BL (HEAD & JAMBS)		PE	
1	SWEEP	307APK		PE	
1	THRESHOLD	271A MSES10SS		PE	
1	ELECTROMAGNETIC HOLDER	998 X VOLTAGE AS REQUIRED	689	NO	⚡
1	ELECTROLYNX HARNESS (FRAME)	QC-C1500P		MK	⚡
1	ELECTROLYNX HARNESS (DOOR)	QC-C*** (LENGTH / TYPE AS REQUIRED)		MK	⚡
1	WIRING DIAGRAM	WD-SYSPK (ELEVATIONS AND POINT TO POINT)		SA	
1	POSITION SWITCH	DPS-M-BK		SU	⚡
1	POWER SUPPLY W/ DISTRIBUTION BOARD	AQL4-R8E1		SU	⚡

NOTES: ELECTROMAGNETIC HOLDER TO BE TIED INTO THE FIRE ALARM.

CARD READER BY SECURITY VENDOR. PRESENTING AUTHORIZED CREDENTIAL TO CARD READER WILL

UNLOCK EXIT DEVICE ALLOWING ACCESS. EGRESS IS BY EXIT DEVICE WHICH IS MONITORED BY REQUEST TO EXIT SWITCH. EMERGENCY ACCESS BY KEY.					
SET: 16.0					
DOORS: 140A					
3	HINGE (HEAVY WEIGHT)	T4A3786	US26D	MK	
1	RIM EXIT DEVICE, PASSAGE	12 PE8815 WEL	US32D	SA	
1	SURFACE CLOSER (HOLD OPEN)	PR7500 (BRACKETS AND DROP PLATE AS REQUIRED)	689	NO	
1	KICK PLATE	K1050 10" HIGH BEV CSK	US32D	RO	
1	ELECTROMAGNETIC HOLDER	998 X VOLTAGE AS REQUIRED	689	NO	⚡
1	GASKETING	S88BL (HEAD & JAMBS)		PE	
NOTES: MAGNETIC HOLD OPEN RELEASED WHEN FIRE ALARM IS ACTIVATED.					
SET: 17.0					
DOORS: 124A					
6	HINGE (HEAVY WEIGHT)	T4A3786	US26D	MK	
1	ELECTRIC POWER TRANSFER	EL-CEPT	630	SU	⚡
2	FLUSH BOLT (MANUAL)	555 (METAL) / 557 (WOOD)	US26D	RO	
1	DUST PROOF STRIKE	570	US26D	RO	
1	FAIL SECURE LOCK	60 10XG71 LL	US26D	SA	⚡
1	CORE	DG263 6300	US15	SA	
2	SURFACE CLOSER (HOLD OPEN)	7500H (BRACKETS AND DROP PLATE AS REQUIRED)	689	NO	
2	ARMOR PLATE	K1050 (F) 42" HIGH ARMOR	US32D	RO	

		PLATE NOTCH HVBEV CSK (FIRE LABEL IF REQUIRED)			
2	DOOR STOP	400/441CU	US26D	RO	
1	ASTRAGAL	S771C		PE	
1	GASKETING	S88BL (HEAD & JAMBS)		PE	
1	ELECTROLYNX HARNESS (FRAME)	QC-C1500P		MK	⚡
1	ELECTROLYNX HARNESS (DOOR)	QC-C*** (LENGTH / TYPE AS REQUIRED)		MK	⚡
1	WIRING DIAGRAM	WD-SYSPK (ELEVATIONS AND POINT TO POINT)		SA	
1	POWER SUPPLY W/ DISTRIBUTION BOARD	AQL4-R8E1		SU	⚡
NOTES: CARD READER BY SECURITY VENDOR. PRESENTING AUTHORIZED CREDENTIAL TO CARD READER WILL UNLOCK EXTERIOR TRIM ALLOWING ACCESS. EGRESS IS BY INSIDE LEVER. EMERGENCY ACCESS BY KEY.					
SET: 18.0					
DOORS: 106A, 114A, 142A, 154A					
3	HINGE (HEAVY WEIGHT)	T4A3786 X NRP	US26D	MK	
1	ELECTRIC POWER TRANSFER	EL-CEPT	630	SU	⚡
1	FAIL SECURE LOCK	60 10XG71 LL	US26D	SA	⚡
1	CORE	DG263 6300	US15	SA	
1	SURFACE CLOSER (HOLD OPEN)	7500H (BRACKETS AND DROP PLATE AS REQUIRED)	689	NO	
1	ARMOR PLATE	K1050 (F) 42" HIGH ARMOR PLATE NOTCH HVBEV CSK (FIRE LABEL IF	US32D	RO	

		REQUIRED)			
1	DOOR STOP	400/441CU	US26D	RO	
1	GASKETING	S88BL (HEAD & JAMBS)		PE	
1	ELECTROLYNX HARNESS (FRAME)	QC-C1500P		MK	⚡
1	ELECTROLYNX HARNESS (DOOR)	QC-C*** (LENGTH / TYPE AS REQUIRED)		MK	⚡
1	WIRING DIAGRAM	WD-SYSPK (ELEVATIONS AND POINT TO POINT)		SA	
1	POWER SUPPLY W/ DISTRIBUTION BOARD	AQL4-R8E1		SU	⚡
NOTES: CARD READER BY SECURITY VENDOR. PRESENTING AUTHORIZED CREDENTIAL TO CARD READER WILL UNLOCK EXTERIOR TRIM ALLOWING ACCESS. EGRESS IS BY INSIDE LEVER. EMERGENCY ACCESS BY KEY.					
SET: 19.0					
DOORS: 101A, 200A					
3	HINGE (HEAVY WEIGHT)	T4A3786 X NRP	US26D	MK	
1	ELECTRIC POWER TRANSFER	EL-CEPT	630	SU	⚡
1	FAIL SECURE LOCK	60 10XG71 LL	US26D	SA	⚡
1	CORE	DG263 6300	US15	SA	
1	SURFACE CLOSER (HOLD OPEN)	PR7500H (BRACKETS AND DROP PLATE AS REQUIRED)	689	NO	
1	ARMOR PLATE	K1050 (F) 42" HIGH ARMOR PLATE NOTCH HVBEV CSK (FIRE LABEL IF REQUIRED)	US32D	RO	
1	DOOR STOP	400/441CU	US26D	RO	
1	GASKETING	S88BL (HEAD & JAMBS)		PE	

1	ELECTROLYNX HARNESS (FRAME)	QC-C1500P		MK	⚡
1	ELECTROLYNX HARNESS (DOOR)	QC-C*** (LENGTH / TYPE AS REQUIRED)		MK	⚡
1	WIRING DIAGRAM	WD-SYSPK (ELEVATIONS AND POINT TO POINT)		SA	
1	POWER SUPPLY W/ DISTRIBUTION BOARD	AQL4-R8E1		SU	⚡
NOTES: CARD READER BY SECURITY VENDOR. PRESENTING AUTHORIZED CREDENTIAL TO CARD READER WILL UNLOCK EXTERIOR TRIM ALLOWING ACCESS. EGRESS IS BY INSIDE LEVER. EMERGENCY ACCESS BY KEY.					
SET: 20.0					
DOORS: 107A, 108A, 109A, 112A, 113A, 148A, 152A					
3	HINGE (HEAVY WEIGHT)	T4A3786 X NRP	US26D	MK	
1	ELECTRIC POWER TRANSFER	EL-CEPT	630	SU	⚡
1	FAIL SECURE LOCK	60 10XG71 LL	US26D	SA	⚡
1	CORE	DG263 6300	US15	SA	
1	KICK PLATE	K1050 10" HIGH BEV CSK	US32D	RO	
1	DOOR STOP	400/441CU	US26D	RO	
1	GASKETING	S88BL (HEAD & JAMBS)		PE	
1	ELECTROLYNX HARNESS (FRAME)	QC-C1500P		MK	⚡
1	ELECTROLYNX HARNESS (DOOR)	QC-C*** (LENGTH / TYPE AS REQUIRED)		MK	⚡

1	WIRING DIAGRAM	WD-SYSPK (ELEVATIONS AND POINT TO POINT)		SA	
1	POWER SUPPLY W/ DISTRIBUTION BOARD	AQL4-R8E1		SU	⚡
NOTES: CARD READER BY SECURITY VENDOR. PRESENTING AUTHORIZED CREDENTIAL TO CARD READER WILL UNLOCK EXTERIOR TRIM ALLOWING ACCESS. EGRESS IS BY INSIDE LEVER. EMERGENCY ACCESS BY KEY.					
SET: 21.0					
DOORS: 103A, 110A, 118A, 119A, 150A					
3	HINGE (HEAVY WEIGHT)	T4A3786 X NRP	US26D	MK	
1	ELECTRIC POWER TRANSFER	EL-CEPT	630	SU	⚡
1	FAIL SECURE LOCK	60 10XG71 LL	US26D	SA	⚡
1	CORE	DG263 6300	US15	SA	
1	SURFACE CLOSER (HOLD OPEN)	7500H (BRACKETS AND DROP PLATE AS REQUIRED)	689	NO	
1	KICK PLATE	K1050 10" HIGH BEV CSK	US32D	RO	
1	DOOR STOP	400/441CU	US26D	RO	
1	GASKETING	S88BL (HEAD & JAMBS)		PE	
1	ELECTROLYNX HARNESS (FRAME)	QC-C1500P		MK	⚡
1	ELECTROLYNX HARNESS (DOOR)	QC-C*** (LENGTH / TYPE AS REQUIRED)		MK	⚡
1	WIRING DIAGRAM	WD-SYSPK (ELEVATIONS AND POINT TO POINT)		SA	
1	POWER SUPPLY W/ DISTRIBUTION BOARD	AQL4-R8E1		SU	⚡

NOTES: CARD READER BY SECURITY VENDOR. PRESENTING AUTHORIZED CREDENTIAL TO CARD READER WILL UNLOCK EXTERIOR TRIM ALLOWING ACCESS. EGRESS IS BY INSIDE LEVER. EMERGENCY ACCESS BY KEY.					
SET: 22.0					
DOORS: 105A, 109B, 123A					
3	HINGE (HEAVY WEIGHT)	T4A3786 X NRP	US26D	MK	
1	ELECTRIC POWER TRANSFER	EL-CEPT	630	SU	⚡
1	FAIL SECURE LOCK	60 10XG71 LL	US26D	SA	⚡
1	CORE	DG263 6300	US15	SA	
1	SURFACE CLOSER (HOLD OPEN)	PR7500H (BRACKETS AND DROP PLATE AS REQUIRED)	689	NO	
1	KICK PLATE	K1050 10" HIGH BEV CSK	US32D	RO	
1	DOOR STOP	400/441CU	US26D	RO	
1	GASKETING	S88BL (HEAD & JAMBS)		PE	
1	ELECTROLYNX HARNESS (FRAME)	QC-C1500P		MK	⚡
1	ELECTROLYNX HARNESS (DOOR)	QC-C*** (LENGTH / TYPE AS REQUIRED)		MK	⚡
1	WIRING DIAGRAM	WD-SYSPK (ELEVATIONS AND POINT TO POINT)		SA	
1	POWER SUPPLY W/ DISTRIBUTION BOARD	AQL4-R8E1		SU	⚡
NOTES: CARD READER BY SECURITY VENDOR. PRESENTING AUTHORIZED CREDENTIAL TO CARD READER WILL UNLOCK EXTERIOR TRIM ALLOWING ACCESS. EGRESS IS BY INSIDE LEVER. EMERGENCY ACCESS BY KEY.					
SET: 23.0					
DOORS: 128A, 129A, 130A, 131A, 132A, 133A, 134A, 138A, 139A					

3	HINGE (HEAVY WEIGHT)	T4A3786	US26D	MK	
1	ELECTRIFIED MORTISE LOCK	V21 60 PHR NAC-82271-24V LNL	US26D	SA	⚡
1	CORE	DG263 6300	US15	SA	
1	SURFACE CLOSER	(PR) 7500 (REG OR PA) (BRACKETS AND DROP PLATE AS REQUIRED)	689	NO	
1	KICK PLATE	K1050 10" HIGH BEV CSK	US32D	RO	
1	ELECTROMAGNETIC HOLDER	998 X VOLTAGE AS REQUIRED	689	NO	⚡
1	GASKETING	S88BL (HEAD & JAMBS)		PE	
1	GASKETING	S44BL (HEAD & JAMBS)		PE	
1	AUTOMATIC DOOR BOTTOM	411ANBL		PE	
1	ELECTROLYNX HARNESS (FRAME)	QC-C1500P		MK	⚡
1	ELECTROLYNX HARNESS (DOOR)	QC-C*** (LENGTH / TYPE AS REQUIRED)		MK	⚡
1	WIRING DIAGRAM	WD-SYSPK (ELEVATIONS AND POINT TO POINT)		SA	
1	POWER SUPPLY W/ DISTRIBUTION BOARD	AQL4-R8E1		SU	⚡

NOTES: CARD READER BY SECURITY VENDOR. PRESENTING AUTHORIZED CREDENTIAL TO CARD READER WILL UNLOCK TRIM UNLESS DEADBOLT IS PROJECTED. DEADBOLT IS PROJECTED AND RETRACTED BY KEY OR INSIDE THUMBTURN. INSIDE LEVER RETRACTS LATCH AND DEADBOLT IF PROJECTED. INDICATOR SHOWS STATUS OF DEADBOLT.
MAGNETIC HOLD OPEN RELEASED WHEN FIRE ALARM IS ACTIVATED.

SET: 24.0

DOORS: 201A

3	HINGE, FULL MORTISE	TA2714XNRP	US26D	MK	
1	STOREROOM/CLOSET LOCK	60 10XG04 LL	US26D	SA	
1	CORE	DG263 6300	US15	SA	
1	SURFACE OVERHEAD HOLDER/STOP	10-X46	630	NO	
3	SILENCER	608		RO	
SET: 25.0					
DOORS: 121A					
3	HINGE, FULL MORTISE	TA2714	US26D	MK	
1	PASSAGE LATCH	10XU15 LL	US26D	SA	
1	SURFACE CLOSER	(PR) 7500 (REG OR PA) (BRACKETS AND DROP PLATE AS REQUIRED)	689	NO	
1	ARMOR PLATE	K1050 (F) 42" HIGH ARMOR PLATE NOTCH HVBEV CSK (FIRE LABEL IF REQUIRED)	US32D	RO	
1	DOOR STOP	400/441CU	US26D	RO	
3	SILENCER	608		RO	
SET: 26.0					
DOORS: 104A, 143B					
6	HINGE, FULL MORTISE	TA2714	US26D	MK	
1	FLUSH BOLT (MANUAL)	555 (METAL) / 557 (WOOD)	US26D	RO	
1	PASSAGE LATCH	10XU15 LL	US26D	SA	
2	SURFACE CLOSER (HOLD OPEN)	CLP7500T (BRACKETS AND DROP PLATE AS REQUIRED)	689	NO	

2	KICK PLATE	K1050 10" HIGH BEV CSK	US32D	RO	
2	SILENCER	608		RO	
NOTES: TOP FLUSHBOLT ONLY.					
SET: 27.0					
DOORS: 111A					
3	HINGE, FULL MORTISE	TA2714	US26D	MK	
1	PASSAGE LATCH	10XU15 LL	US26D	SA	
1	DOOR STOP	400/441CU	US26D	RO	
3	SILENCER	608		RO	
SET: 28.0					
DOORS: 143A, 156A					
3	HINGE (HEAVY WEIGHT)	T4A3786	US26D	MK	
1	PASSAGE LATCH	10XU15 LL	US26D	SA	
1	SURFACE CLOSER (HOLD OPEN)	7500H (BRACKETS AND DROP PLATE AS REQUIRED)	689	NO	
1	ARMOR PLATE	K1050 (F) 42" HIGH ARMOR PLATE NOTCH HVBEV CSK (FIRE LABEL IF REQUIRED)	US32D	RO	
1	DOOR STOP	400/441CU	US26D	RO	
3	SILENCER	608		RO	
SET: 29.0					
DOORS: 140B					

3	Hinge (heavy weight)	T4A3786	US26D	MK	
1	Passage Latch	10XU15 LL	US26D	SA	
1	Surface Overhead Stop	10-X36	630	RI	

1	Kick Plate	K1050 10" high HVBEV CSK	US32D	RO	
1	Door Stop	400/441CU	US26D	RO	
3	Silencer	608		RO	

SET: 30.0
DOORS: 144.1A, 144.1B

6	HINGE, FULL MORTISE	TA2714	US26D	MK	
2	FLUSH BOLT (MANUAL)	555 (METAL) / 557 (WOOD)	US26D	RO	
1	DUST PROOF STRIKE	570	US26D	RO	
1	PASSAGE LATCH	10XU15 LL	US26D	SA	
2	CORE	DG263 6300	US15	SA	
2	SURFACE CLOSER (HOLD OPEN)	CLP7500T (BRACKETS AND DROP PLATE AS REQUIRED)	689	NO	
2	SILENCER	608		RO	

SET: 31.0
DOORS: 141A, 147B, 149A

3	HINGE, FULL MORTISE	TA2714	US26D	MK	
1	PRIVACY LOCK (WITH INDICATORS BOTH SIDES)	10XU65 VSLL	US26D	SA	
1	SURFACE CLOSER (HOLD OPEN)	7500H (BRACKETS AND DROP PLATE AS REQUIRED)	689	NO	
1	KICK PLATE	K1050 10" HIGH BEV CSK	US32D	RO	
1	DOOR STOP	400/441CU	US26D	RO	
3	SILENCER	608		RO	

SET: 32.0
DOORS: 135A, 136A, 137A

3	HINGE, FULL MORTISE	TA2714	US26D	MK	

1	PRIVACY LOCK (WITH INDICATORS BOTH SIDES)	10XU65 VSLL	US26D	SA	
1	SURFACE CLOSER	(PR) 7500 (REG OR PA) (BRACKETS AND DROP PLATE AS REQUIRED)	689	NO	
1	KICK PLATE	K1050 10" HIGH BEV CSK	US32D	RO	
1	ELECTROMAGNETIC HOLDER	998 X VOLTAGE AS REQUIRED	689	NO	⚡
1	GASKETING	S88BL (HEAD & JAMBS)		PE	
NOTES: MAGNETIC HOLD OPEN RELEASED WHEN FIRE ALARM IS ACTIVATED					
SET: 33.0					
DOORS: 122A					
6	HINGE (HEAVY WEIGHT)	T4A3786	US26D	MK	
2	PUSH PLATE	70C	US32D	RO	
2	PULL PLATE	BF 110X70C	US32D	RO	
2	SURFACE CLOSER (HOLD OPEN)	PR7500H (BRACKETS AND DROP PLATE AS REQUIRED)	689	NO	
2	KICK PLATE	K1050 10" HIGH BEV CSK	US32D	RO	
2	DOOR STOP	400/441CU	US26D	RO	
2	SILENCER	608		RO	
SET: 34.0					
DOORS: 117A, 120A					
3	HINGE (HEAVY WEIGHT)	T4A3786	US26D	MK	
1	PUSH PLATE	70C	US32D	RO	
1	PULL PLATE	BF 110X70C	US32D	RO	

1	SURFACE CLOSER (HOLD OPEN)	7500H (BRACKETS AND DROP PLATE AS REQUIRED)	689	NO	
1	ARMOR PLATE	K1050 (F) 42" HIGH ARMOR PLATE NOTCH HVBEV CSK (FIRE LABEL IF REQUIRED)	US32D	RO	
1	DOOR STOP	400/441CU	US26D	RO	
3	SILENCER	608		RO	
SET: 35.0					
DOORS: 115C, 115D					
1	CONTINUOUS HINGE	CFM__HD1 X LAR		PE	
1	PUSH PLATE	70C	US32D	RO	
1	PULL PLATE	BF 110X70C	US32D	RO	
1	SURFACE CLOSER	PR7500 (BRACKETS AND DROP PLATE AS REQUIRED)	689	NO	
1	ARMOR PLATE	K1050 (F) 42" HIGH ARMOR PLATE NOTCH HVBEV CSK (FIRE LABEL IF REQUIRED)	US32D	RO	
1	ELECTROMAGNETIC HOLDER	998 X VOLTAGE AS REQUIRED	689	NO	⚡
1	DOOR STOP	400/441CU	US26D	RO	
3	SILENCER	608		RO	
SET: 36.0					
DOORS: MISC					
1	KEY CABINET	1205		LU	
SET: 37.0					
DOORS: 125A					

3	HINGE (HEAVY WEIGHT)	T4A3786	US26D	MK	
1	PASSAGE LATCH	10XU15 LL	US26D	SA	
1	SURFACE CLOSER	7500 (BRACKETS AND DROP PLATE AS REQUIRED)	689	NO	
1	ARMOR PLATE	K1050 (F) 42" HIGH ARMOR PLATE NOTCH HVBEV CSK (FIRE LABEL IF REQUIRED)	US32D	RO	
1	DOOR STOP	400/441CU	US26D	RO	
3	SILENCER	608		RO	
1	ELECTROMAGNETIC HOLDER	998 X VOLTAGE AS REQUIRED	689	NO	⚡

END OF SECTION 08 0671

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SECTION 08 1113 - HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Non-fire-rated hollow metal doors and frames.

B. Hollow metal frames for wood doors.

C. Fire-rated hollow metal doors and frames.

D. Thermally insulated hollow metal doors with frames.

E. Hollow metal borrowed lites glazing frames.

F. Accessories, including glazing and louvers.

1.2 ABBREVIATIONS AND ACRONYMS

A. ANSI: American National Standards Institute.

B. NFPA: National Fire Protection Association.

C. SDI: Steel Door Institute.

D. UL: Underwriters Laboratories.

1.3 ACTION SUBMITTALS

A. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, fire-resistance ratings, and finishes; and one copy of referenced standards/guidelines.

B. Shop Drawings: include the following:
1. Elevations of each door type.
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 each different wall opening condition.
6. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
7. Details of anchorages, joints, field splices, and connections.
8. Details of accessories.
9. Details of moldings, removable stops, louvers, and glazing.

C. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For door inspector.
1. Fire-Rated Door Inspector: Submit documentation of compliance with NFPA 80, Section 5.2.3.1.
2. Egress Door Inspector: Submit documentation of compliance with NFPA 101, Section 7.2.1.15.4.
3. Submit copy of DHI Fire and Egress Door Assembly Inspector (FDAI) certificate.

B. Product Test Reports: For each type of fire-rated hollow-metal door and frame assembly, fire-rated borrowed-lite assembly, and thermally rated door assemblies for tests performed by a qualified testing agency indicating compliance with performance requirements.

C. Oversize Construction Certification: For assemblies required to be fire-rated and exceeding limitations of labeled assemblies.

D. Field quality-control reports.

E. Installer's Qualification Statement.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience and approved by manufacturer.

B. Fire-Rated Door Inspector Qualifications: Inspector for field quality-control inspections of fire-rated door assemblies is to meet the qualifications set forth in NFPA 80, Section 5.2.3.1 and the following:
1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certification.

C. Egress Door Inspector Qualifications: Inspector for field quality-control inspections of egress door assemblies is to meet the qualifications set forth in NFPA 101, Section 7.2.1.15.4 and the following:
1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certification.

D. Maintain at project site copies of reference standards relating to installation of products specified.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Hollow Metal Doors and Frames:

1. Ceco Door, an Assa Abloy Group company.
2. Curries, an Assa Abloy Group company.
3. Republic Doors, an Allegion brand.
4. Steelcraft, an Allegion brand.

2.2 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Doors and Frames:
1. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
2. Accessibility: Comply with ICC A117.1 and ADA Standards.
3. Exterior Door Top Closures: Flush end closure channel, with top and door faces aligned.
4. Door Edge Profile: Manufacturers standard for application indicated.
5. Typical Door Face Sheets: Flush.
6. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Flush.
7. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
8. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.
    a. Based on SDI Standards: Provide at least A60/ZF180 (galvannealed) when necessary, coating not required for typical interior door applications.

B. Fire-Rated 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 ratings indicated on Drawings, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
1. 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. 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.

C. Fire-Rated, Borrowed-Lite Assemblies: Assemblies complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing in accordance with NFPA 257 or UL 9.

D. Thermally Rated Door Assemblies: Provide door assemblies with U-factor of not more than 0.38 deg Btu/F x h x sq. ft. when tested in accordance with ASTM C1363 or ASTM E1423.
1. At doors with greater than or equal to 25 percent fenestration: Provide door assemblies with U-factor of not more than 0.63 deg Btu/F x h x sq. ft. when tested in accordance with ASTM C1363 or ASTM E1423.

E. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.3 HOLLOW METAL DOORS

A. Door Finish: Factory primed and field finished.

B. Exterior Doors: Thermally insulated.
1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
    a. Level 3 - Extra Heavy-duty.
    b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
    c. Model 2 - Seamless.
    d. Door Face Metal Thickness: 16 gauge, 0.053 inch, minimum.
    e. Zinc Coating: A60/ZF180 galvannealed coating; ASTM A653/A653M.
2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
    a. Foam Plastic Insulation: Manufacturer's standard board insulation with maximum flame spread index (FSI) of 75, and maximum smoke developed index (SDI) of 450 in accordance with ASTM E84, and completely enclosed within interior of door.
3. Door Thickness: 1-3/4 inches, nominal.
4. Weatherstripping: Refer to Section 08 7100.

C. Interior Doors, Non-Fire-Rated:
1. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
2. Door Thickness: 1-3/4 inches, nominal.

D. Fire-Rated Doors:
1. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
2. Provide units listed and labeled by UL (DIR) or ITS (DIR).
    a. Attach fire rating label to each fire rated unit.
3. Smoke and Draft Control Doors (Indicated with letter "S" on Drawings and/or Door Schedule): Self-closing or automatic closing doors in accordance with NFPA 80 and NFPA 105, with fire-resistance-rated wall construction rated the same or greater than the fire-rated doors, and the following;
    a. Maximum Air Leakage: 3.0 cfm/sq ft of door opening at 0.10 inch w.g. pressure, when tested in accordance with UL 1784 at both ambient and elevated temperatures.
    b. Gasketing: Provide gasketing or edge sealing as necessary to achieve leakage limit.
    c. Label: Include the "S" label on fire-rating label of door.
4. Door Core Material: Manufacturers standard core material/construction in compliance with requirements.
5. Door Thickness: 1-3/4 inches, nominal.

2.4 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. Frame Finish: Factory primed and field finished.

C. Exterior Door Frames: Full profile/continuously welded type.
   1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A60/ZF180 coating.
   2. Frame Metal Thickness: 16 gauge, 0.053 inch, minimum.
   3. Weatherstripping: Separate, see Section 08 7100.

D. Interior Door Frames, Non-Fire Rated: Face welded type.
   1. Frame Metal Thickness: 18 gauge, 0.042 inch, minimum.

E. Door Frames, Fire-Rated: Full profile/continuously welded type.
   1. Fire Rating: Same as door, labeled.
   2. Frame Metal Thickness: 18 gauge, 0.042 inch, minimum.

F. Frames for Wood Doors: Comply with frame requirements in accordance with corresponding door.

G. Mullions for Pairs of Doors: Fixed, except where removable is indicated, with profile similar to jambs.

H. Borrowed Lites Glazing Frames: Construction and face dimensions to match door frames, and as indicated on drawings.

I. Transom Bars: Fixed, of profile same as jamb and head.

J. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.

K. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inches high to fill opening without cutting masonry units.

L. Frames Wider than 48 inches: Reinforce with steel channel fitted tightly into frame head, flush with top.

2.5 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

B. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15 mil, 0.015 inch dry film thickness (DFT) per coat; provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
   1. Fire-Rated Frames: Comply with fire rating requirements indicated.

2.6 ACCESSORIES

A. Louvers: Roll formed steel with overlapping frame; finish same as door components ; factory-installed.
   1. Style: Sightproof inverted V blade or Sightproof inverted Y blade.
   2. Fasteners: Concealed fasteners.

B. Door Window Frames: Door window frames with glazing securely fastened within door opening.
   1. Size: As indicated on drawings.

C. Glazing: As specified in Section 08 8000 - Glazing and 08 8813 - Fire-Rated Glazing, factory installed.

D. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.

E. Astragals for Double Doors: Specified in Section 08 7100.

F. Mechanical Fasteners for Concealed Metal-to-Metal Connections: Self-drilling, self-tapping, steel with electroplated zinc finish.

G. Grout for Frames: Mortar grout complying with ASTM C476 with maximum slump of 4 inches as measured in accordance with ASTM C143/C143M for hand troweling in place; plaster grout and thinner pumpable grout are prohibited.

H. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

I. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.2 PREPARATION

A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.3 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.
   1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.
   2. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
      a. Install frames with removable stops located on secure side of opening.
   3. Floor Anchors: Secure with post installed expansion anchors.

a. Floor anchors may be set with power-actuated fasteners instead of post installed expansion anchors if so indicated and approved on Shop Drawings.

4. Solidly pack mineral-fiber insulation inside frames.

B. Install fire rated units in accordance with NFPA 80.

C. Coordinate frame anchor placement with wall construction.

D. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.

E. In-Place Concrete or Masonry Construction: Secure frames in place with post installed expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.

F. Install door hardware as specified in Section 08 7100.
1. Comply with recommended practice for hardware placement of doors and frames in accordance with ANSI/SDI A250.6 or NAAMM HMMA 861.

G. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.
1. Non-Fire-Rated Steel Doors: Comply with ANSI/SDI A250.8.
2. Fire-Rated Doors: Install doors with clearances in accordance with NFPA 80.
3. Smoke-Control Doors: Install doors in accordance with NFPA 105.

H. Comply with glazing installation requirements of Section 08 8000.

I. Coordinate installation of electrical connections to electrical hardware items.

J. Touch up damaged factory finishes.

3.4 TOLERANCES

A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.

B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

C. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.

D. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.

E. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.

3.5 FIELD QUALITY CONTROL

A. Inspection Agency: Engage a qualified inspector to perform inspections and to furnish reports to Architect.

B. Inspections:
1. Fire-Rated Door Inspections: Inspect each fire-rated door in accordance with NFPA 80, Section 5.2.

2. Egress Door Inspections: Inspect each door equipped with panic hardware, each door equipped with fire exit hardware, each door located in an exit enclosure, each electrically controlled egress door, and each door equipped with special locking arrangements in accordance with NFPA 101, Section 7.2.1.15.

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.

E. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80 and NFPA 101.

3.6 ADJUSTING

A. Adjust for smooth and balanced door movement.

3.7 REPAIR

A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

END OF SECTION 08 1113

SECTION 08 1416 - FLUSH WOOD DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Flush wood doors; flush and flush glazed configuration; fire-rated and non-rated.

1.2 ACTION SUBMITTALS

A. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.

B. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.

1.3 INFORMATIONAL SUBMITTALS

A. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

B. Qualification Data: For door inspector.
1. Fire-Rated Door Inspector: Submit documentation of compliance with NFPA 80, Section 5.2.3.1.
2. Egress Door Inspector: Submit documentation of compliance with NFPA 101, Section 7.2.1.15.4.
3. Submit copy of DHI's Fire and Egress Door Assembly Inspector (FDAI) certificate.

C. Manufacturer's qualification statement.

D. Installer's qualification statement.

E. Specimen warranty.

1.4 CLOSEOUT SUMITTALS

A. Warranty, executed in Owner's name.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Package, deliver and store doors in accordance with specified quality standard.

B. Accept doors on site in manufacturer's packaging, and inspect for damage.

C. Protect doors with resilient packaging sealed with heat shrunk plastic; do not store in damp or wet areas or areas where sunlight might bleach veneer; seal top and bottom edges with tinted sealer if stored more than one week, and break seal on site to permit ventilation.

1.7 WARRANTY

A. Manufacturer Warranty: Provide manufacturer's warranty on interior doors for the life of the installation. Complete forms in Owner's name and register with manufacturer.
   1. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Wood Veneer Faced Doors:
   1. Forte Opening Solutions.
   2. Oregon Door.
   3. Lambton Doors.
   4. Vancouver Architectural Doors.
   5. VT Industries, Inc.

2.2 DOORS

A. Doors: See drawings for locations and additional requirements.
   1. Quality Standard: Premium Grade, Heavy Duty performance, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
   2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.

B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
   1. Provide solid core doors at each location.
   2. Fire Rated Doors: Tested to ratings indicated on drawings in accordance with UL 10C - Positive Pressure; Underwriters Laboratories Inc (UL) or Intertek/Warnock Hersey (WHI) labeled without any visible seals when door is open.
   3. Smoke and Draft Control Doors (Indicated as "S" on Drawings): In addition to required fire rating, provide door assemblies tested in accordance with UL 1784 with maximum air leakage of 3.0 cfm per sq ft of door opening at 0.10 inch wg pressure at both ambient and elevated temperatures for "S" label; if necessary, provide additional gasketing or edge sealing.
   4. Wood veneer facing with factory transparent finish as indicated on drawings.

2.3 DOOR AND PANEL CORES

A. Non-Rated Solid Core and 20 Minute Rated Doors: Type structural composite lumber core (SCLC), plies and faces as indicated.

B. Fire-Rated Doors: Mineral core type, with fire resistant composite core (FD), plies and faces as indicated above; with core blocking as required to provide adequate anchorage of hardware without through-bolting.

2.4 DOOR FACINGS

A. Veneer Facing for Transparent Finish: White oak, HPVA Grade AA, plain sliced (flat cut), with book match between leaves of veneer, center balance match of spliced veneer leaves assembled on door or panel face.
   1. Vertical Edges: Same species as face veneer.
   2. "Pair Match" each pair of doors; "Set Match" pairs of doors within 10 feet of each other when doors are closed.

B. Facing Adhesive: Type II - water resistant.

2.5 DOOR CONSTRUCTION

A. Fabricate doors in accordance with door quality standard specified.

B. Cores Constructed with stiles and rails:
   1. Provide solid blocks at lock edge for hardware reinforcement.
   2. Provide solid blocking for other throughbolted hardware.

C. Where supplementary protective edge trim is required, install trim after veneer facing has been applied full-width.

D. Glazed Openings: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.

E. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.

F. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.

G. Provide edge clearances in accordance with the quality standard specified.

2.6 FINISHES - WOOD VENEER DOORS

A. Finish work in accordance with AWI/AWMAC/WI (AWS), Section 5 - Finishing for grade specified and as follows:
   1. Transparent:
      a. System - 9, UV Curable, Acrylated Epoxy, Polyester or Urethane.
      b. Stain: Minwax Performance Series Tintable Wood Stain, Refer to Material Finish Key selected color, ST-1.
      c. Sheen: Satin.

B. Factory finish doors in accordance with approved sample.

2.7 ACCESSORIES

A. Glazing: See Section 08 8000.

B. Glazing Stops: Wood, of same species as door facing, butted corners; prepared for countersink style tamper proof screws.

C. Astragals and Edges for Double Doors: Pairs of doors astragals, and door edge sealing and protection devices.
   1. UL listed products in compliance with requirements of authorities having jurisdiction.

D. Door Hardware: See Section 08 7100.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.2 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and specified quality standard.
   1. Install fire-rated doors in accordance with NFPA 80 requirements.

B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.

C. Use machine tools to cut or drill for hardware.

D. Coordinate installation of doors with installation of frames and hardware.

E. Coordinate installation of glazing.

3.3 TOLERANCES

A. Comply with specified quality standard for fit and clearance tolerances.

B. Comply with specified quality standard for telegraphing, warp, and squareness.

3.4 FIELD QUALITY CONTROL

A. Inspection Agency: Engage a qualified inspector to perform inspections and to furnish reports to Architect.

B. Inspections:
   1. Fire-Rated Door Inspections: Inspect each fire-rated door in accordance with NFPA 80, Section 5.2.
   2. Egress Door Inspections: Inspect each door equipped with panic hardware, each door equipped with fire exit hardware, each door located in an exit enclosure, each electrically controlled egress door, and each door equipped with special locking arrangements in accordance with NFPA 101, Section 7.2.1.15.

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.

E. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80 and NFPA 101.

3.5 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

END OF SECTION 08 1416

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SECTION 08 1613 - FIBERGLASS DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fiberglass doors.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Obtain hardware templates from hardware manufacturer prior to starting fabrication.

1.3 ACTION SUBMITTALS

A. Product Data: Provide manufacturer's standard details, installation instructions, hardware and anchor recommendations.

B. Shop Drawings: Indicate layout and profiles; include assembly methods.
1. Indicate product components, including hardware reinforcement locations and preparations, accessories, finish colors, patterns, and textures.
2. Indicate wall conditions, door and frame elevations, sections, materials, gauges, finishes, location of door hardware by dimension, and details of openings; use same reference numbers indicated on drawings to identify details and openings.

C. Selection Samples: Submit two complete sets of color chips, illustrating manufacturer's available finishes, colors, and textures.

D. Verification Samples: Submit door surface samples for each finish specified, 10 inches by 10 inches in size, illustrating finishes, colors, and textures.

1.4 INFORMATIONAL SUBMITTALS

A. Test Reports: Submit certified test reports from qualified independent testing agency indicating doors comply with specified performance requirements.

B. Manufacturer's qualification statement.

C. Installer's qualification statement.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: Include instructions for repair of minor scratches and damage.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum 5 years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified, with minimum 5 years of documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

B. Store materials in original packaging, under cover, protected from exposure to harmful weather conditions and from direct contact with water.
1. Store at temperature and humidity conditions recommended by manufacturer.
2. Do not use non-vented plastic or canvas shelters.
3. Immediately remove wet wrappers.

C. Store in position recommended by manufacturer, elevated minimum 4 inches above grade, with minimum 1/4 inch space between doors.

1.8 FIELD CONDITIONS

A. Do not install doors until structure is enclosed.

B. Maintain temperature and humidity at manufacturer's recommended levels during and after installation of doors.

1.9 WARRANTY

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: FRP Architectural Doors, Inc; Heavy Wall Door Series FD55 or comparable system submitted to Architect for review.

2.2 DOOR AND FRAME ASSEMBLIES

A. Door and Frame Assemblies: Factory-fabricated, prepared and machined for hardware.
1. Physical Endurance: Swinging door cycle test to ANSI/SDI A250.4, Level A (1,000,000 cycles) minimum; tested with hardware and fasteners intended for use on project.
2. Screw-Holding Capacity: Tested to 890 pounds, minimum.
3. Surface Burning Characteristics: Flame spread index (FSI) of 0 to 25, Class A, and smoke developed index (SDI) of 450 or less, when tested in accordance with ASTM E84.
4. Flammability: Self-extinguishing when tested in accordance with ASTM D635.
5. Sizes: As indicated on drawings.
6. Clearance Between Door and Frame: 1/8 inch, maximum.
7. Clearance Between Bottom of Door and Finished Floor: 3/4 inch, maximum; not less than 1/4 inch clearance to threshold.

2.3 COMPONENTS

A. Doors: Fiberglass construction with reinforced core.
1. Type: As indicated on drawings, including swinging doors.
2. Thickness: 1-3/4 inch, nominal.
3. Core Material: Urethane foam.
4. Construction:
a. Fiberglass ultraviolet resistant mylar coated, with 1/8 inch thick through color face sheets laminated to core.
5. Face Sheet Texture: Pebble grain.
6. Door Panel Configuration: As indicated on drawings.
7. Subframe and Reinforcements: Manufacturer's standard materials.
8. Waterproof Integrity: Provide factory fabricated edges, cut-outs, and hardware preparations of fiberglass reinforced plastic (FRP); provide cut-outs with joints sealed independently of glazing, louver inserts, or trim.
9. Hardware Preparations: Factory reinforce, machine, and prepare for door hardware including field installed items; provide solid blocking for each item; field cutting, drilling or tapping is not permitted; obtain manufacturer's hardware templates for preparation as necessary.

2.4 PERFORMANCE REQUIREMENTS

A. Design and size components to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of side hinged doors.

B. Water Leakage: No uncontrolled leakage on interior face when tested in accordance with ASTM E331 at differential pressure of 9.19 psf.

C. Air Leakage: Maximum 0.1 cfm/sf, when tested in accordance with ASTM E283/E283M at differential pressure of 6.24 psf across assembly.

D. Structural Performance: Withstand positive and negative wind loads equal to 1.5 times design wind loads specified by local code without damage or permanent set, when tested in accordance with ASTM E330/E330M, using 10 second duration of maximum load.

E. Thermal Transmittance, Exterior Doors:
1. At Opaque Exterior Doors: AAMA 1503, U-factor of 0.35, maximum, measured on exterior door in size required for this project.
2. At Glazed Exterior Doors: AAMA 1503, U-factor of 0.63, maximum, measured on exterior door in size required for this project.

F. Fiberglass Reinforced Plastic (FRP) Face Sheet Properties:
1. Izod Impact Resistance: ASTM D256, 14 foot-pound force per inch of width, minimum, with notched izod.
2. Tensile Strength at Break: ASTM D638, 13,250 psi, minimum.
3. Water Absorption: ASTM D570, 0.20 percent, maximum, after 24 hours at 74 degrees F.
4. Flexural Strength: ASTM D790, 21,000 psi, minimum.

2.5 FINISHES

A. Gel Coating: Ultraviolet (UV) stabilized polyester finish.
1. Thickness: Minimum 15 mils, 0.015 inch wet thickness, plus/minus 3 mils, 0.003 inch.
2. Color: As selected by Architect from manufacturer's full line of colors.

2.6 HARDWARE

A. Door Hardware: See Section 08 7100.

2.7 ACCESSORIES

A. Stops for Glazing: Fiberglass, unless otherwise indicated or required by fire rating; provided by door manufacturer to fit factory made openings, with color and texture to match door; fasteners shall maintain waterproof integrity.
1. Exterior Doors: Provide non-removable stops on exterior side with continuous compression gasket weatherseal.
2. Glazed Openings: Provide removable stops on interior side.
3. Opening Sizes and Shapes: As indicated on drawings.

B. Glazing: See Section 08 8000.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify actual dimensions of openings by field measurements before door fabrication; show recorded measurements on shop drawings.

B. Do not begin installation until substrates have been properly prepared.

3.2 PREPARATION

A. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

B. Clean and prepare substrate in accordance with manufacturer's directions.

C. Protect adjacent work and finish surfaces from damage during installation.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions; do not penetrate frames with anchors.

B. Install exterior doors in accordance with ASTM E2112.

C. Install door hardware as specified in Section 08 7100.

D. Set units plumb, level, and true-to-line, without warping or racking doors, and with specified clearances; anchor in place.

E. Separate aluminum and other metal surfaces from sources of corrosion of electrolytic action at points of contact with other materials.

F. Repair or replace damaged installed products.

3.4 ADJUSTING

A. Lubricate, test, and adjust doors to operate easily, free from warp, twist or distortion, and to fit watertight for entire perimeter.

B. Adjust hardware for smooth and quiet operation.

C. Adjust doors to fit snugly and close without sticking or binding.

3.5 CLEANING

A. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance.

3.6 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION 08 1613

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SECTION 08 3100 - ACCESS DOORS AND PANELS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wall- and ceiling-mounted access units.

1.2 ACTION SUBMITTALS

A. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.
   1. Manufacturer's Installation Instructions: Indicate installation requirements and rough-in dimensions.

B. Shop Drawings: Indicate exact position of each access door and/or panel unit.

C. Product Schedule: For access doors and frames. Use same designations indicated on Drawings.

1.3 INFORMATION SUBMITTALS

A. Installer's qualification statement.

B. Qualification Data: For testing and inspecting agency.
   1. Fire-Rated Door Inspector: Submit documentation of compliance with NFPA 80, Section 5.2.3.1.
   2. Submit copy of DHI Fire and Egress Door Assembly Inspector (FDAI) certificate.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents:
   1. Record actual locations of each access unit.
   2. For fire-rated doors, list of applicable room name and number in which access door is located.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

B. Fire-Rated Door Inspector Qualifications: Inspector for field quality control inspections of fire-rated door assemblies meets the qualifications set forth in NFPA 80, Section 5.2.3.1 and the following:
   1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certification.

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 WALL- AND CEILING-MOUNTED ACCESS UNITS

A. Manufacturers: Provide indicated Basis-of-Design Product or comparable product by one of the following:
1. Activar Construction Products Group, Inc. - JL Industries.
2. ACUDOR Products Inc.
3. BAUCO Access Panel Solutions Inc.
4. Best Access Doors.
5. Cendrex, Inc.
6. Elmdor.

2.3 ACCESS DOORS AND PANELS ASSEMBLIES

A. Wall-Mounted Units:
1. Basis-of-Design Product: BAUCO; Concealed Hardware and Gypsum Board Inlay - Regular Size: BAUCO Plus II - Access Panels.
2. Location: As indicated on drawings.
3. Panel Material: Aluminum extrusions with gypsum board inlay.
4. Size: 12 by 12 inches.
5. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
6. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.

B. Wall-Mounted Units at Tiling:
1. Basis-of-Design Product: Best Access Doors; Series BA-IVT.
2. Location: At locations with tiling.
3. Panel Material: Steel, hot-dipped zinc, or zinc-aluminum-alloy coated.
4. Size: 12 by 12 inches.
5. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
6. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface recessed for infill with wall finish.

C. Fire-Rated Wall-Mounted Units:
1. Basis-of-Design: Best Access Doors; Series BA-FRI.
2. Location: As indicated on drawings.
3. Wall Fire-Rating: As indicated on drawings.
4. Panel Material: Steel.
5. Size: 12 by 12 inches.
6. Door/Panel: Insulated double-surface panel, with tool-operated spring or cam lock and no handle.

D. Ceiling-Mounted Units:
1. Basis-of-Design Product: BAUCO; Concealed Hardware and Gypsum Board Inlay - Regular Size: BAUCO Plus II - Access Panels.
2. Location: As indicated on drawings.
3. Panel Material: Aluminum extrusion with gypsum board inlay.
4. Size - Other Ceilings: 12 by 12 inches.
5. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that rough openings are correctly sized and located.

B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to proceeding with this work.

B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.3 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install frames plumb and level in openings, and secure units rigidly in place.

C. Position units to provide convenient access to concealed equipment when necessary.

3.4 FIELD QUALITY CONTROL

A. Inspection Agency: Engage a qualified inspector to perform inspections and to furnish reports to Architect.

B. Inspections:
1. Fire-Rated Door Inspections: Inspect each fire-rated access door in accordance with NFPA 80, Section 5.2.

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.

E. Prepare and submit separate inspection report for each fire-rated access door indicating compliance with each item listed in NFPA 80 and NFPA 101.

3.5 ADJUSTING

A. Adjust doors and hardware, after installation, for proper operation.

END OF SECTION 08 3100

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SECTION 08 3323 - OVERHEAD COILING DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Exterior coiling doors.

B. Electric operators and control stations.

C. Wiring from electric circuit disconnect to operators and control stations.

1.2 ACTION SUBMITTALS

A. Product Data: For each type and size of coiling door and accessory, provide general construction details, material descriptions, dimensions of individual components, slat profiles, finishes, electrical equipment, component connections and details, rated capacities, operating characteristics, and description of automatic closing device including testing and resetting instructions.
   1. Manufacturer's Installation Instructions: Indicate installation sequence and procedures, adjustment and alignment procedures.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data, include plans, elevations, sections, installation details, points of attachments to other work, hardware and control locations, pertinent dimensions, required clearances, location and size of field connections, diagrams of power, and diagrams for signal and control wiring.

C. Samples: Two full slats, 12 inches long illustrating shape, color, texture, and gasketing between slats.

1.3 INFORMATIONAL SUBMITTALS

A. Manufacturer's qualification statement.

B. Installer's qualification statement.

C. Maintenance Data: Provide manufacturer's maintenance guide/manual(s) and recommended service schedule. Indicate lubrication requirements and frequency and periodic adjustments required.

D. Specimen warranty.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten (10) years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years documented experience. Entity shall employ installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.

1. Maintenance Proximity: Not more than two hours normal travel time from Installer's place of business to Project site.

C. Products Requiring Electrical Connection: Listed and classified by ITS (DIR), UL (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for purpose specified and indicated.

1.5 WARRANTY

A. Extended Correction Period: Correct defective work discovered within a 2-year period commencing on Date of Substantial Completion.

B. Manufacturer Warranty, General: Provide 2-year warranty to repair or replace components of coiling overhead doors that fail in materials or workmanship within specified warranty period.
1. Failures include, but are limited to, the following:
a. Structural failures including, but not limited to, excessive deflection.
b. Failure of components or operators before reaching required number of operation cycles.
c. Faulty operation of hardware.
d. Deterioration of metals and other materials beyond normal weathering and use; rust through.

C. Manufacturer Warranty, Electrical Components: Provide 5-year manufacturer warranty for electric operating equipment. Complete forms in Owner's name and register with manufacturer.

D. Finish Warranty: Provide 10-year manufacturer warranty, from date of Substantial Completion, to repair or replace components that show evidence of deterioration of factory-applied finishes.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain all overhead doors (Coiling, Sectional) from single source from single manufacturer.
1. Obtain operators and controls from overhead coiling-door manufacturer unless directed otherwise.

2.2 PERFORMANCE REQUIREMENTS

A. Structural Performance, General: Sectional doors shall meet performance requirements specified without failure due to defective manufacture, fabrication, installation, or defects in construction and without requiring temporary installation of reinforcing components.

B. Structural Performance, Exterior Doors: Capable of withstanding the following design wind loads:
1. Design Wind Load: As indicate on drawings.
2. Exposure Category: C.
3. Deflection Limits: Design overhead coiling doors to withstand design wind load without evidencing permanent deformation or disengagement of door components. Deflection of door in horizontal position (open) shall not exceed 1/120 of the door width.
4. Operability Under Wind Load: Design Overhead coiling doors to remain operable under design wind load, acting inward and outward.

C. Seismic Performance: Overhead coiling doors are to withstand the effects of earthquake motions determined according to ASCE/SEI 7.
   1. Component Importance Factor: Category IV; 1.5.

D. Exterior Door Air Leakage Rate: Maximum rate of 0.47 cfm/sq ft when tested in accordance with ASTM E283/E283M at test pressure difference of 1.57 psf.

E. Fire Rated Door Assemblies: Comply with NFPA 80; listed and labeled by qualified testing agency, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to NFPA 252 or UL 10B.

2.3 COILING DOORS

A. Insulated Exterior Coiling Doors: Steel slat curtain.
   1. Basis of Design Product: Subject to compliance with requirements, provide the following or comparable product by another manufacturer:
      a. Raynor Garage Doors; ; DuraCoil, Flat Slat.
   2. Single Thickness Slats: Manufacturer's standard.
   3. Operation Cycles: Door Components and operators capable of operating for not less than 50,000 cycles. 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.
   4. Nominal Slat Size: 2 inches wide by required length.
      a. Gasket Seal: Manufacturer's standard continuous gasket between slats.
   5. Finish: Factory painted; manufacturer's proprietary powder coating, color as selected.
   6. Guide, Angles: Galvanized steel.
   7. Hood Enclosure: Manufacturer's standard; primed steel.
   8. Electric operation.
   9. Mounting: Face mounted.

2.4 MATERIALS

A. Metal Curtain Construction: Interlocking slats.
   1. Slat Ends: Alternate slats fitted with end locks to act as wearing surface in guides and to prevent lateral movement.
   2. Curtain Bottom for Slat Curtains: Fitted with angles to provide reinforcement and positive contact in closed position.
   3. Weatherstripping for Exterior Doors: Moisture and rot proof, resilient type, located at exterior curtain-side guide, interior curtain-side guide, bottom bar, and where curtain enters hood enclosure (lintel) of exterior doors.
   4. Steel Slats: Minimum thickness, 18 gauge; ASTM A653/A653M galvanized steel sheet.
      a. Galvanizing: Minimum G90 coating.

B. Guide Construction: Continuous, of profile to retain door in place, mounting brackets of same metal.

C. Guides - Angle: ASTM A36/A36M metal angles, size as required for wind loading.
   1. Stainless Steel: ASTM A 666, Type 304, rollable temper.

D. Hood Enclosure and Trim: Internally reinforced to maintain rigidity and shape.

1. Finished to match door slats.

E. Lock Hardware:
1. For motor operated units, additional lock or latching mechanisms are not required.

F. Roller Shaft Counterbalance: Steel pipe and helical steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb nominal force to operate.

2.5 ELECTRIC OPERATION

A. Operator, Controls, Actuators, and Safeties: Comply with UL 325; provide products listed by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction.
1. Provide interlock and limit switches on motor operated units.
2. Provide tamperproof operation cycle counter.

B. Electric Operators:
1. Usage Classification: Standard Duty, up to 25 cycles per hour and up to 90 cycles per day.
2. Mounting: Side of hood.
3. Motor Enclosure:
   a. Exterior Coiling Doors: NEMA MG 00001, Type 4X; open drip proof.
4. Motor Rating: As recommended by manufacturer to comply with performance requirements, door size, and other project requirements; continuous duty.
5. Motor Voltage: As indicated on drawings; Coordinate with electrical schedules.
6. Motor Controller: NEMA ICS 2, full voltage, reversing magnetic motor starter.
7. Controller Enclosure: NEMA EN 10250, Type 4X.
8. Opening Speed: Not less than 8 inches per second.
9. Brake: Manufacturer's standard type, activated by motor controller.
10. Manual override in case of power failure; Chain type.

C. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated; enclose terminal lugs in terminal box sized to comply with NFPA 70.

D. Control Wiring: Solid state circuitry with provisions for connection of monitored reversing device, external radio control receiver hook up, external antenna hook up, maximum run timer, and multiple control station hook up. Circuitry shall provide for closing timer, mid stop capability, and lock bar sensor capability.

E. Control Station(s):
1. Wired Control Stations: Provide two (2), standard three button, 'Open-Close-Stop', momentary-contact control device(s) for each operator complying with UL 325.
   a. Control Station Locations: As indicated within drawings. Where not indicated within drawings, provide control station(s) at the following location(s): Adjacent to door jamb, interior side, of door being operated and Office/Control room directly adjacent to vehicle bay and overseeing response pad.
      1) Final location of controllers shall be verified with Architect and Owner prior to electrical rough-in of under slab and under ground conduit.
      2) Vehicle Bay control stations shall be surface mounted.
      3) Office area control stations shall be recess mounted.

2. Remote Control(s): Provide commercial grade, battery powered, push button remote control unit(s) and corresponding receiver(s) for in-vehicle use. Units shall feature a two button transmitter with 900 MHz. Range shall be line of site up to 1800 feet.
    a. Basis of Design Product: Subject to compliance with requirements, provide provide the following or comparable product by another manufacturer:
        1) Basis of Design SECO-LARM; 900 MHz HL-Series RF Transmitter - 2 Button; HL-951T2-SQ and 900 MHz HL-Series RF Receiver - 1 Channel; HL-951R1-SQ.
    b. Provide (3) transmitters per operator/door.
    c. Include radio receivers and logic controllers with field-changeable dip switches controlling remote controller frequency in each door operator, for remote operation via wireless remote control units.
    d. Provide external antenna outside of building envelope, mounted to building face at door jamb, connected to signal receiver such that transmitter signal is received without interference of building assemblies, internal LED lighting, and internal equipment frequencies.
3. Entrapment Protection Devices: Provide sensing devices and safety mechanisms complying with UL 325.
    a. Primary Device: Provide NEMA 4X photo eye sensors as required with momentary-contact control device.
    b. Secondary Device: Provide electric sensing edge with wireless edge kit as an option along with continuous-constant control device.

F. Emergency Operation:
1. Emergency Manual Operation: Equip each electronically powered door with capability for emergency manual operation. Design manual mechanism so the required force for door operation does not exceed 35 lbf.
2. Emergency Operation Disconnect Device: Equip operator with hand operated disconnect mechanism for automatically engaging manual operator and releasing break for emergency manual operation while disconnecting motor without affecting timing or limit switch. Mount mechanism so ti is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

G. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that adjacent construction is suitable for door installation.

B. Verify that electrical services have been installed and are accessible.

C. Verify that door opening is plumb, header is level, and dimensions are correct.

D. Notify Architect of any unacceptable conditions or varying dimensions.

E. Commencement of installation indicates acceptance of substrate and door opening conditions.

3.2 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

E. Coordinate installation of electrical service with Section 26 0583.

F. Complete wiring from disconnect to unit components.

G. Complete wiring from fire alarm system.

H. Install enclosure and perimeter trim.

3.3 TOLERANCES

A. Maintain dimensional tolerances and alignment with adjacent work.

B. Maximum Variation From Plumb: 1/16 inch.

C. Maximum Variation From Level: 1/16 inch.

D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 feet straight edge.

3.4 ADJUSTING

A. Adjust operating assemblies for smooth and noiseless operation.
1. Lubricate bearings and sliding parts as recommended by manufacturer.

B. Adjust exterior doors and components to be weather resistant and comply with air infiltration requirements.
1. Adjust seals to provide tight fit around entire perimeter.

3.5 CLEANING

A. Clean installed components.

B. Remove labels and visible markings.

END OF SECTION 08 3323

SECTION 08 3516 - FOUR-FOLD DOOR SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes Four-Fold metal doors with surface mounted tube frames.

B. Operation of Four-Fold metal doors includes overhead mounted electro-mechanical operators.

1.2 ACTION SUBMITTALS

A. Product Data: For each type and size of four-fold door and accessory.
1. Include construction details, material descriptions, dimensions of individual components, profile door sections, and finishes.
2. For power-operated doors, include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.

B. Shop Drawings: For each installation and for components not dimensioned or detailed in manufacturers product data.
1. Include fabrication and installation of Four-Fold metal doors including plans, elevations, sections, details of components, hardware, operating mechanism, and attachments to the other units of Work. Include wiring diagrams for coordination with electrical trade.

1.3 QUALITY ASSURANCE

A. Doors shall be designed to withstand external or internal horizontal wind loads of (25) pounds minimum per square foot. The maximum allowable deflection shall not exceed 1/120 of the span. Fiber stresses in main members shall be limited to 27,000 pounds per square inch. Steel frames shall be designed in accordance with the AISC Steel Construction Manual .

1.4 DELIVERY, STORAGE AND HANDLING

A. Store delivered materials and equipment in dry locations with adequate ventilation, free from dust and water, and so as to permit access for inspection and handling.

B. Handle materials carefully to prevent damage.

1.5 WARRANTY

A. The door manufacturer shall provide a written standard limited warranty for material and workmanship.

PART 2 PRODUCTS

2.1 MANUFACTURERS, GENERAL

A. Source Limitation: Obtain four fold doors from single source from single manufacturer.
   1. Obtain operators and controls from four fold door manufacturer.

B. Basis of Design Manufacturer: Four-Fold industrial metal doors manufactured by Door Engineering and Manufacturing or equal products by other approved manufacturers.

2.2 FOUR-FOLD DOOR ASSEMBLY

A. Basis of Design Product: Subject to compliance with requirements, provide FF300 Series, Glazed as manufactured by Door Engineering, A Senneca Company or approved equivalent product.

B. Material:
   1. Steel Tube: ASTM A513 and ASTM A500/A500M
   2. Steel Sheets: Steel sheets of commercial quality, complying with ASTM A1011/A1011M hot-rolled steel sheet.
   3. Hardware: Manufacturer¢s standard components.
   4. Fasteners: Zinc-coated steel.

C. Construction: Door framing shall be minimum 11-gauge structural steel tube with 14-gauge steel sheet on the exterior and interior faces. Sheeting shall be formed on the vertical edges with no visible welds on the interior or exterior panel faces. All frames and framing members shall be true to dimension and square in all directions, and no door shall be bowed, warped, or out of line, in the vertical or horizontal plane of the door opening by more than 1/8 inch in 20 feet. Exposed welds and welds which interfere with the installation of various parts shall be ground smooth and flush.

D. Surface Mounted Tube Frame: Supply pre-hung tube frame system constructed of minimum TS6x4x0.25, designed to anchor to masonry wall construction or weld to steel structure. All hinges, track supports and operator supports shall be factory attached.

E. Factory finish: Door Panels and Tube Frames shall be finished with manufacturers standard PPG Spectracron epoxy primer and polyurethane top coat. Customer to select from Manufacturer¢s standard color chart or furnish sample to match.
   1. Operator and operating hardware shall be powder-coated manufacturers standard gray.

F. Hardware: Hardware shall include guide tracks and brackets, trolleys, center guides, not less than three pairs of jamb and fold hinges per opening, and all bolts, nuts, fasteners, etc. necessary for complete installation and operation.
   1. All hardware, including hinges and trolleys, shall be bolted to the panel for easy removal for service or panel replacement.
   2. Doors up to 16 wide and under 30psf windload shall require no floor mounted supports, guides or tracks.
   3. Top tracks shall be adjustable on the end track hangers to allow for adjustment of the door panels in the open position and easily replaceable without removal of the door framing or operators.

G. Hinges: Jamb hinges shall be dual shear and have two thrust bearings and two needle bearings. Fold hinges shall be stainless steel and be dual shear with two thrust bearings. All bearings shall be completely concealed within the hinge barrel and include grease zerks. All hinge pins shall be minimum ¾ diameter hardened steel.

H. Hinge Guards: Provide plastic guards at jamb hinges to prevent access through hinge space.

I. Weatherstripping: Material shall be adjustable and readily replaceable and provide a substantially weather-tight installation. Weatherstripping at center shall be 1/16 cloth inserted neoprene and include no exposed fasteners on the exterior face of the panel. Weatherstripping at sill shall include two 1/16 cloth inserted neoprene sweeps with an aluminum retainer. The retainer shall be attached to the door with adhesive.

J. Perimeter Weatherstripping: Provide jamb and head weatherstipping of 1/16 cloth-inserted neoprene bulb (or closed cell neoprene).

K. Vision Panels: Provide 1 insulated, tempered, vision panels of the size, shape and location as noted on the drawings.

2.3 OPERATOR

A. Each Four-Fold door shall be operated by an overhead mounted electro-mechanical drive unit designed for high cycle operation. Operator consists of an electric motor, gear reducer, and rotating drive arm. The door shall be operated with connecting rods attached to the rotating drive arm on the operator and to control arms attached to the jamb door section and to the door lintel. The connecting rods shall be positive drive, keeping the door under firm control at all times. The connecting rods shall be fitted with spherical bearings and control arms shall be equipped with oil impregnated bronze bearings on polished shafts.

B. Operator shall be instantly reversible, open and close rapidly and start and stop gradually. Operator shall be adjustable to allow door to fully clear the opening. Operator shall automatically lock the door in the closed position. Operator shall be equipped with disengaging mechanism to convert to manual operation.

C. Electric motor shall be of sufficient size to operate doors under normal operating conditions at no more than 75 percent of rated capacity. The motor shall coordinated and provided to comply with the building electrical system as indicated on the drawings.

D. Electric Controls: Controls shall be furnished by the door manufacturer and shall be complete for each door, and built in accordance with the latest NEMA standards. Incoming electrical shall be as indicated within drawings.
   1. Control panel assemblies shall be UL listed as per NFPA 70.
   2. Controls shall include a programmable logic controller with digital message display or LED indicators. Controller shall include programmable close timers and programmable inputs/outputs.
   3. Controls shall include a variable frequency drive with independent adjustment of the opening and closing speeds.
   4. Enclosures shall be NEMA 4 with disconnect switch.
   5. Pushbuttons (interior) for each door shall have one (1) momentary pressure three-button push-button station marked ÓOPEN , ÓCLOSE and ÓSTOP . Push button enclosure shall be NEMA 4.
   6. Limit switches shall be provided to stop the travel of the door in its fully open or fully closed position.
   7. Safety edges: Provide 4-wire fail-safe electric safety edges on leading edge of all doors to reverse door upon contact with obstruction.

8. Photo eyes: Provide (1) exterior, jamb mounted, light Curtain type photo eyes, NEMA 4 rated. Photo eye shall cover from floor level to 72 above floor.
9. Presence Sensor: Provide (1) interior, overhead mounted, presence sensor with pre-open and pre-close safety fields. Sensor shall be LZR-Widescan or equal.
10. Radio Controls: Provide five (5) radio receivers and (5) single button remotes per door. Remotes shall open and close doors with a single button.
11. Timer Activation Loop Detectors: Provide pulse on exit type loop detector to activate auto close timer once loop has been activated and cleared, include hand/auto switch to deactivate timer. G.C. to coordinate installation of preformed loop with installer prior to exterior apron being poured.
12. Wiring: Door manufacturer shall supply controls and components only. Electrical contractor shall install controls and furnish and install conduits and wiring for jobsite power and control wiring.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install Four-Fold metal doors in strict accordance with the approved drawings by qualified door erection crews. All door openings shall be completely prepared by the general contractor prior to the installation of the doors. Permanent or temporary electric wiring shall be brought to the door opening before installation is started and shall be completed so as not to delay the inspection test.

B. Doors shall be set plumb, level, and square, and with all parts properly fastened and mounted. All moving parts shall be tested and adjusted and left in good operating condition.

3.2 ADJUSTING AND CLEANING

A. Inspection of the doors and a complete operating test will be made by the installer in the presence of the general contractor or architect as soon as the erection is complete. Any defects noted shall be corrected. After door approval in the above test, the general contractor must assume the responsibility for any damage or rough handling of the doors during construction until the building is turned over to the owner and final inspection is made.

B. Clean surfaces and repaint abraded or damaged finished surfaces to match factory-applied finish.

END OF SECTION 08 3516

SECTION 08 3613 - SECTIONAL DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Overhead sectional doors, electrically operated.

B. Operating hardware and supports.

C. Electrical controls.

1.2 ACTION SUBMITTALS

A. Shop Drawings: Indicate opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, and installation details.

B. Product Data: Show component construction, anchorage method, and hardware.

1.3 INFORMATIONAL SUBMITTALS

A. Manufacturer's qualification statement.

B. Installer's qualification statement.

C. Operation Data: Include normal operation, troubleshooting, and adjusting.

D. Maintenance Data: Include data for motor and transmission, shaft and gearing, lubrication frequency, spare part sources.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years documented experience and approved by manufacturer.

C. Comply with applicable code for motor and motor control requirements.

D. Products Requiring Electrical Connection: Listed and classified by ITS (DIR), UL (DIR), or testing firm acceptable to authorities having jurisdiction, as suitable for purpose specified.

1.5 WARRANTY

A. Extended Correction Period: Correct defective work within a 2-year period commencing on Date of Substantial Completion.

B. Manufacturer Warranty: Provide 5-year manufacturer warranty for electric operating equipment. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Sectional Doors: provide product as indicated or comparable product submitted for Architect's review.
   1. Raynor Garage Doors; SteelPro SP24.

B. Source Limitations: Obtain all overhead doors (Coiling, Sectional) from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. General Performance: Provide sectional doors that comply with performance requirements specified without failure from defective manufacture, fabrication, installation, or other defects in construction and without requiring temporary installation of reinforcing components.

B. Structural Performance: Withstand positive and negative wind loads equal to 1.5 times design wind loads specified by local code without damage or permanent set, when tested in accordance with ASTM E330/E330M, using 10 second duration of maximum load.
   1. Deflection Limits: Design sectional doors to withstand design wind loads without evidencing permanent deformation or disengagement of door components.
      a. Deflection of door sections in horizontal position (open) shall not exceed 1/120 of door width.
      b. Deflection of horizontal track assembly shall not exceed 1/240 of door height.
   2. Seismic Performance: Provide sectional doors that withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7.
      a. Component Importance Factor: 1.0.

C. Air Leakage Rate: Less than 0.40 cfm/sq ft when tested in accordance with ASTM E283/E283M at test pressure difference of 1.57 psf.

D. Thermal Transmittance: U-factor of 0.31 Btu/hr sq ft degrees F, maximum, in accordance with DASMA 102.

E. Operation Cycles: Door components and operators capable of operating for not less than 10,000 operation cycles. One operation cycle is complete when door is opened from closed position to the open position and returned to closed position.

2.3 STEEL DOORS

A. Doors: Flush steel, insulated; vertical lift operating style with track and hardware; complying with DASMA 102, Commercial application.
   1. Door Panels: Steel construction; outer steel sheet of 24 gauge, 0.0239 inch minimum thickness, flush profile; inner steel sheet of 24 gauge, 0.0239 inch minimum thickness, flat profile; core reinforcement sheet steel roll formed to channel shape, rabbeted weather joints at meeting rails; polyurethane insulation.

2. Door Nominal Thickness: 2 inches thick.
3. Exterior Finish:
   a. Factory finished with ColorWave Enamel or similiar; color as selected by Architect manufacturer's full color range.
4. Interior Finish: Stucco Embossed.
   a. Factory finished with manufacturer's standard; white.
5. Glazed Lites: Full panel width, one row; set in place with resilient glazing channel.
   a. Glazing: Fully tempered glass; insulated glass units; clear; 1 inch nominal overall thickness.
6. Electric Operation: Electric control station.

2.4 COMPONENTS

A. Counterbalance Mechanism:
1. Torsion Spring: Adjustable-tension torsion springs complying with requirements of DASMA 102 for number of operation cycles indicated, mounted on torsion shaft.
2. Cable Drums and Shaft for Doors: Cast-aluminum cable drums mounted on torsion shaft and grooved to receive door-lifting cables as door is raised.
   a. Mount counterbalance mechanism with manufacturer's standard ball-bearing brackets at each end of torsion shaft.
   b. Provide one additional midpoint bracket for shafts up to 16 ft. (4.88 m) long and two additional brackets at one-third points to support shafts more than 16 ft. (4.88 m) long unless closer spacing is recommended in writing by door manufacturer.
3. Cables: Galvanized-steel, multistrand, lifting cables with cable safety factor of at least 5 to 1.
4. Cable Safety Device: Include a spring-loaded steel or bronze cam mounted to bottom door roller assembly on each side and designed to automatically stop door if lifting cable breaks.
5. Bracket: Provide anchor support bracket as required to connect stationary end of spring to the wall and to level the shaft and prevent sag.
6. Bumper: Provide spring bumper at each horizontal track to cushion door at end of opening operation.

B. Track: Galvanized steel angles, 0.094 inch minimum thickness; 2-5/16 x 4 inch size, continuous one piece per side; galvanized steel mounting brackets 1/4 inch thick.

C. Hinge and Roller Assemblies: Heavy duty hinges and adjustable roller holders of galvanized steel; floating hardened steel bearing rollers, located at top and bottom of each panel, each side.

D. Lift Mechanism: Torsion spring on cross head shaft, with braided galvanized steel lifting cables.
1. For Manual Operation: Requiring maximum exertion of 25 lbs force to open.

E. Sill Weatherstripping: Resilient vinyl strip, one piece; fitted to bottom of door panel, full length contact.

F. Jamb Weatherstripping: Roll formed steel section full height of jamb, fitted with resilient weatherstripping, placed in moderate contact with door panels.

G. Head Weatherstripping: EPDM rubber seal, one piece full length.

H. Panel Joint Weatherstripping: Neoprene foam seal, one piece full length.

I. Lock: Inside side mounted, adjustable keeper, spring activated latch bar with feature to retain in locked or retracted position; interior handle. Latch bar to close with hasp to receive padlock. Padlock provided by Owner.

2.5 MATERIALS

A. Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G60/Z180 coating, plain surface.

B. Float Glass: Provide float glass glazing, unless noted otherwise.
1. Heat-Strengthened and Fully Tempered Types: ASTM C1048.

C. Insulation: Foamed-in-place polyurethane, bonded to facing.
1. R-value of 6.8.

2.6 ELECTRIC OPERATION

A. Operator, Controls, Actuators, and Safeties: Comply with UL 325; provide products listed by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction.
1. Provide interlock switches on motor operated units.

B. Electric Operators:
1. Mounting: Side mounted on cross head shaft.
2. Motor Enclosure:
a. Exterior Doors: NEMA MG 00001, Type 4; open drip proof.
3. Motor Rating: 1/3 hp; continuous duty.
4. Motor Voltage: 120 volts, single phase, 60 Hz.
5. Motor Controller: NEMA ICS 2, full voltage, reversing magnetic motor starter.
6. Controller Enclosure: NEMA EN 10250, Type 1.
7. Opening Speed: 12 inches per second.
8. Brake: Adjustable friction clutch type, activated by motor controller.
9. Manual override in case of power failure.
10. See Division 26 electrical connections.

C. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated; enclose terminal lugs in terminal box sized to comply with NFPA 70.

D. Control Station: Provide standard three button (Open-Close-Stop) momentary-contact control device for each operator complying with UL 325.
1. 24 volt circuit.
2. Surface mounted, at interior door jamb.
3. Entrapment Protection Devices: Provide sensing devices and safety mechanisms complying with UL 325.
a. Primary Device: Provide electric sensing edge, wireless sensing, NEMA 1 photo eye sensors, or NEMA 4X photo eye sensors as required with momentary-contact control device.

E. Safety Edge: Located at bottom of sectional door panel, full width; electro-mechanical sensitized type, wired to stop and reverse door direction upon striking object; hollow neoprene covered to provide weatherstrip seal.

F. Provide interconnection to security system.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.

B. Verify that electric power is available and of the correct characteristics.

3.2 INSTALLATION

A. Install door unit assembly in accordance with manufacturer's instructions.

B. Anchor assembly to wall construction and building framing without distortion or stress.

C. Securely brace door tracks suspended from structure. Secure tracks to structural members only.

D. Fit and align door assembly including hardware.

E. Coordinate installation of electrical service. Complete power and control wiring from disconnect to unit components.

F. Install perimeter trim and closures.

3.3 TOLERANCES

A. Maximum Variation from Plumb: 1/16 inch.

B. Maximum Variation from Level: 1/16 inch.

C. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch from 10 ft straight edge.

D. Maintain dimensional tolerances and alignment with adjacent work.

3.4 ADJUSTING

A. Adjust door assembly for smooth operation and full contact with weatherstripping.

B. Have manufacturer's field representative present to confirm proper operation and identify adjustments to door assembly for specified operation.

3.5 CLEANING

A. Clean doors and frames.

B. Remove temporary labels and visible markings.

3.6 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

B. Do not permit construction traffic through overhead door openings after adjustment and cleaning.

END OF SECTION 08 3613

SECTION 08 4113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Aluminum-framed storefront systems.
2. Aluminum-framed entrance door systems.

B. Related Requirements:
1. Section 08 1613 - Fiberglass Doors.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

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.

B. 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.
4. Include point-to-point wiring diagrams showing the following:
   a. Power requirements for each electrically operated door hardware.
   b. Location and types of switches, signal device, conduit sizes, and number and size of wires.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch (300-mm) 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.

E. Delegated Design Submittal: For aluminum-framed entrances and storefronts including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Certificates:
1. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.
a. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.

B. Test and Evaluation Reports:
1. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by qualified testing agency.

C. Qualification Statements:
1. For Installer.

D. Delegated design engineer qualifications.

E. Sample warranties.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For aluminum-framed entrances and storefronts.

1.6 QUALITY ASSURANCE

A. Qualifications:
1. Installers: An entity that employs installers and supervisors who are trained and approved by manufacturer and that employs a qualified glazing contractor for this Project who is certified under the North American Contractor Certification Program (NACC) for Architectural Glass & Metal (AG&M) contractors and that employs glazing technicians certified under the Architectural Glass and Metal Technician (AGMT) certification program.
2. Delegated Design Engineer: A professional engineer who is legally qualified to practice in state where Project is located and who is experienced in providing engineering services of the type indicated.
3. Testing Agency: Qualified in accordance with 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.
1. 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.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees 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: 10 years from date of Substantial Completion.

B. Special Finish Warranty, Anodized 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 in accordance with ASTM D2244.
      b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
      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, as defined in Section 01 4000 "Quality Requirements," 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, 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 Drawings.

2. Other Design Loads: As indicated on Drawings.

D. Deflection of Framing Members Supporting Glass: At design wind load, as follows:
1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans of up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches.
2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch.

E. Structural: Test in accordance with 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 in accordance with ASTM E331 as follows:
1. No evidence of water penetration through fixed glazing and framing areas, including entrance doors, when tested in accordance with a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft. (480 Pa).

G. Water Penetration under Dynamic Pressure: Test in accordance with AAMA 501.1 as follows:
1. No evidence of water penetration through fixed glazing and framing areas when tested at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft. (480 Pa).
2. Maximum Water Leakage: No uncontrolled water penetrating assemblies or water appearing on assemblies' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.

H. Energy Performance: Certified and labeled by manufacturer for energy performance as follows:
1. Thermal Transmittance (U-factor):
   a. Fixed Glazing and Framing Areas: U-factor for the system of not more than 0.36 Btu/sq. ft. x h x deg F (2.55 W/sq. m x K) as determined in accordance with NFRC 100.
   b. Entrance Doors: U-factor of not more than 0.63 Btu/sq. ft. x h x deg F (4.37 W/sq. m x K) as determined in accordance with NFRC 100.
2. Solar Heat-Gain Coefficient (SHGC):
   a. Fixed Glazing and Framing Areas: SHGC for the system of not more than 0.36 as determined in accordance with NFRC 200.
   b. Entrance Doors: SHGC of not more than 0.58 as determined in accordance with NFRC 200.
3. Air Leakage:
   a. Fixed Glazing and Framing Areas: Air leakage for the system of not more than 0.06 cfm/sq. ft. (0.30 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa) when tested in accordance with ASTM E283.
   b. Entrance Doors: Air leakage of not more than 1.0 cfm/sq. ft. (5.08 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).
4. Condensation Resistance Factor (CRF):
   a. Fixed Glazing and Framing Areas: CRF for the system of not less than 55 as determined in accordance with AAMA 1503.
   b. Entrance Doors: CRF of not less than 63 as determined in accordance with AAMA 1503.

I. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes.
   1. Temperature Change: 120 degrees Fahrenheit, ambient; 180 degrees Fahrenheit, material surfaces.

2.3 STOREFRONT SYSTEMS

A. Basis of Design Manufacturer: Kawneer North America; an Arconic company or one of the following companies that may offer comparable products:
   1. Arcadia, Inc.
   2. Avanti Systems, Inc.
   3. EFCO Corporation.
   4. U.S. Aluminum; a brand of C.R. Laurence
   5. YKK AP America Inc.

B. 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 .
      a. Basis of Design Product:Subject to compliance with requirements, provide Kawneer North America Trifab VG 451UT or comparable product by another manufacturer.
   2. Interior Framing Construction: Nonthermal.
      a. Basis of Design Product: Subject to compliance with requirements, provide Kawneer North America Trifab VG 451 or comparable product by another manufacturer
   3. Glazing System: Retained mechanically with gaskets on four sides.
   4. Glazing Plane: Center.
   5. Finish:
      a. Typical: Clear Anodized finish.
      b. SF-3: Color Anodized finish.
   6. Fabrication Method: Field-fabricated stick system.
   7. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
   8. Steel Reinforcement: As required by manufacturer.

C. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

D. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

2.4 ENTRANCE DOOR HARDWARE

A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 08 7100 "Door Hardware."

B. General: Provide entrance door hardware and entrance door hardware sets as indicated within door and door hardware schedule(s) within the drawings to comply with requirements in Section 08 7100 Door Hardware.

2.5 GLAZING

A. Glazing: Comply with Section 08 8000 "Glazing."

B. Glazing Sealants: As recommended by manufacturer. Comply with Section 08 8000 "Glazing."

2.6 MATERIALS

A. Sheet and Plate: ASTM B209 (ASTM B209M).

B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221 (((ASTM B221M))).

C. Structural Profiles: ASTM B308/B308M.

D. 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.

E. 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 in accordance with recommendations in SSPC-SP COM, and prepare surfaces in accordance with applicable SSPC standard.

F. Regional Materials: Products shall be manufactured within 100 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.

2.7 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.

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.

C. Concealed Flashing: Dead-soft, 0.018-inch- (0.457-mm-) 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 (0.762-mm) thickness per coat.

2.8 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 head-and-sill-receptor system with shear blocks at intermediate horizontal members.

F. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
1. At interior and exterior doors, provide compression weather stripping at fixed stops.

G. 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.

H. After fabrication, clearly mark components to identify their locations in Project in accordance with Shop Drawings.

2.9 ALUMINUM FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

B. Class I Color Anodized Finish: AAMA 611 AA-M12C22A42 Integrally colored anodic coating not less than 0.7 mils thick.
1. Color: Red, submit manfuacturer's full range of indicated color for selection.

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 07 9200 "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 08 8000 "Glazing."

3.4 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 (12.7 to 25.4 mm) 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.

END OF SECTION 08 4113

SECTION 08 7100 - 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. 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. Cylinders specified for doors in other sections.

C. Codes and References: Comply with the version 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. State Building Codes, Local Amendments.

D. 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. UL 10C - 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 REFERENCE STANDARDS

A. BHMA A156.1 - Standard for Butts and Hinges.

B. BHMA A156.2 - Bored and Preassembled Locks and Latches.

C. BHMA A156.3 - Exit Devices.

D. BHMA A156.4 - Door Closers and Pivots.

E. BHMA A156.5 - Cylinders and Input Devices for Locks.

F. BHMA A156.6 - Standard for Architectural Door Trim.

G. BHMA A156.8 - Door Controls - Overhead Stops and Holders.

H. BHMA A156.13 - Mortise Locks and Latches.

I. BHMA A156.16 - Standard for Auxiliary Hardware.

J. BHMA A156.18 - Standard for Materials and Finishes.

K. BHMA A156.26 - Standard for Continuous Hinges.

L. BHMA A156.36 - Auxiliary Locks.

M. ICC (IBC) - International Building Code.

N. ICC A117.1 - Accessible and Usable Buildings and Facilities.

O. NFPA 70 - National Electrical Code.

P. NFPA 80 - Standard for Fire Doors and Other Opening Protectives.

Q. NFPA 101 - Life Safety Code.

R. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives.

S. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.

T. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies.

U. UL 294 - Access Control System Units.

V. UL 305 - Standard for Panic Hardware.

W. UL 437 - Standard for Key Locks.

X. UL 1784 - Standard for Air Leakage Tests of Door Assemblies and Other Opening Protectives.

1.4 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. 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.

1.5 CLOSEOUT SUBMITTALS

A. 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.

1.6 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. 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.

F. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.

G. 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.

H. 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

I. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.

1.7 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".

1.8 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 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.

1.9 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.

PART 2 PRODUCTS

2.1 MATERIALS

A. Hardware shall not have any visible manufacturer names on exposed materials, except cylinders, when the door is in a closed position.

2.2 BUTT HINGES

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 inches, provide 4 hinges, plus 1 hinge for every 30 inches of 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 all out-swinging lockable doors.
   5. Manufacturers:
      a. Hager Companies (HA) - BB Series, 5-knuckle.
      b. McKinney (MK) - TA/T4A Series, 5-knuckle.
      c. dormakaba BEST (ST) - F/FBB Series, 5-knuckle.

2.3 CONTINUOUS HINGES

A. 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. Manufacturers:.
      a. Hager Companies (HA).
      b. Pemko (PE).
      c. dormakaba BEST (ST).

2.4 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.

2.5 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. Door Controls International (DC).
      b. Rockwood (RO).
      c. Trimco (TC).

B. 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. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
   2. 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.
   3. 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.

4. Pulls shall be provided with a 10” clearance from the finished floor on the push side to accommodate wheelchair accessibility.
5. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets. When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.
6. Manufacturers:
   a. Hiawatha, Inc. (HI).
   b. Rockwood (RO).
   c. Trimco (TC).

2.6 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: Manufacturer’s Standard.

C. Large Format Interchangeable Cores: Provide removable cores (LFIC) as specified, core insert, removable by use of a special key, and for use with only the core manufacturer's cylinder and door hardware.

D. Security Cylinders: ANSI/BHMA A156.5, Grade 1 Certified Products Directory (CPD) listed security cylinders and keys able to be used together under the same facility master or grandmaster key system. Cylinders to be factory keyed.
1. New security key systems shall not be established with products that have an expired patent. Expired systems shall only be specified and supplied to support existing systems.
2. Manufacturers:
   a. Corbin Russwin (RU) - Access 3 AS.
   b. Sargent (SA) - Degree DG2.

E. 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. New System: Key locks to a new key system as directed by the Owner.

F. 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).

G. Construction Keying: Provide construction master keyed cylinders.

H. 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.

2.7 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).

2.8 MORTISE LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): Provide ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed mortise locksets. Listed manufacturers shall meet all functions and features as specified herein.
1. Electromechanical locksets shall have the following functions and features:
a. Universal Molex plug-in connectors that have standardized color-coded wiring and are available in fail safe or fail secure and operate from 12vdc to 24vdc regulated.
b. EcoFlex or equivalent technology that reduces energy consumption up to 92% as certified by GreenCircle.
c. Options to be available for request-to-exit or enter signaling, latchbolt and deadbolt monitoring.
d. Optional high security monitoring with internal end-of-line monitoring alongside deadbolt privacy and integrated door position monitoring.
e. Two-year limited warranty on electrified functions.
2. Manufacturers:
a. Corbin Russwin Hardware (RU) - ML2000 Series.
b. Sargent Manufacturing (SA) - 8200 Series.

2.9 CYLINDRICAL LOCKS AND LATCHING DEVICES

A. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Operational Grade 1 Certified Products Directory (CPD) listed cylindrical locksets. Listed manufacturers shall meet all functions and features as specified herein.
1. Provide locksets with functions and features as follows:
a. Meets ANSI/BHMA A156.41 for single motion egress.
b. Where required by code, provide knurling or abrasive coating on all levers leading to hazardous areas.
c. Meets UL and CUL Standard 10C Positive Pressure, Fire Test of Door Assemblies with levers that meet A117.1 Accessibility Code.
d. Exceeds ANSI/BHMA A156.2 requirements by 2.6 times for 3,100 inch-lb. abusive locked lever torque with no entry while maintaining egress.

e. Exceeds ANSI/BHMA A156.2 requirements by 8 times for 1,600 lbs. offset lever pull with no entry for protection against attacks.
f. Exceeds ANSI/BHMA A156.3 requirements by 2 times for latch retraction with 100 lb. preload while maintaining operation in warped doors.
g. Exceeds ANSI/BHMA A156.3 requirements by 20 times for no access with minimum 100 vertical impacts for protection against vandalism attempts.
h. Independent return springs allow lock to exceed ANSI/BHMA A156.2 Grade 1 cycle requirements without lever sag.
i. Status indicators inside, outside, or on both sides of doors as specified with high visibility red/green or red/white icons to display locked or unlocked state in the rose.
j. Ten-year limited warranty for mechanical functions.

2. Electromechanical locksets shall have the following functions and features:
   a. Universal Molex plug-in connectors that have standardized color-coded wiring and are field configurable in fail safe or fail secure and operate from 12vdc to 24vdc regulated.
   b. EcoFlex or equivalent technology that reduces energy consumption up to 92% as certified by GreenCircle.
   c. Options to be available for request-to-exit or enter signaling.
   d. Two-year limited warranty on electrified functions.
3. Manufacturers:
   a. Corbin Russwin Hardware (RU) - CLX3300 Series.
   b. Sargent Manufacturing (SA) - 10X Line.

2.10 DEADLOCKS AND LATCHES

A. Cylindrical Deadlocks: ANSI/BHMA A156.36 Grade 1 Certified Products Directory (CPD) listed deadlocks to fit standard ANSI 161 preparation. Provide tapered collars to resist vandalism and 1" throw solid steel bolt with hardened steel roller pins. Deadlocks to be products of the same source manufacturer and keyway as other locksets.
   1. Manufacturers:
      a. Corbin Russwin Hardware (RU) - DL3000 Series.
      b. Sargent Manufacturing (SA) - 480 Series.

2.11 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.

2.12 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 UL 305. 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. 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.
   7. 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.
   8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2” wide stiles.
   9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
   10. Rail Sizing: Provide exit device rails factory sized for proper door width application.
   11. 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 exit devices. Listed manufacturers shall meet all functions and features as specified herein.
   1. Provide exit devices with functions and features as follows:
      a. Where required by code, provide knurling or abrasive coating on all levers leading to hazardous areas.
      b. Meets UL and CUL Standard 10C Positive Pressure, Fire Test of Door Assemblies with levers that meet A117.1 Accessibility Code.
      c. No catch points: addition of applied deflectors or other added components are not allowed.
      d. No visible plastic.
      e. Heavy duty end caps with flush and overlapping options made of stainless steel, brass, or bronze with architectural finishes.
      f. Constructed of all stainless steel.
      g. Stainless steel pullman type latch with deadlock feature.

h. Narrow or wide style exterior trim as specified in the hardware sets.
i. Center case adjustability on concealed vertical rod exit devices; single operation with hex key individually adjusts top or bottom latches. No retainer screws or clips required to maintain adjustment.
j. Ten-year limited warranty for mechanical features.

2. Electromechanical exit devices shall have the following functions and features:
   a. Universal Molex plug-in connectors that have standardized color-coded wiring and are field configurable in fail safe or fail secure and operate from 12vdc to 24vdc regulated.
   b. Wire routing for all non-access control electromechanical functions and EcoFlex trim to be contained within the carrier of the device eliminating the need for cavities in doors to be drilled. Include a protective film so that wires don't get damaged if the rail needs to be removed.
   c. EcoFlex or equivalent technology that reduces energy consumption up to 92% as certified by GreenCircle.
   d. Options to be available for request-to-exit or enter signaling, latchbolt and touchbar monitoring.
   e. Field configurable electrified trim to fail-safe or fail-secure that operates from 12-24VDC.
3. Manufacturers:
   a. Corbin Russwin Hardware (RU) - PED4000 / PED5000 Series.
   b. Sargent Manufacturing (SA) - PE80 Series.

2.13 SURFACE 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.

2.14 SURFACE MOUNTED CLOSER HOLDERS

A. Electromagnetic Door Holders: ANSI A156.15, Grade 1 electromagnetic door holder/releases with a minimum 25 to 40 pounds holding power and fail-safe operation; power failure releases door to close.
1. Manufacturers:
a. Norton Rixson (NO) - 900 Series.
b. Sargent Manufacturing (SA) - 1560 Series.

2.15 ARCHITECTURAL TRIM AND ACCESSORIES

A. Door, Frame and Wall Protective Trim: ANSI/BHMA A156.6, protective products as specified in the hardware sets. Door protection plates shall be not more than 2" less than door width on stop side and 1" less door width on the pull side or on stop side of pairs of doors. Listed manufacturers shall meet all functions and features as specified herein.
1. Provide protective trim with functions and features as follows:
a. Meets ADA requirements for smooth bottom door surfaces.
b. UL Classified options for use on fire-rated doors up to 3 hours.
c. Fabricated from stainless steel, brass, bronze, aluminum, or high-impact plastic.
d. Available in a variety of sizes, finishes, and profiles to suit aesthetic and functional requirements.
e. Designed to protect doors, frames, and adjacent walls from damage due to impact, abrasion, or traffic.
f. Fasteners included; adhesive-backed options available for select models.
g. Ten-year limited warranty.
2. Manufacturers:
a. Hiawatha, Inc. (HI).
b. Rockwood (RO).
c. Trimco (TC).

2.16 DOOR STOPS AND HOLDERS

A. 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. Hiawatha, Inc. (HI).
b. Rockwood (RO).
c. Trimco (TC).

B. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.
1. Manufacturers:

a. Norton Rixson (NO).
b. Rockwood (RO).
c. Sargent Manufacturing (SA).

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 UL 10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NFPA 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. National Guard Products (NG).
2. Pemko (PE).
3. Reese Enterprises, Inc. (RE).

2.18 ELECTRONIC ACCESSORIES

A. 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. Alarm Controls (AK) - CP1-1026 Series.
b. Securitron (SU) - DPS Series.

B. Intelligent Switching Power Supplies: Provide the least number of power supplies at the appropriate amperage level sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.
1. Power supplies shall meet all functions and features as specified herein.
a. UL listed dual voltage 12 or 24 VDC field selectable continuous output.

b. Dedicated fast charger to prolong battery life with low battery cutoff to protect batteries from deep discharge.
c. Enhanced surge immunity for input/output protection
d. Separate, dedicated battery charging circuit to keep locks cooler.
e. Dual-color LED visual notification to prevent applying incorrect voltages to the power supply.
f. Instant auto-switch to battery on AC loss.
g. Expandable up to 16 outputs in the standard enclosure
h. Integrated fire alarm interface to allow main output shutdown or disconnect on a per output basis when using an R8 output module.
i. Network ready and remotely manage locks and connected devices when using an M8 managed output module on network models.
j. Lifetime replacement, no-fault, no questions asked warranty.

2. Manufacturers:
   a. Life Safety Power (LP).
   b. 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. Paint prime coated mullions to match frames.

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. 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.

D. 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.

E. Push Plates and Door Pulls: When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.

F. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

G. 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.
   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.

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. Refer to Section 08 0671 - Door Hardware Sets, for hardware sets.

END OF SECTION 08 7100

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SECTION 08 8000 - GLAZING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Glass products.
2. Insulating glass.
3. Glazing sealants.
4. Glazing tapes.
5. Miscellaneous glazing materials.

1.2 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 in accordance with ASTM C1036.

C. IBC: International Building Code.

D. Interspace: Space between lites of an insulating-glass unit.

1.3 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances to achieve proper safety margins for glazing retention under each design load case, load case combination, and service condition.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
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 temporary protection requirements for glazing during and after installation.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For glass.

C. Sample Warranties: For special warranties.

1.7 QUALITY ASSURANCE

A. Fabricated-Glass Manufacturer Qualifications: A qualified manufacturer of fabricated glass units who is approved and certified by primary glass manufacturer.

B. Installer Qualifications: A qualified glazing contractor for this Project who is certified under the North American Contractor Certification Program (NACC) for Architectural Glass & Metal (AG&M) contractors.

C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials in accordance with 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.

1.9 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.
   1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 degrees Fahrenheit.

1.10 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.
   1. Warranty Period: 10 years from date of Substantial Completion.

B. 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 obstruction of vision by dust, moisture, or film on interior surfaces of glass.
   1. Warranty Period: 10 years from date of Substantial Completion.

C. Manufacturer's Special Warranty for Heat-Soaked Tempered Glass: Manufacturer agrees to replace heat-soaked tempered glass units that spontaneously break due to nickel sulfide (NiS) inclusions at a rate exceeding 0.3 percent (3/1000) within specified warranty period. Coverage for any other cause is excluded.
   1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Glass: Obtain tinted and coated glass from single source from single manufacturer.

B. Source Limitations for Glazing Accessories: For each product and installation method, obtain from single source from single manufacturer.

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 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. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 4000 "Quality Requirements," to design glazing.

C. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined in accordance with the IBC and ASTM E1300:
   1. Design Wind Pressures: As indicated on Drawings.
      a. Wind Design Data: As indicated on Drawings.
   2. Design Snow Loads: As indicated on Drawings.
   3. 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.
   4. Thermal Loads: Design glazing to resist thermal stress breakage induced by differential temperature conditions and limited air circulation within individual glass lites and insulated glazing units.

D. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

E. 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 0.24 inch thick.
   2. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
   3. U-Factors: Center-of-glazing values, in accordance with NFRC 100 and based on most current non-beta version of LBL's WINDOW computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
   4. SHGC and Visible Transmittance: Center-of-glazing values, in accordance with NFRC 200 and based on most current non-beta version of LBL's WINDOW computer program.
   5. Visible Reflectance: Center-of-glazing values, in accordance with 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. NGA Publications: "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. 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 the IGCC.

D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than 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 MANUFACTURERS

A. Basis-of-Design: Provide Basis-of-Design Product or comparable products by the following:

B. Base Glass Manufacturers:
   1. AGC Glass Company North America, Inc.
   2. Cardinal Glass Industries.
   3. Guardian Glass; SunGuard.
   4. Pilkington North America.
   5. Schollglas.
   6. Vitro Architectural Glass.

C. Glass Fabricators:
   1. Dreamwalls.
   2. Pilkington.
   3. McGrory.
   4. Viracon.
   5. PRL Glass & Aluminum.
   6. Or comparable local to project site glass fabricator submitted for Architect's review.

D. IGU Fabricators:
   1. Guardian Glass.
   2. Pilkington.

3. Vitro Architectural Glass.
4. Viracon.
5. PRL Glass & Aluminum.
6. Or comparable IGU fabricator submitted for Architect's review.

2.5 GLASS PRODUCTS

A. Clear Annealed Float Glass: ASTM C1036, Type I, Class 1 (clear), Quality-Q3.

B. Tinted Annealed Float Glass: ASTM C1036, Type I, Class 2 (tinted), Quality-Q3.

C. Fully Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

D. Heat-Strengthened Float Glass: ASTM C1048, 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.
1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

E. Reflective- and Low-E-Coated Vision Glass: ASTM C1376.

2.6 INSULATING GLASS

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified in accordance with ASTM E2190.
1. Sealing System: Dual seal, with manufacturer's standard primary and secondary sealants.
2. Perimeter Spacer: Manufacturer's standard spacer material and construction.
    a. Manufacturers: Subject to compliance with requirements, provide products by the following:
        1) Technoform.
        2) Thermix; a brand of Ensinger USA.
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 indicated by manufacturer's designations.

B. Neutral-Curing Silicone Glazing Sealant, Class 100/50: Complying with ASTM C920, Type S, Grade NS, Use NT.
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    a. GE Construction Sealants; Momentive Performance Materials Inc.
    b. Pecora Corporation.

c. Sika Corporation.
d. The Dow Chemical Company.
e. Tremco Incorporated.

C. Neutral-Curing Silicone Glazing Sealant, Class 50: Complying with ASTM C920, Type S, Grade NS, Use NT.
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
a. Adfast.
b. GE Construction Sealants; Momentive Performance Materials Inc.
c. Pecora Corporation.
d. Sika Corporation.
e. The Dow Chemical Company.
f. Tremco Incorporated.

D. Neutral-Curing Silicone Glazing Sealant, Class 25: Complying with ASTM C920, Type S, Grade NS, Use NT.
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
a. GE Construction Sealants; Momentive Performance Materials Inc.
b. Pecora Corporation.
c. Sika Corporation.
d. The Dow Chemical Company.
e. Tremco Incorporated.

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 C1281 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.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
1. AAMA 810.1, Type 1, for glazing applications in which tape acts as primary sealant.
2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.9 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, recommended in writing by 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:
1. Silicone with Shore A durometer hardness of 85, plus or minus 5.

2. Type recommended in writing by sealant or glass manufacturer.

D. Spacers:
1. Neoprene blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
2. Type recommended in writing by sealant or glass manufacturer.

E. Edge Blocks:
1. Silicone with Shore A durometer hardness per manufacturer's written instructions.
2. Type recommended in writing by sealant or glass manufacturer.

F. Cylindrical Glazing Sealant Backing: ASTM C1330, 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.
1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
a. Temperature Change: 120 degrees Fahrenheit , ambient; 180 degrees Fahrenheit , 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.

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- (3-mm-) 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 in accordance with 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 in writing 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 in writing 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 in writing 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.
   1. If, despite such protection, contaminating substances do 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 GL1: Fully tempered float glass.
   1. Minimum Thickness: 6 mm.
   2. Safety glazing required.

3.9 INSULATING GLASS SCHEDULE

A. Low-E-Coated, Tinted Insulating Glass Type GL3:
   1. Basis-of-Design Product: Vitro Architectural Glass; Solarban70.
   2. Overall Unit Thickness: 1 inch.
   3. Minimum Thickness of Each Glass Lite:6 mm.
   4. Outdoor Lite: Tinted heat-strengthened float glass.
      a. Tint Color: Gray.
   5. Interspace Content: Argon.
   6. Indoor Lite: Clear fully tempered float glass.
   7. Low-E Coating: Sputtered on second surface.
   8. Winter Nighttime U-Factor: 0.24 maximum.
   9. Summer Daytime U-Factor: 0.36 maximum.
   10. Visible Light Transmittance: 64 percent minimum.
   11. SGHC: 0.36 maximum.
   12. Safety glazing required.

END OF SECTION 08 8000

SECTION 08 8813 - FIRE-RATED GLAZING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fire-rated glazing units.

B. Glazing compounds.

1.2 DEFINITIONS

A. Fire-Protection-Rated Glazing: Glazing that prevents spread of fire and smoke and complies with requirements for rated openings; incapable of blocking radiant heat

B. Fire-Resistance-Rated Glazing: Glazing that prevents spread of fire and smoke and radiant heat and complies with requirements for rated walls and rated openings; capable of blocking radiant heat

C. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

D. Glass Thicknesses: Indicated by thickness designations in millimeters in accordance with ASTM C1036.

1.3 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.4 ACTION SUBMITTALS

A. Product Data on Glazing Unit Glazing Types: Provide structural, physical, and environmental characteristics, size limitations, special handling and installation requirements.
   1. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

1.5 INFORMATION SUBMITTALS

A. Certificate: Certify that products of this section meet or exceed specified requirements.

B. Installer's qualification statement.

1.6 QUALITY ASSURANCE

A. Perform work in accordance with GANA (GM) and GANA (SM) for glazing installation methods. Maintain one copy on site.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.
   1. Provide company, field supervisors, and installers that hold active ANSI accredited certifications in appropriate categories for work specified.
      a. Equivalent independent third-party ANSI accredited certification.

C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of type specified in this section.

1.7 FIELD CONDITIONS

A. Ambient Conditions: Do not install glazing when ambient temperature is less than 40 degrees F.

B. Maintain minimum ambient temperature before, during, and 24 hours after installation of glazing compounds.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fully Tempered Safety Glass: Comply with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.

2.2 GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless otherwise indicated.
   1. Kind FT - Fully Tempered Type: Comply with ASTM C1048.
   2. Impact-Resistant Safety Glass: Comply with ANSI Z97.1 - Class A, or 16 CFR 1201 - Category I criteria.

2.3 GLAZING UNITS

A. Type GL1R - Fire-Protection-Rated Glazing: Type, thickness, and configuration of glazing that contains flame, smoke, and does not block radiant heat, as required to achieve indicated fire rating period as indicated on drawings.
   1. Applications:
      a. Glazing in fire-resistance-rated door assembly.
      b. Other locations as indicated on drawings.
   2. Glass Type: Specialty tempered float glass.
   3. Provide products listed by ITS (DIR) or UL (DIR) and approved by authorities having jurisdiction.
   4. Safety Glazing Certification: 16 CFR 1201 Category II.
   5. Glazing Method: As required for fire rating.
   6. Fire-Rating Period: As indicated on drawings.
   7. Markings for Fire-Protection-Rated Glazing Assemblies: Provide permanent markings on fire-protection-rated glazing in compliance with ICC (IBC), local building code, and authorities having jurisdiction
      a. "D" - meets fire door assembly criteria of NFPA 252, UL 10B, or UL 10C fire test standards.

b. "OH" - meets fire window assembly criteria, including hose stream test of NFPA 257 or UL 9 fire test standards.
c. "H" - meets fire door assembly hose stream test of NFPA 252, UL 10B, or UL 10C fire tests standards.
d. "XXX" - placeholder that represents fire-rating period, in minutes.

8. Provide product indicated as Basis-of-Design or comparable listed manufacturer submitted for Architect's review.
   a. McGrory Glass, Inc.
   b. SAFTIFIRST, a division of O'Keeffe's Inc.
   c. Basis-of-Design: Technical Glass Products; Fireglass20.

2.4 GLAZING COMPOUNDS

A. Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; nonbleeding, nonstaining; ASTM C920 Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; color as selected.

2.5 ACCESSORIES

A. Setting Blocks: Aluminum silicate, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.

B. Spacer Shims: Silicone, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Continuous by one half the height of glazing stop by thickness to suit application, self adhesive on one face.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

3.2 INSTALLATION - GENERAL

A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers unless more stringent requirements are indicated, including those in referenced glazing standards.

B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.

D. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.

E. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.

F. Prevent glass from contact with contaminating substances that may result from construction operations including, but not limited to weld spatter, fire-safing, plastering, mortar droppings, etc.

3.3 INSTALLATION - DRY GLAZING METHOD (TAPE AND TAPE)

A. Application - Interior Glazed: Set glazing infills from interior of building.

B. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch above sightline.

C. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.

D. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane or unit.

E. Place glazing tape on free perimeter of glazing in same manner described above.

F. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.

G. Carefully trim protruding tape with knife.

3.4 CLEANING

A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

B. Remove nonpermanent labels immediately after glazing installation is complete.

C. Clean glass and adjacent surfaces after sealants are fully cured.

D. Clean glass on both exposed surfaces not more than four days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.5 PROTECTION

A. After installation, mark pane with 'X' by using removable plastic tape or paste; do not mark heat-absorbing or reflective glass units.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION 08 8813

SECTION 09 0561 - COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. This section applies to floors identified in Contract Documents that are receiving the following types of floor coverings:
   1. Resilient tile and sheet.
   2. Carpet tile.
   3. Thin-set ceramic tile and stone tile.
   4. Resinous Flooring.

B. Preparation of new concrete floor slabs for installation of floor coverings.

C. Testing of concrete floor slabs for moisture and alkalinity (pH).

D. Remediation of concrete floor slabs due to unsatisfactory moisture or alkalinity (pH) conditions.
   1. Contractor shall perform all specified remediation of concrete floor slabs. If such remediation is indicated by testing agency's report and is due to a condition not under Contractor's control or could not have been predicted by examination prior to entering into the contract, a contract modification will be issued.

E. Patching compound.

F. Remedial floor coatings.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordinate scheduling of cleaning and testing, so that preliminary cleaning has been completed for at least 24 hours prior to testing.

1.3 ACTION SUBMITTALS

A. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
   1. Moisture and alkalinity (pH) limits and test methods.
   2. Manufacturer's required bond/compatibility test procedure.

B. Remedial Materials Product Data: Manufacturer's published data on each product to be used for remediation.

C. Testing Agency's Report:
   1. Description of areas tested; include floor plans and photographs if helpful.
   2. Summary of conditions encountered.
   3. Moisture and alkalinity (pH) test reports.
   4. Copies of specified test methods.

5. Recommendations for remediation of unsatisfactory surfaces.
6. Product data for recommended remedial coating.
7. Submit report to Architect.
8. Submit report not more than two business days after conclusion of testing.

D. Adhesive Bond and Compatibility Test Report.

1.4 QUALITY ASSURANCE

A. Moisture and alkalinity (pH) testing shall be performed by an independent testing agency employed and paid by Contractor.

B. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.
1. Submit evidence of experience consisting of at least 3 test reports of the type required, with project Owner's project contact information.

C. Contractor's Responsibility Relating to Independent Agency Testing:
1. Provide access for and cooperate with testing agency.
2. Confirm date of start of testing at least 10 days prior to actual start.
3. Allow at least 4 business days on site for testing agency activities.
4. Achieve and maintain specified ambient conditions.
5. Notify Architect when specified ambient conditions have been achieved and when testing will start.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, handle, and protect products in accordance with manufacturer’s instructions and recommendations.

B. Deliver materials in manufacturer’s packaging; include installation instructions.

C. Keep materials from freezing.

1.6 FIELD CONDITIONS

A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F or more than 85 degrees F.

B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

PART 2 PRODUCTS

2.1 MATERIALS

A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:
1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.

2. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.
3. Products:
   a. ARDEX Engineered Cements; ARDEX Feather Finish.
   b. TEC Specialty Products LLC; TEC VersaPatch Latex Modified Floor Patch.
   c. USG Corporation; Durock Brand Advanced Skim Coat Floor Patch.

B. Remedial Floor Coating, Two-Component: Single-layer coating resistant to water vapor transmission meeting flooring manufacturer's emission limits, resistant to alkalinity (pH) level found, and suitable for flooring adhesion without further treatment.
1. Material: Comply with ASTM F3010.
2. Thickness: As required for application and in accordance with manufacturer's installation instructions.
3. Use product recommended by testing agency.

PART 3 EXECUTION

3.1 CONCRETE SLAB PREPARATION

A. Perform following operations in the order indicated:
1. Preliminary cleaning.
2. Moisture vapor emission tests; 3 tests in the first 1000 square feet and one test in each additional 1000 square feet, unless otherwise indicated or required by flooring manufacturer.
3. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
4. Alkalinity (pH) tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
5. Specified remediation, if required.
6. Patching, smoothing, and leveling, as required.
7. Other preparation specified.
8. Adhesive bond and compatibility test.
9. Protection.

B. Remediations:
1. Active Water Leaks or Continuing Moisture Migration to Surface of Slab: Correct this condition before doing any other remediation; re-test after correction.
2. Excessive Moisture Emission or Relative Humidity: If an adhesive that is resistant to the level of moisture present is available and acceptable to flooring manufacturer, use that adhesive for installation of the flooring; if not, apply remedial floor coating or remedial sheet membrane over entire suspect floor area.
3. Excessive Alkalinity (pH): If remedial floor coating is necessary to address excessive moisture, no additional remediation is required; if not, if an adhesive that is resistant to the level present is available and acceptable to the flooring manufacturer, use that adhesive for installation of the flooring; otherwise, apply a skim coat of specified patching compound over entire suspect floor area.

3.2 PRELIMINARY CLEANING

A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.

B. Do not use solvents or other chemicals for cleaning.

3.3 MOISTURE VAPOR EMISSION TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test in accordance with ASTM F1869 and as follows.

D. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if test values exceed 3 pounds per 1000 square feet per 24 hours.

F. Report: Report the information required by the test method.

3.4 INTERNAL RELATIVE HUMIDITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test in accordance with ASTM F2170 Procedure A and as follows.

D. Testing with electrical impedance or resistance apparatus may not be substituted for the specified ASTM test method, as the values determined are not comparable to the ASTM test values and do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if any test value exceeds 75 percent relative humidity.

F. Report: Report the information required by the test method.

3.5 ALKALINITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. The following procedure is the equivalent of that described in ASTM F710, repeated here for the Contractor's convenience.
   1. Use a wide range alkalinity (pH) test paper, its associated chart, and distilled or deionized water.
   2. Place several drops of water on a clean surface of concrete, forming a puddle approximately 1 inch in diameter. Allow the puddle to set for approximately 60 seconds, then dip the alkalinity (pH) test paper into the water, remove it, and compare immediately to chart to determine alkalinity (pH) reading.

3. Use of a digital pH meter with probe is acceptable; follow meter manufacturer's instructions.

C. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if alkalinity (pH) test value is over 10.

3.6 ADHESIVE BOND AND COMPATIBILITY TESTING

A. Comply with requirements and recommendations of floor covering manufacturer.

3.7 APPLICATION OF REMEDIAL FLOOR COATING

A. Comply with requirements and recommendations of coating manufacturer.

3.8 PROTECTION

A. Cover prepared floors with building paper or other durable covering.

END OF SECTION 09 0561

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SECTION 09 2216 - NON-STRUCTURAL METAL FRAMING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Nonstructural steel framing.
2. Grid suspension systems.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:
1. Indicate prefabricated work, component details, stud layout, framed openings, anchorage to structure, acoustic details, type and location of fasteners, accessories, and items of other related work.
2. Describe method for securing studs to tracks, splicing, and for blocking and reinforcement of framing connections.

C. Delegated Design Submittals: for non-structural metal framing.
1. Delegated Design to include, but not limited to, the following:
   a. Soffits.
   b. Bulkheads.
   c. Partitions.
   d. Furring.
   e. Ceiling, and miscellaneous framing and blocking.
   f. metal framing thickness.
2. Non-structural metal framing design shall first increase metal stud thickness, second decrease metal stud spacing to 12-inches on center, and third increase stud width where adjusting stud thickness and spacing are insufficient to comply with requirements.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For code-compliance certification of studs and track.

B. Evaluation Reports: Submit evaluation reports certified under an independent third-party inspection program administered by an agency accredited by IAS to ICC-ES AC98 accreditation criteria for inspection agencies.

C. Manufacturer's Certification: Submit manufacturer's certification of product compliance with codes and standards along with product literature and data sheets for specified products.

1.5 QUALITY ASSURANCE

A. Code-Compliance Certification of Studs and Track: Provide documentation that framing members are certified in accordance with product-certification program of the Steel Framing Industry Association (SFIA) or similar organization providing a verifiable code-compliance program.

B. Contractor to provide effective, full-time quality control over fabrication and erection complying with pertinent codes and regulations of government agencies having jurisdiction. Conduct preinstallation meeting to verify Project requirements, substrate conditions, and manufacturer's written installation instructions.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

B. Protect materials from corrosion, deformation, and other damage during delivery, storage, and handling in accordance with AISI S202.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: Where indicated on Drawings, provide assemblies incorporating nonstructural steel framing identical to those of assemblies tested for fire resistance in accordance with ASTM E119 and displaying a classification label from an independent testing agency acceptable to authorities having jurisdiction.
   1. Construct fire-resistance-rated partitions in compliance with tested assembly requirements indicated on Drawings.
   2. Rated assemblies to be substantiated from applicable testing using proposed products, by Contractor.

B. STC-Rated Assemblies: Where indicated on Drawings, provide assemblies incorporating nonstructural steel framing identical to those of assemblies tested in accordance with ASTM E90 and classified in accordance with ASTM E413 by an independent testing agency.

C. Horizontal Deflection: For non-composite wall assemblies, limited to 1/240 of the wall height based on the following horizontal loading:
   1. Horizontal Loading: 5 lbf/sq. ft. (240 Pa).

D. Design framing systems in accordance with AISI S220, unless otherwise indicated.

E. Design Loads: As indicated on architectural Drawings or 5 lbf/sq. ft. (240 Pa) minimum as required by the IBC.

2.2 MANUFACTURER

A. Provide Basis-of-Design Product or comparable product by a current member of the SFIA.

2.3 NONSTRUCTURAL STEEL FRAMING

A. Framing Members, General: Comply with requirements in AISI S220 for conditions indicated on Drawings.
   1. Steel Sheet Components: Comply with AISI S220 requirements for metal unless otherwise indicated.
   2. Protective Coating: ASTM A653/A653M , G60 (Z180). Galvannealed products are unacceptable.
      a. Equivalent Corrosion-Resistant Coating: Evaluation report acceptable to authorities having jurisdiction demonstrates corrosion resistance equivalent to specified protective coating.
      b. Basis-of-Design Product: Subject to compliance with requirements, provide ClarkDietrich; DiamondPlus Coating on ProSTUD and ProTRAK 20.

B. Studs and Track: Conventional members, roll-formed into standard shapes without surface deformations to stiffen framing members.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide ClarkDietrich; ProSTUD Drywall Framing System.
   2. Minimum Base-Steel Thickness: As required by performance requirements for horizontal deflection.
   3. Flange Width: 1-1/4 inches.
   4. Web Depth: As indicated on Drawings.

C. High-Strength Steel Studs and Track: Roll-formed into proprietary shapes incorporating ribs, embossment, knurling, or dimensional changes to stiffen framing members.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide ClarkDietrich; ProSTUD Drywall Framing System.
   2. Minimum Base-Steel Thickness: As required by horizontal deflection performance requirements.
   3. Flange Width: 1-1/4 inches.
   4. Web Depth: As indicated on Drawings.

D. Steel Framing Stud and Track Wall System: Self-locking steel studs, and telescoping stud extensions and tracks.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide ClarkDietrich; TRAKLOC Drywall Framing System.
   2. Minimum Base-Steel Thickness: 0.0329 inch.
   3. Web Depth: 2-1/2 inches.

E. Slip-Type Head Joints: Where indicated on Drawings, 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 track while allowing 1-1/2-inch (38-mm) minimum vertical movement.
      a. Basis-of-Design Product: Subject to compliance with requirements, provide ClarkDietrich; Fast Top Clip (FTC3).
   2. Single Long-Leg Track: Top track with solid, 2-inch- (51-mm-) deep flanges in base-steel thickness not less than that of studs, installed with studs friction fit into track and with continuous bridging and spacer bar located within 12 inches (305 mm) of the top of studs to provide lateral bracing.
      a. Basis-of-Design Product: Subject to compliance with requirements, provide ClarkDietrich; Deep Leg Deflection Track and Spazzer 9200 Bridging and Spacer Bar.
   3. Head-of-Wall Sound Isolation Clip System: Fabricated from fire-resistant, ABS polymer; eliminates metal-to-metal contact at head-of-wall connection while accommodating vertical and lateral movement. Tested system consists of horizontal and vertical proprietary stud members.
      a. Basis-of-Design Product: Subject to compliance with requirements, provide ClarkDietrich; ProSTUD Motion Frame Connector.

F. Firestop Track: Top track manufactured to allow partition heads to expand and contract with movement of structure above while maintaining continuity of fire-resistance-rated assembly indicated on Drawings; in base-steel thickness not less than that of studs and in width to accommodate depth of studs.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide ClarkDietrich; BlazeFrame DL.

G. Hole Reinforcing Plate: Restores structural integrity to cold-formed steel framing members with field openings.
   1. Basis-of-Design: Product: Subject to compliance with requirements, provide ClarkDietrich; MEP Gusset Plate MEP3.

H. Backing Plate: Proprietary fire-retardant-treated wood blocking and bracing in width indicated.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide ClarkDietrich; Danback Fire-Retardant Treated Wood Backing Plate D16F.

I. Flat Strap: Steel sheet for blocking and bracing in length and width indicated on Drawings.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide ClarkDietrich; Flat Strap.
   2. Minimum Base-Steel Thickness: 0.0296 inch.

J. Channel Bridging and Bracing: Pre-notched steel, 7/8 by 7/8 by 50 inches (22.2 by 22.2 by 1270 mm) with 0.0329-inch- (0.84-mm-) minimum base-steel thickness.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide ClarkDietrich; Spazzer 9200 (SPZD.

K. U-Channel Bridging: Steel, 0.0538-inch- (1.37-mm-) minimum base-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide ClarkDietrich; Cold-Formed U-Channel and Channel Clip (CC33) Bridging Clip.
   2. U-Channel Web Depth: As indicated on Drawings.

L. Rigid Furring Channels:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide ClarkDietrich; Furring Channel.
   2. Minimum Base-Steel Thickness: 0.0296 inch.
   3. Web Depth: As indicated on Drawings.

M. Resilient Furring Channels: 1/2-inch- (13-mm-) deep, steel sheet members designed to reduce sound transmission.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide ClarkDietrich; RC Deluxe.
   2. Configuration: Asymmetrical.

N. Sound Isolation Clips: Use with 7/8-inch- (22-mm-), 18-mil (0.457-mm), 25-gauge, drywall furring channels for acoustical separation and fire-rated in compliance with UL 263.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide ClarkDietrich; Sound Clip (CDSC).

O. Carrying Channels: 0.053-inch (1.34-mm) base-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges.
   1. Depth: As indicated on Drawings.
   2. Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum base-steel thickness of 0.0296 inch.

P. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches (32 mm), wall attachment flange of 3/4 inch, minimum base-steel thickness of 0.0179 inch, and depth required to fit insulation thickness indicated on Drawings.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide ClarkDietrich; Z-Furring Channel.

Q. Headers and Jambs: Manufacturer's proprietary shape used to form header beams and jambs, columns or posts, of web depths indicated, unpunched, with stiffened flanges and as follows:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide ClarkDietrich; Heavy-Duty Stud (HDS) Framing System.
   2. Minimum Base-Steel Thickness: 0.0329 inch.
   3. Web Depth: 3-5/8 inches.
   4. Flange Width: 3 inches.

R. Framed Openings: Galvanized-steel, one-piece header and jamb studs in lieu of built-up members.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide ClarkDietrich; RedHeader Lite and RHLC Header Bracket..
   2. Minimum Base-Steel Thickness: 0.0329 inch.
   3. Web Depth: 2-1/2 inches.
   4. Flange Width: 2-1/2 inches.
   5. Header Support: Size and minimum base-steel thickness as required by design.

S. Partial Wall Framing Connection: 3/8-inch (9.5-mm) ASTM A36/A36M steel-plate ST50H stud connector designed to support out-of-plane loading of cantilevered partial wall systems that are unsupported at the top track.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide ClarkDietrich; Pony Wall.
   2. Minimum Base-Steel Thickness: 0.0966 inch.

2.4 SUSPENSION SYSTEMS

A. Carrying Channels (Main Runners): Cold-formed, commercial-steel sheet with a base-steel thickness of 0.0538 inch and minimum 1/2-inch- (13-mm-) wide flanges.
   1. Depth: As indicated on Drawings.

B. Furring Channels (Furring Members):
   1. Cold-Formed Channels: 0.0538-inch (1.367-mm) base-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges, 3/4 inch deep.
   2. Steel Studs and Tracks: AISI S220.
      a. Basis-of-Design Product: Subject to compliance with requirements, provide ClarkDietrich; ProSTUD Drywall Framing System.
      b. Minimum Base-Steel Thickness: 0.0329 inch.
      c. Flange Size: 1-1/4 inches.
      d. Web Depth: As indicated on Drawings.
   3. Hat-Shaped, Rigid Furring Channels: Comply with AISI S220.
      a. Minimum Base-Steel Thickness: 0.0296 inch.
      b. Depth: As indicated on Drawings.
   4. Resilient Furring Channels: 1/2-inch- (13-mm-) deep members designed to reduce sound transmission.

a. Basis-of-Design Product: Subject to compliance with requirements, provide ClarkDietrich; RC Deluxe (RCSD) Resilient Channel or comparable product by a current member of the SFIA.
b. Configuration: Asymmetrical.

2.5 GRID SUSPENSION SYSTEMS, CLG-#

A. Grid Suspension Systems for Gypsum Board Ceilings: ASTM C645, direct-hung system composed of main beams and cross-furring members that interlock.
1. Provide Basis-of-Design Products indicated on Ceiling Types Schedule or provide products by one of the following:
a. Armstrong World Industries, Inc.
b. CertainTeed; SAINT-GOBAIN.
c. Rockfon; ROCKWOOL International.
d. USG Corporation.

2.6 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.
1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper.
1. Suspended Ceiling Systems:
a. Splicing Carrying Channels (Main Runners) and Furring Members: Use double loops of minimum 0.0625-inch- (1.59-mm-) diameter wire.
b. Tying Carrying Channels (Main Runners) to Cross Furring: Use minimum 0.0625-inch- (1.59-mm-) diameter wire, or double strand of 0.0475-inch- (1.21-mm-) diameter wire.

C. Power-Actuated Anchors: Fastener systems with an evaluation report, acceptable to authorities having jurisdiction, based on ICC-ES AC70.

D. Wire Hangers: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.162 inch in diameter.

E. Flat Hangers: ASTM A653/A653M G40 (Z120) hot-dip galvanized steel sheet, in size indicated on Drawings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas, substrates, and conditions, with Installer present, 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. 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 framing members. Frame both sides of joints independently.

3.4 INSTALLATION OF NONSTRUCTURAL STEEL FRAMING

A. Install framing system components at spacings indicated on Drawings, but not greater than spacings required by referenced installation standards for assembly types.
   1. Single-Layer Application: As required by horizontal deflection performance requirements unless otherwise indicated on Drawings.
   2. Multilayer Application: As required by horizontal deflection performance requirements unless otherwise indicated on Drawings.
   3. Tile Backing Panels: As required by horizontal deflection performance requirements unless otherwise indicated on Drawings.

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. Studs for Head-of-Wall Sound Isolation Clip System: Install in accordance with manufacturer's written instructions.

E. Install track at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated on Drawings 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 on Drawings.

b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) 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 unless otherwise indicated on Drawings.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated on Drawings. 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 on Drawings and support closures to make partitions continuous from floor to underside of solid structure.
   a. Install fire-resistant partitions using manufacturer's proprietary equivalent-gauge studs in compliance with requirements of UL U419.
   b. Firestop Track: Install to maintain continuity of fire-resistance-rated assembly indicated on Drawings.
5. Hole Reinforcing Plate: Install in accordance with manufacturer's written instructions.
6. STC-Rated Partitions: Install framing to comply with STC-rated assembly indicated on Drawings.

F. Direct Furring:
1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.

G. Wall-Furring Bracket Systems: Install brackets with serrated edges facing upward spaced at minimum 48 inches (1219 mm) o.c. vertically with 6 inches (152 mm) maximum from floor and ceiling, and minimum 36 inches (914 mm) o.c. horizontally with 4 inches (102 mm) maximum from abutting construction, unless otherwise indicated on Drawings.

H. 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 (610 mm) 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 (610 mm) 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 (305 mm) from corner and cut insulation to fit.

3.5 INSTALLATION OF SUSPENSION SYSTEMS

A. Install suspension system components in accordance with 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. Suspended Assemblies: Isolate suspension assemblies 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. Hangers: 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 spaced as indicated on Drawings.
    a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
    b. 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.
        1) Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
    c. 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.
    d. 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.
    e. Do not attach hangers to steel roof deck.
    f. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
    g. Do not connect or suspend framing from ducts, pipes, or conduit.
2. Carrying Channels (Main Runners): U-channels spaced as indicated on Drawings.
3. Furring Channels (Furring Members): As indicated on Drawings .
    a. Spacing: As indicated on Drawings.
    b. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
4. Seismic Bracing: Sway-brace suspension systems with hangers used for support.

3.6 INSTALLATION OF GRID SUSPENSION SYSTEMS

A. Grid Suspension Systems: Install in accordance with manufacturer's written instructions. 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.

B. Installation Tolerances for Grid Suspension Systems: 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.

3.7 FIELD QUALITY CONTROL

A. Installation Tolerances for Nonstructural Steel Framing:
1. Framing Members: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.
2. Suspended Assemblies: 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 09 2216

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SECTION 09 2900 - GYPSUM BOARD

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Interior gypsum board.
2. Tile backing panels.
3. Trim and shower niche.

1.2 ACTION SUBMITTALS

A. Product Data: For the specified products.

B. Shop Drawings: Show locations and installation of control and expansion joints, including plans, elevations, sections, details of components, and attachments to other work.

C. Samples: For the following products:
1. Trim Accessories: Full-size Sample in 12 inch long length for each trim accessory indicated.

D. Samples for Initial Selection: For each type of trim accessory indicated.

E. Samples for Verification: For the following products:
1. Trim Accessories: Full-size Sample in 12 inch long length for each trim accessory indicated.

1.3 MOCKUPS

A. 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.
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.

1.4 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 supported on risers on a flat platform to prevent sagging.

1.5 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 SOURCE LIMITATIONS

A. Obtain each type of gypsum panel and joint finishing material from single source with resources to provide products of consistent quality in appearance and physical properties.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated in accordance with 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 in accordance with ASTM E90 and classified in accordance with ASTM E413 by an independent testing agency.

2.3 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. Acceptable Manufacturers:
1. American Gypsum.
2. Armstrong Ceiling & Wall Solutions.
3. Certainteed; SAINT-GOBAIN.
4. Continental Building Products Inc.
5. Georgia-Pacific Gypsum LLC.
6. Gold Bond Building Products, LLC provided by National Gypsum Company.
7. PABCO Gypsum.
8. USG Corporation.

2.4 INTERIOR GYPSUM BOARD

A. Gypsum Board, Type X: ASTM C1396/C1396M.
1. Thickness: 5/8 inch.

2. Long Edges: Tapered.

B. Gypsum Ceiling Board: ASTM C1396/C1396M.
1. Thickness: 1/2 inch.
2. Long Edges: Tapered.

C. Impact-Resistant Gypsum Board: ASTM C1396/C1396M gypsum board, tested in accordance with ASTM C1629/C1629M.
1. Core: 5/8 inch , Type X.
2. Surface Abrasion: ASTM C1629/C1629M, meets or exceeds Level 3 requirements.
3. Indentation: ASTM C1629/C1629M, meets or exceeds Level 1 requirements.
4. Soft-Body Impact: ASTM C1629/C1629M, meets or exceeds Level 2 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.

2.5 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. Core: 5/8 inch , Type X.
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.

2.6 TILE BACKING PANELS

A. Glass-Mat, Water-Resistant Backing Board: ASTM C1178/C1178M, with manufacturer's standard edges.
1. Core: 5/8 inch , Type X.
2. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.

B. Cementitious Backer Units: ANSI A118.9 and ASTM C1288 or ASTM C1325, with manufacturer's standard edges.
1. Thickness: 5/8 inch.
2. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.

C. Water-Resistant Gypsum Backing Board: ASTM C1396/C1396M, with manufacturer's standard edges.
1. Core: 5/8 inch , Type X.

2.7 TRIM ACCESSORIES

A. Interior Trim: ASTM C1047.
1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet.
2. Shapes:
   a. Cornerbead.
   b. LC-Bead: J-shaped; exposed long flange receives joint compound.
   c. L-Bead: L-shaped; exposed long flange receives joint compound.

d. U-Bead: J-shaped; exposed short flange does not receive joint compound.
e. Expansion (control) joint.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
1. Basis-of-Design Product: Provide trims as indicated on Material Finish Legend or provide comparable product by one of the following:
a. Flannery, Inc.
b. Fry Reglet Corporation.
c. Gordon Inc.
d. Pittcon Industries.
e. Tamlyn.
2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B221 (ASTM B221M), Alloy 6063-T5.
3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

C. Shower Niche, EQ54:
1. Basis-of-Design Product: Provide product indicated on Equipment Schedule or provide comparable product by another manufacturer.
2. Installation depth: 4-inches.
3. Material: Stainless steel.
4. Finish: Powder-coat.

2.8 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C475/C475M.

B. Joint Tape:
1. Interior Gypsum Board: Paper.
2. Tile Backing Panels: As recommended by panel manufacturer.

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 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 setting-type, sandable topping compound.
5. Skim Coat: For final coat of Level 5 finish, use high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish.

D. Joint Compound for Tile Backing Panels:
1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.
2. Cementitious Backer Units: As recommended by backer unit manufacturer.
3. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.

2.9 AUXILIARY MATERIALS

A. Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

B. 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 0.122 inch thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

C. 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.
2. Products:
a. Thermafiber, Inc; SAFB FF.
b. ROCKWOOL; AFB evo™.
c. Johns Manville; MinWool Sound Attenuation Fire Batts.

D. Acoustical Sealant: As specified in Section 07 9200 - Joint Sealants.

E. Thermal Insulation: As specified in Section 07 2100 - 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. Type X: Vertical surfaces unless otherwise indicated.
   2. Ceiling Type: Ceiling surfaces.
   3. Impact-Resistant Type: As indicated on Drawings.
   4. Glass-Mat Interior Type: At the following locations:
      a. As indicated on Drawings
      b. At equipment rooms, custodial closets, restrooms surfaces not receiving tile, kitchens, and wet areas. Provide at areas within 8 feet of water source.

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.

3.4 INSTALLATION OF TILE BACKING PANELS

A. Refer to Section 09 3000 - Tiling for tiling requirements and tile installation schedules.

B. Glass-Mat, Water-Resistant Backing Panels: Comply with manufacturer's written installation instructions and install at showers, tubs, "wet" walls to receive tiles or not receiving tiles, and where indicated on Drawings. Install with 1/4 inch gap where panels abut other construction or penetrations.

C. Cementitious Backer Units: ANSI A108.11, at showers, tubs, and where indicated on Drawings and shower floors and locations indicated to receive heavy tiles.

D. Water-Resistant Backing Board: Install where indicated with 1/4 inch gap where panels abut other construction or penetrations at kitchen backsplash and dry tiled locations, and including above showers.

E. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 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 in accordance with 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 on Drawings.
4. U-Bead: Use at exposed panel edges.

D. Aluminum Trim: Install in locations indicated on Drawings.

E. Shower Niche: Install in accordance with manfuacturer's installation instructions and in coordination with shower waterproofing membrane.

3.6 FINISHING OF 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 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 in accordance with ASTM C840:
   1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
   2. Level 2: Panels that are substrate for tile.
   3. Level 3: Surfaces at back-of-house locations, including electrical, mechanical, and storage rooms
   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 09 9123 - Interior Painting.
   5. Level 5: Where indicated on Drawings and as follows:
      a. At surfaces requiring Gloss or High Gloss finish.
      b. At locations with Wallcoverings, refer to Section 09 7200 - Wallcovering.
      c. Primer and its application to surfaces are specified in Section 09 9123 - Interior Painting.

E. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.

F. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.7 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 09 2900

SECTION 09 3000 - TILING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Tile for floor applications.

B. Tile for wall applications.

C. Stone thresholds.

D. Non-ceramic trim.

1.2 DEFINITIONS

A. General: Definitions in ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.

B. Face Size: Actual tile size, excluding spacer lugs.

C. Large Format Tile: Tile with at least one edge 15 inches (381 mm) or longer.

D. Module Size: Actual tile size plus joint width indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by affected installers.
   1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.4 ACTION SUBMITTALS

A. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

B. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, ceramic accessories, and setting details.

C. Samples: Mount tile and apply grout on two plywood panels, minimum 18 by 18 inches in size illustrating pattern, color variations, and grout joint size variations.

1.5 INFORMATIONAL SUBMITTALS

A. Certificate: Certify products of this section meet or exceed specified requirements.

B. Master Grade Certificate: Submit for each type of tile, signed by the tile manufacturer and tile installer.

C. Installer's qualification statement.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.

1.7 MAINTENANCE MATERIALS SUBMITTAL

A. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. Extra Tile: 10 sq ft of each size, color, and surface finish combination.
2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.6

1.8 QUALITY ASSURANCE

A. Installer Qualifications:
1. Company specializing in performing tile installation, with minimum of five years of documented experience.
2. Installer Certification:
a. Ceramic Tile Education Foundation (CTEF): Certified Tile Installer (CTI).
b. Advanced Certifications for Tile Installers (ACT): Certification in installation of membranes, mortar bed (mud) floors, mortar (mud) walls, shower receptors, large format tile, gauged porcelain tile/panels/slabs, and grouts.

1.9 MOCK-UPS

A. Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

B. Build mockup of each type of wall and floor tile installation.

C. Locate where directed by Architect.

D. Mock-up may remain as part of work.

1.10 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.

E. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.11 FIELD CONDITIONS

A. Do not install solvent-based products in an unventilated environment.

B. Maintain ambient and substrate temperature above 50 degrees F and below 100 degrees F during installation and curing of setting materials.

1.12 WARRANTY

A. System Warranty: Manufacturer's non-prorated comprehensive warranty that agrees to repair and replace defective installation areas, material, and labor that fail under normal usage within specified warranty period.
   1. Warranty Period: Lifetime from date of Product Purchase.

PART 2 PRODUCTS

2.1 SOURCE LIMITATIONS

A. Tiling System: Obtain system products 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 underlayment from manufacturer of setting and grouting materials.
   3. Obtain waterproof membrane, crack isolation, and other required membranes from manufacturer of setting and grouting materials.
   4. Obtain joint sealants from manufacturer of setting and grouting materials.

B. Accessory Products: Obtain each of the following products specified in this Section from a single manufacturer:
   1. Stone thresholds.

2.2 MANUFACTURERS

A. Provide Basis-of-Design Products listed on Interior Material Legend and specified within this specification or comparable products by the following:
   1. CT-#, Tile:
      a. Architessa.
      b. Dal-Tile Corporation.
      c. Mosaic Tile.
      d. Conestogo.
      e. Studio Collection.
      f. Umore.
   2. Setting Materials:
      a. ARDEX Engineered Cements.
      b. Custom Building Products.
      c. TEC Specialty Products LLC.
      d. LATICRETE International, Inc.
      e. Mapei Corporation.

3. Grout:
    a. ARDEX Engineered Cements.
    b. Custom Building Products.
    c. TEC Specialty Products LLC.
    d. LATICRETE International, Inc.
    e. Mapei Corporation.

2.3 PERFORMANCE REQUIREMENTS

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
1. Provide tile complying with Standard Grade requirements, unless otherwise indicated.

B. Floor Tile: Provide tile for flooring applications with minimum wet Dynamic Coefficient of Friction (DCOF) of 0.42 when tested in accordance with ANSI A326.3.

C. Moisture Absorption:
1. Ceramic Mosaic Tile and Porcelain Tile: 0 to 0.5 percent as tested in accordance with ASTM C373.
2. Glazed Wall Tile: 7.0 to 20.0 percent as tested in accordance with ASTM C373.
3. Pressed Floor Tile: Moisture Absorption: 0.5 to 3.0 percent as tested in accordance with ASTM C373.

D. 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.

E. 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.

F. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.
1. Where tile is indicated for installation 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.

G. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.4 TRIM AND ACCESSORIES

A. Non-Ceramic Trim: Brushed stainless steel, style and dimensions to suit application, set with tile mortar or adhesive.
1. Applications:
    a. Open edges of wall and floor tile.
    b. Inside and outside wall corners.
    c. Transition between floor finishes of different heights.
    d. Thresholds at door openings.
    e. Floor and wall expansion and control joints.

f. Floor-to-wall joints, including coved shaped profile.
g. Borders and other trim as indicated on drawings.

2. Basis-of-Design Manufacturer: Schluter Systems or comparable products by one of the following manufacturers:
   a. Blanke Corporation.
   b. Futura Transitions.
   c. LATICRETE International, Inc.
   d. Profilitec.

2.5 THRESHOLDS

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
   1. 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.

B. Thresholds: 2 inches wide by full width of wall or frame opening; beveled edge on one edge, refer to Threshold details; without holes, cracks, or open seams.
   1. Material: Marble, honed finish.
   2. Color and Pattern: Uniform, fine- to medium-grained white stone with gray veining.
   3. Applications:
      a. At doorways where tile terminates.
      b. At open edges of floor tile where adjacent finish is a different height.

2.6 SETTING MATERIALS

A. Provide setting and grout materials from same manufacturer.

B. Latex-Portland Cement Mortar Bond Coat: ANSI A118.4.
   1. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to other requirements in ANSI A118.4.
   2. Applications: Large Format Tile at floors.
      a. Basis-of-Design Products:
         1) Custom Building Products; ProLite Premium Rapid Setting Large Format Tile Mortar, with Multi-Surface Bonding Primer.

C. Improved Latex-Portland Cement Mortar Bond Coat (thin-set): ANSI A118.15.
   1. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to other requirements in ANSI A118.15.
   2. Applications: Use at large format tile floors, exterior or interior locations.
      a. Products:
         1) Mapei Corporation; Kerabond T/Keralastic System.
   3. Application: Use for wall and floor applications of large and heavy tile.
      a. Product:
         1) Mapei Corporation; Ultralite S1 Quick.
   4. Application: Use as typical setting bed for floor and wall installation, unless otherwise indicated.
      a. Product:

1) Mapei Corporation; Ultralite S2.

D. Standard Dry-Set Mortar (Thinset): ANSI A118.1.
1. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to other requirements in ANSI A118.1.
2. Application: Standard tiles and mosaic tiles in dry locations.
a. Product: TEC Full Set Plus Unmodifed Thin-Set Mortar.

E. Mortar Bed Materials: Pre-packaged mix of Portland cement, sand, and water.
1. Products:
a. Mapei Corporation; Modified Mortar Bed.

2.7 GROUTS

A. High Performance Polymer Modified Grout: ANSI A118.7 polymer modified cement grout.
1. Applications: Use where indicated on drawings and where no other type of grout is indicated.
2. Use sanded grout for joints 1/8 inch wide and larger; use unsanded grout for joints less than 1/8 inch wide.
3. Color: As selected by Architect from manufacturer's full line.
4. Products:
a. Mapei Corporation; Ultracolor Plus FA.

B. Epoxy Grout: ANSI A118.3 chemical resistant and water-cleanable epoxy grout.
1. Applications: Refer to Installation Schedule for locations.
2. Color: As selected by Architect from manufacturer's full line.
3. Products:
a. Mapei Corporation; Kerapoxy CQ or Kerapoxy. Select to suit tile joints.

2.8 MAINTENANCE MATERIALS

A. Tile Sealant: See Section 07 9200.

B. Grout Sealer: Liquid-applied, moisture and stain protection for existing or new Portland cement grout.
1. Composition: Water-based colorless silicone.
2. Product: compatible with grout installed.

2.9 ACCESSORY MATERIALS

A. Concrete Floor Slab Crack Isolation Membrane: Material complying with ANSI A118.12; not intended as waterproofing.
1. Crack Resistance: No failure at 1/8 inch gap, minimum.
2. Fluid or Trowel Applied Type:
a. Material: Synthetic rubber or Acrylic.
b. Thickness: 20 mils, maximum.
c. Products:
1) Mapei Corporation; Mapelastic CI.
3. Bonded Sheet Membrane Type:

a. Material: Polyethylene sheet membrane with polyester fleece laminated to underside, 20 mils thick.
b. Products:
1) Schluter-Systems; DITRA.

B. Waterproofing Membrane at Floors: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.
1. Crack Resistance: No failure at 1/16-inch gap, minimum; comply with ANSI A118.12.
2. Bonded Sheet Membrane Type: Contractor to select one of the following:
a. Material: Polyethylene sheet membrane with nonwoven fabric laminated to both sides, 20 to 30 mils thick, nominal.
b. Material: Polyethylene vinyl acetate (PEVA) core with nonwoven polypropylene laminated to both sides, 8 mils thick.
c. Products:
1) LATICRETE International, Inc; LATICRETE HYDRO BAN Sheet Membrane.
2) Mapei Corporation; Mapeguard WP 200 Membrane.
3) Schluter-Systems; KERDI.

C. Waterproofing Membrane at Showers and Tiled Tubs: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.
1. Mortar Bonded Sheet Type:
a. Products:
1) LATICRETE International, Inc; LATICRETE HYDRO BAN Sheet Membrane.

D. Reinforcing Mesh: 2 by 2 inch size weave of 16/16 wire size; welded fabric, galvanized.

E. Tile Underlayment: Specifically designed for bonding to thin-set setting mortar; not primarily waterproofing material and having the following characteristics:
1. Crack Resistance: No failure at 1/16-inch gap, minimum; comply with ANSI A118.12.
2. Water Resistance: Comply with ANSI A118.10, bonded waterproofing.
3. Uncoupling Function: Allow for separation between membrane and mortar adhering tile to membrane when subjected to excessive substrate movement.
4. Suitable for installation over green concrete.

F. Mesh Tape: 2 inch wide self-adhesive fiberglass mesh tape.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive tile.

B. Verify wall surfaces are smooth and flat within tolerances specified for that type of work, are dust-free, and are ready to receive tile.

C. Verify that subfloor surfaces are dust free and free of substances that could impair bonding of setting materials to subfloor surfaces.

D. Cementitious Subfloor Surfaces: Verify that substrates are ready for tiling installation by testing for moisture and alkalinity (pH).
   1. Test in accordance with Section 09 0561.
   2. Obtain instructions if test results are not within limits recommended by tiling material manufacturer and setting material manufacturer.

E. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

A. Vacuum clean surfaces and damp clean.

B. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with adhesives with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

C. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.

D. Where indicated, prepare substrates to receive waterproof membrane by applying a reinforced mortar bed that complies with ANSI A108.1 and is sloped 1/4 inch per foot (1:50) toward drains.

E. 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.

F. Substrate Flatness:
   1. For tile shorter than 15 inches (381 mm), confirm that structure or substrate is limited to variation of 1/4 inch in 10 ft. (6.4 mm in 3 m) from the required plane, and no more than 1/16 inch in 12 inches (1.5 mm in 300 mm) when measured from tile surface high points.

G. For large format tile, tile with at least one edge 15 inches (381 mm) or longer, confirm that structure or substrate is limited to 1/8 inch in 10 ft. (3 mm in 3 m) from the required plane, and no more than 1/16 inch in 24 inches (1.5 mm in 609 mm) when measured from tile surface high points.

3.3 INSTALLATION - GENERAL

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.
   1. Allow waterproof membrane to cure and verify by testing that it is watertight before installing tile or setting materials over it.

B. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate.
   1. Allow crack isolation membrane to cure before installing tile or setting materials over it.

C. Mix mortars and grouts and mortar and grout manufacturers' written instructions.
   1. Add materials, water, and additives in accurate proportions.

2. 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.

D. Install tile and thresholds and grout in accordance with applicable requirements of ANSI A108/A118/A136, manufacturer's instructions, and TCNA (HB) installation methods.
1. For the following installations, follow procedures in ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:
   a. Tile floors in wet areas.
   b. Tile floors consisting of tiles 8 by 8 inches (200 by 200 mm) or larger.
   c. Tile floors consisting of rib-backed tiles.
2. 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.
3. 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.
4. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
5. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.
6. 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 use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
   a. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets, so joints between sheets are not apparent in finished Work.
   b. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
   c. 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.
7. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

E. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly.

F. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.

G. Movement Joints: Provide movement joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated on Drawings. Form joints during installation of setting materials, mortar beds, and tile. Keep joints free of dirt, debris, and setting materials prior to filling with sealants. Do not saw-cut joints after installing tiles.
1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.

H. Form internal angles square and external angles square.

I. Install non-ceramic trim in accordance with manufacturer's instructions.

J. Thresholds: Install stone and solid surface thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in improved modified dry-set mortar (thinset).

2. Do not extend cleavage membrane, waterproof membrane, or crack isolation membrane under thresholds set in modified dry-set, improved modified dry-set, or standard dry-set mortar. Fill joints between such thresholds and adjoining tile set on cleavage membrane, waterproof membrane, or crack isolation membrane with elastomeric sealant.

K. Metal Flooring Transitions: Install 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.

L. Metal Wall Trim: Install at locations indicated on Drawings.

M. Sound tile after setting. Replace hollow sounding units.

N. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

O. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.
1. See Section 07 9200 for installation of sealant.

3.4 TILE BACKING BOARD

A. Refer to Section 09 29 00 - Gypsum Board for tile backer types and installation requirements.

3.5 INSTALLATION SCHEDULE, FLOORS

A. Concrete Subfloors:
1. TCNA F114: ANSI A108.1A Cement mortar bed (thickset) with cleavage membrane and reinforcing.
   a. Application: Public Toilets.
   b. Tiles: for tiles over 15-inches on long edge.
   c. Bond Coat for Cured-Bed Method: Latex-Portland Cement Mortar Bond Coat.
   d. Grout: Epoxy grout.
   e. Joint Width: as recommended by tile manufacturer.

B. Cleavage Membrane: Lap and seal watertight, edges and ends.

C. Waterproofing Membrane: Install as recommended by manufacturer and as specified in the section in which the product is specified.

D. Mortar Bed Thickness: 5/8 inchor as indicated as minimum thickness in TCNA manual.

E. Install tile-to-tile floor movement joints in accordance with TCNA (HB) Method EJ171F.

3.6 INSTALLATION SCHEDULE, WALLS

A. Wood or Metal Studs or Furring:
1. TCNA W243: Thin-set mortar on gypsum board.
   a. Application: at Dry Areas only, including backsplashes in kitchens and accent walls in restrooms without plumbing.
   b. Thinset Mortar: Standard dry-set mortar.
   c. Grout: Water-cleanable epoxy grout.
   d. Waterproof Membrane: As recommended by setting material manufacturer.

e. Joint Width: as recommended by tile manufacturer.
f. Movement Joints: Types located on Drawings.

2. TCNA W245: Thinset mortar on glass-mat, water-resistant gypsum backer board over waterproof membrane.
   a. Application: Non-shower wet areas at bathrooms.
   b. Thinset Mortar: Improved modified dry-set mortar.
   c. Grout: Water-cleanable epoxy grout.
   d. Waterproof Membrane: As recommended by setting material manufacturer.
   e. Joint Width: as recommended by tile manufacturer.
   f. Movement Joints: Types located on Drawings.

3.7 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 in accordance with tile and grout manufacturer's written instructions. 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.

3.8 PROTECTION

A. Do not permit traffic over finished floor surface for 7 days after grout installation.

B. 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.

C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

END OF SECTION 09 3000

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SECTION 09 5100 - ACOUSTICAL CEILINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

C. Supplementary insulation above ceiling.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

B. Do not install acoustical units until after interior wet work is dry.

1.3 ACTION SUBMITTALS

A. Product Data: Provide data on suspension system components and acoustical units.

B. Shop Drawings: Indicate grid layout and related dimensioning, junctions with other ceiling finishes, and mechanical and electrical items installed in the ceiling.

C. Delegated Design Submittals: For seismic restraints for ceiling systems.
1. Include design calculations for seismic restraints including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

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 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.

B. Qualification Data: For testing agency.

C. Product Test Reports: For each acoustical panel ceiling, for tests performed by a qualified testing agency.

D. Evaluation Reports: For each acoustical panel ceiling suspension system from ICC-ES.

E. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. Extra Acoustical Units: Quantity equal to 5 percent of total installed.

1.7 QUALITY ASSURANCE

A. Designer Qualifications for Seismic Design: Perform under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed at the State in which the Project is located.

1.8 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide Basis-of-Design Products indicated on Ceiling Types Schedule or provide comparable product by one of the following acceptable manufacturers.

B. Acoustic Tiles/Panels:
1. Armstrong World Industries, Inc.
2. Certainteed Architectural.
3. Rockfon.
4. USG Corporation.

C. Suspension Systems:
1. Same as for acoustical units.

2.2 PERFORMANCE REQUIREMENTS

A. Surface Burning Characteristics: Class A in accordance with ASTM E84.

B. Seismic Performance: Ceiling systems designed to withstand the effects of earthquake motions determined according to ASCE 7 for Seismic Design Category C and complying with the following:
1. Local authorities having jurisdiction.

2.3 ACOUSTICAL UNITS

A. Acoustical Panels CLG-1: Mineral fiber with membrane-faced overlay, with the following characteristics:
1. Classification: ASTM E1264 Type A.
a. Form: A2.2, wet formed.
b. Pattern: G - smooth.
2. Size: 24 by 24 inches.
3. Thickness: 1 inch.
4. Light Reflectance: 0.90 percent, in accordance with ASTM E1264.
5. Noise Reduction Coefficient (NRC): 0.90, in accordance with ASTM E1264.
6. Ceiling Attenuation Class (CAC): 30, in accordance with ASTM E1264.
7. Panel Edge: Square.
8. Color: White.
9. Suspension System: Exposed grid.

B. Acoustical Panels, CLG-3: Mineral fiber with scrubbable finish, with the following characteristics:
1. Classification: ASTM E1264 Type A.
a. Form: A3.2, wet formed.
b. Pattern: G - smooth.
2. Size: 24 by 24 inches.
3. Thickness: 5/8 inch.
4. Light Reflectance: 0.89 percent, in accordance with ASTM E1264.
5. Ceiling Attenuation Class (CAC): 33, in accordance with ASTM E1264.
6. Panel Edge: Square.
7. Color: White.
8. Suspension System: Exposed grid.

2.4 SUSPENSION SYSTEMS

A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold-down clips, stabilizer bars, clips, and splices as required.
1. Materials:
a. Steel Grid: ASTM A653/A653M, G60 coating, unless otherwise indicated.

B. Exposed Suspension System: Hot-dip galvanized steel grid with aluminum cap.
1. Applications: Seismic.
2. Structural Classification: Heavy-duty, when tested in accordance with ASTM C635/C635M.
3. Profile: Tee; 15/16 inch face width.
4. Finish: Baked enamel.

5. Color: White.

2.5 ACCESSORIES

A. Plenum Barrier Board Insulation: at CLG-1A and CLG-2A.
   1. Basis-of-Design Product: provide ROCKFON; Plenum Barrier Board or comparable product submitted to Architect for review.
   2. Physical and Performance Characteristics:
      a. Size: 24-inches by 48-inches.
      b. Thickness: 1-1/2-inches.
      c. Warning Label: Printed in black ink on the facing shall be warning labels 4” high by 4” wide spaced 12” inches in both directions with the words “Noise Barrier. Do not remove barrier or damage foil facing.” Warning labels shall be oriented in all four directions in ninety degree increments so legible from any edge of the board.
      d. Density: 8.0 lbs/cu ft (actual density).
      e. Fire Class: Class A.
      f. Fire Performance: UL 723 (ASTM E84) Flame Spread / Smoke Developed: no greater than 25/50.

B. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

C. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.

D. Hold-Down Clips: Manufacturer's standard clips to suit application.

E. Seismic Clips: Manufacturer's standard clips for seismic conditions and to suit application.

F. Perimeter Moldings: Same metal and finish as grid.
   1. Size: As required for installation conditions and specified Seismic Design Category.
   2. Angle Molding: L-shaped, for mounting at same elevation as face of grid.
   3. Channel Molding: U-shaped, for hold-down type installations.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.2 PREPARATION

A. Install after major above-ceiling work is complete.

B. Coordinate the location of hangers with other work.

C. Provide hanger clips during steel deck erection. Provide additional hangers and inserts as required.

3.3 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions, as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

C. Locate system on room axis according to reflected plan.

D. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
1. Use longest practical lengths.

E. Seismic Suspension System, Seismic Design Category C: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Maintain a 3/8 inch clearance between grid ends and wall.

F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

H. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

I. Do not eccentrically load system or induce rotation of runners.

3.4 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

E. Cutting Acoustical Units:
1. Make field cut edges of same profile as factory edges.

F. Where round obstructions occur, provide preformed closures to match perimeter molding.

G. Install hold-down clips on panels within 20 ft of an exterior door.

H. Install plenum barrier board insulation to form contiguous sound barrier above demising walls according to manufacturer's instructions.
1. Install at locations indicated as CLG-1A and CLG-2A.

3.5 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.6 FIELD QUALITY CONTROL

A. Site Tests and Inspections: Inspect around and between installed plenum barrier boards and around penetrating elements and fill openings with non-hardening acoustic sealant.

B. Special Inspections: Engage a qualified special inspector to perform the following special inspections:
1. Periodic inspection during the installation of suspended ceiling grids in accordance with ASCE/SEI 7.

C. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
1. 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.
2. Within each test area, testing agency will select one of every 10 power-actuated fasteners and postinstalled anchors used to attach hangers to concrete and will test them for 200 lbf (890 N) of tension; it will also select one of every two postinstalled anchors used to attach bracing wires to concrete and will test them for 440 bf (1957 N) of tension.
3. 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. See Section 01 4000 "Quality Requirements" for retesting and reinspecting requirements and Section 01 7300 "Execution" for requirements for correcting the Work.

E. Acoustical panel ceiling hangers, anchors, and fasteners will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports.

3.7 CLEANING

A. Clean surfaces.

B. Replace damaged or abraded components.

END OF SECTION 09 5100

SECTION 09 6513 - RESILIENT BASE AND ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Resilient stair coverings.
   1. Stair Nosings.

B. Resilient base.
   1. Standard Resilient Base.

C. Installation Materials.

1.2 ACTION SUBMITTALS

A. Product Data: Provide data on specified products and installation materials, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

B. Product Schedule:
   1. Resilient Base Schedule shall indicate the following information:
      a. Base Designation as indicated within the Contract Documents.
      b. Installation Area/Room Number as indicated within the Contract Documents.
      c. Base Color as selected by Architect.
   2. Resilient Stair Nosings Schedule shall indicate the following information:
      a. Nosing Designation as indicated within the Contract Documents.
      b. Installation Room Number as indicated within the Contract Documents.

C. Selection Samples: Submit manufacturer's complete set of color samples and texture/pattern samples for Architect's initial selection.

D. Verification Samples: Submit two samples in size illustrating color and pattern for each resilient flooring product specified.
   1. Resilient base and nosing: 12 inches each.

1.3 INFORMATIONAL SUBMITTALS

A. Installer's Qualification Statement.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 6000 - Product Requirements, for additional provisions.
2. Base Material: Provide for the following for each type, color and texture/pattern.
a. Rolled Materials: Provide one (1) full roll.
b. Adhesive: 5 full, unopened tubes or 2 full unopened bucket(s).
3. Nosings: Provide the following for each type, color, and texture/pattern.
a. Nosings: Provide 10 full length pieces each.
b. Adhesive: 5 full, unopened tubes or 2 full unopened bucket(s).

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in installing specified products with minimum three years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials as required and recommended in writing by manufacturer but not in any way less then the following minimum requirements:
1. Store all materials off of the floor in an acclimatized, weather-tight space.
2. Maintain temperature in storage area between 55 degrees F and 90 degrees F.
3. Protect roll materials from damage by storing on end.
4. Do not double stack pallets.

1.8 FIELD CONDITIONS

A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions between 55 degrees F and 90 degrees F or as required to maintain manufacturer's warranty if more stringent.

PART 2 PRODUCTS

2.1 RESILIENT STAIR COVERING

A. General
1. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.

B. Stair Nosings: ASTM F2169; Type TV, vinyl, thermoplastic matching other resilient stair accessories.
1. Stair Nosings - Type RF-2
a. Basis of Design Product: As indicated on Material Finish Key or provide one of the following:
1) Roppe Corporation; Nosings.
2) Flexco Corporation; Stair Nosings.

b. Size: Lengths to fit each stair tread in a single piece. Where stair tread exceeds the maximum length manufactured, provide minimum number of equal length peices.
c. Nosing Tread Transition: Nosing shall have recess to receive tread finish material.
d. Nominal Thickness: Manufacturer's standard thickness as required to accommodate tread and riser finish material.
e. Color: As indicated on drawings.

2.2 RESILIENT BASE

A. General
1. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.

B. Standard Resilient Base
1. Thermoset-Rubber Base; Type TP, rubber, thermoplastic; ASTM F1861
a. Resilient Base - Type B-1
1) Basis of Design Product: As indicated on Material Finish Key or provide one of the following:
a) Roppe Corporation; Pinnacle.
b) Flexco Corporation; Wallflowers.
2) Style: ; Style B, Cove
3) Height: 4 inches.
4) Thickness: 0.125 inch.
5) Finish: Matte.
6) Length: Roll.
7) Color: To be selected by Architect from manufacturer's full range.
8) Corners:
a) Field Formed:
(1) Inside corners.
(2) Outside corners.

2.3 INSTALLATION MATERIALS

A. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

B. Stair Tread Nose Filler: Two part epoxy compound recommended by resilient stair tread/nosing manufacturer to fill nosing substrates that do not conform to tread contours.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to product manufacturer, free of cracks that might telegraph through product, clean, dust free, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of product to substrate.

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 manufacturers written instructions and recommendations to ensure adhesion of resilient products.

B. Clean substrate immediately prior to installation.

C. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.

D. Fill minor low spots, cracks, joints, holes, and other defects with trowelable leveling and patching compound; remove subfloor ridges and bumps to produce a uniform and smooth substrate.
1. Prohibit installation of resilient products and traffic until filler is fully cured.

3.3 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of substrate conditions.

B. Install in accordance with manufacturer's written instructions.

C. Adhesive-Applied Installations: Spread only enough adhesive to permit installation of materials before initial set.

3.4 INSTALLATION - RESILIENT BASE

A. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in locations, rooms, and areas where base is required or unless otherwise noted.

B. Install resilient base in lengths as long as practical without gaps or seams and with tops of adjacent pieces aligned. Fit joints tightly and make vertical.

C. Install base on solid backing. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

D. Do not stretch resilient base during installation.

E. On masonry and other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

F. Field Formed Corners:
1. Outside Corners, Standard Resilient Base: Use straight pieces of maximum lengths possible and form with returns not less than height of base in length.
    a. Form with out producing discoloration (whitening) at bends.
2. Inside Corner: Use straight pieces of maximum lengths possible and form with returns not less than height of of base in length. Miter or cope corners; minimize open joints.

G. Scribe and fit to door frames and other interruptions.

3.5 INSTALLATION - STAIR COVERINGS

A. Install stair noses in one piece for full length/width of tread/nosing.

B. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread/nosing contours.

C. Adhere over entire surface. Fit accurately and securely.

3.6 CLEANING

A. Remove excess adhesive from adjacent surfaces and resilient products without damage.

B. Clean in accordance with manufacturer's written instructions.

3.7 PROTECTION

A. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

B. Prohibit traffic on resilient products for 48 hours after installation.

END OF SECTION 09 6513

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SECTION 09 6536 - STATIC-CONTROL RESILIENT FLOORING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Static-control, vinyl composition floor tile.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
1. Review methods and procedures related to static-control resilient flooring including, but not limited to, the following:
a. Examination and preparation of substrates to receive static-control resilient flooring.
b. Installation techniques required for specified products.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For each type of static-control resilient flooring. Include floor-covering layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
1. Show details of special patterns.
2. Show locations of inscribed maintenance floor tiles in conductive, solid vinyl floor tile installation areas.
3. Show grounding locations of grounding strips and connections.

C. Samples: For each type of static-control resilient flooring and in each color, pattern, and texture required, in manufacturer's standard size, but not less than 6 by 9 inches (150 by 230 mm).

D. Samples for Initial Selection: For each exposed static-control resilient flooring product, in manufacturer's standard size.

E. Product Schedule: For static-control resilient flooring. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For static-control resilient flooring, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of static-control resilient flooring 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. 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: A qualified installer who employs workers for this Project who are competent in installation techniques required by manufacturer for specified static-control resilient flooring.
   1. Engage an installer who employs workers for this Project who are trained or certified by manufacturer for installation techniques required for specified products.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store static-control resilient flooring and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended in writing by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C).
   1. Floor Tile: Store on flat surfaces.
   2. Sheet Floor Covering: Store rolls upright.

1.9 PROJECT CONDITIONS

A. Maintain ambient temperatures in spaces to receive static-control resilient flooring within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 85 deg F (29 deg C), during the following time periods:
   1. Period recommended in writing by manufacturer before installation.
   2. During installation.
   3. Period recommended in writing by manufacturer after installation.

B. Until Substantial Completion, maintain ambient temperatures in installation areas within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

C. Close spaces to traffic during static-control resilient flooring installation.

D. Close spaces to traffic for period recommended in writing by manufacturer after static-control resilient flooring installation.

E. Install static-control resilient flooring after other finishing operations, including painting, have been completed.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Flooring 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." Formaldehyde emissions shall not exceed 16.5 mcg/cu. m or 13.5 ppb, whichever is less.

2.2 STATIC-CONTROL, VINYL COMPOSITION FLOOR TILE SDT-1

A. Basis of Design Product: Subject to compliance with requirements, provide Armstrong World Industries, Inc.; Excelon SDT or comparable product by another manufacturer.

B. Source Limitations: Obtain floor tile from single source from single manufacturer.

C. Static-Control Properties: As determined by testing identical products in accordance with test method indicated by an independent testing and inspecting agency.
   1. Electrical Resistance:
      a. Material: Point-to-point and point-to-ground resistances between 1,000,000 ohms and 1,000,000,000 ohms when tested in accordance with ASTM F150 ESD STM7.1.
      b. Material in Combination with a Person: Average resistance of 448,000,000 ohms when tested in accordance with ESD STM97.1.
   2. Static Generation: When tested in accordance with ESD STM97.2, an average of less than 30 V when tested at 12 percent relative humidity with static-control footwear.
   3. Static Decay: 1000 to 100 V in maximum of 0.2 seconds at 12 percent relative humidity when tested in accordance with manufacturer's standard test protocol using an operator wearing static-control footwear and a static decay meter.

D. Critical Radiant Flux: 0.45 W/sq. cm or greater in accordance with ASTM E648 or NFPA 253.

E. Construction: ASTM F1066 Class 2, vinyl composition floor tile, through pattern.

F. Thickness: 1/8 inch.

G. Size: 12 by 12 inches (305 by 305 mm).

H. Colors and Patterns: As selected by Architect from manufacturer's full range.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified portland cement or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Static-Control Adhesive: Provided or approved by manufacturer; type that maintains electrical continuity of floor-covering system to ground connection.

C. Grounding Strips: Provided or approved by manufacturer; type and size that maintains electrical continuity of floor-covering system to ground connection.

D. Floor Polish: Provide protective, static-control liquid floor polish products recommended in writing by floor-covering manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer and manufacturer's representative present, for compliance with requirements for conditions affecting performance of the Work.

B. 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 installation or static-control characteristics of floor coverings.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates in accordance with manufacturer's written instructions and with oversight by manufacturer's representative to ensure successful installation of static-control resilient flooring and electrical continuity of floor-covering systems.

B. Concrete Substrates: Prepare in accordance with 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 floor-covering adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended in writing by manufacturer. Proceed with installation only after substrate alkalinity is not less than 6 or more than 8 pH unless otherwise recommended in writing by flooring manufacturer.
4. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft. (304.8 sq. m), and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas. Provide one or both of the following tests as recommended by the flooring manufacturer to maintain product warranty.
    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. (1.36 kg of water/92.9 sq. m) 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 and remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install static-control resilient flooring until it is same temperature as space where it is to be installed.
1. Move static-control resilient flooring and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

E. Sweep and vacuum substrates to be covered by static-control resilient flooring immediately before installation.

3.3 INSTALLATION, GENERAL

A. Install static-control resilient flooring in accordance with manufacturer's written instructions and with oversight by manufacturer's representative.

B. Extend grounding strips beyond perimeter of static-control resilient floor-covering surfaces to ground connections.
   1. For adhesively installed flooring, embed grounding strips in static-control adhesive.

C. Scribe, cut, and fit static-control resilient flooring to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
   1. Extend static-control resilient flooring below built-in items and permanent, but movable, items that allow for a flexible layout where indicated on Drawings.

D. Extend static-control resilient flooring into toe spaces, door reveals, closets, and similar openings.

E. Extend static-control resilient flooring to center of door openings where flooring or color transitions occur.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on static-control resilient flooring as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.

G. Adhesive Installation: Adhere static-control resilient flooring to substrates using a full spread of static-control 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 INSTALLATION OF FLOOR TILE

A. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so floor tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half floor tile at perimeter.
   1. Lay floor tiles square with room axis.

B. In each space where conductive, solid vinyl floor tile is installed, install maintenance floor tile identifying conductive floor tile in locations approved by Architect.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of static-control resilient flooring.

B. Perform the following operations immediately after completing static-control resilient flooring:
   1. Remove static-control adhesive from exposed surfaces.
   2. Remove dirt and blemishes from exposed surfaces.
   3. Sweep and vacuum surfaces thoroughly.
   4. Damp-mop surfaces to remove marks and soil.

C. Protect static-control resilient flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
   1. Do not wax static-control resilient flooring.

2. If recommended in writing by manufacturer, apply protective static-control floor polish formulated to maintain or enhance floor covering's electrical properties. Before polishing, do the following:
    a. Ensure that static-control resilient flooring surfaces are free from soil, static-control adhesive, and surface blemishes.
    b. Verify that both floor polish and its application method are approved by manufacturer and that floor polish will not leave an insulating film that reduces static-control resilient flooring's effectiveness for static control.

D. Cover static-control resilient flooring and protect from rolling loads until Substantial Completion.

END OF SECTION 09 6536

SECTION 09 6566 - RESILIENT ATHLETIC FLOORING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Rubber sheet flooring, adhesively installed.

1.2 ACTION SUBMITTALS

A. Product Data: Manufacturer's printed data sheets for products specified.

B. Shop Drawings: Fabrication and installation details, and layout, colors, and widths of game lines and equipment locations.

C. Verification Samples: Actual flooring material specified, not less than 12 inch square, mounted on solid backing.

1.3 INFORMATIONAL SUBMITTALS

A. Test Reports: Submit test reports showing compliance with ASTM F2772.

B. Installer's qualification statement.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in unopened containers clearly labeled with manufacturer's name and identification of contents.

B. Store materials in dry and clean location until needed for installation. During installation, handle in a manner that will prevent marring and soiling of finished surfaces.

1.6 FIELD CONDITIONS

A. Maintain temperature in spaces to receive adhesively installed resilient flooring within range of 70 to 95 degrees F for not less than 48 hours before the beginning of installation and for not less than 48 hours after installation has been completed. Subsequently, do not allow temperature in installed spaces to drop below 50 degrees F or to go above 100 degrees F.

PART 2 PRODUCTS

2.1 PREFORMED ATHLETIC FLOORING, RF-1

A. Basis-of-Design Product: Product product indicated on Material Finish Key or comparable product by one of the following:
   1. Mondo America, Inc.
   2. Robbins Sports Surfaces.
   3. Tarkett.

B. Rubber Sheet Flooring: Recycled SBR (styrene butadiene rubber) and colored EPDM granules with urethane binder, lengths to avoid transverse seams.
   1. VOC Content: As specified in Section 01 6116.
   2. Thickness: Minimum 3/8 inch.
   3. Sheet Width: Minimum 48 inches.
   4. Tensile Strength: Minimum 200 psi, per ASTM D412.
   5. Durometer Hardness, Type A: Minimum of 60, when tested in accordance with ASTM D2240.
   6. Color: As indicated on drawings.

2.2 ACCESSORIES

A. Leveling Compound: Latex-modified cement formulation as recommended by flooring manufacturer for substrate conditions.

B. Flooring Adhesive: Waterproof; types recommended by flooring manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates for conditions detrimental to installation of athletic flooring. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of athletic flooring to substrate.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
   1. Test in accordance with Section 09 0561.
   2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

3.2 PREPARATION

A. Prepare floor substrates for installation of flooring in accordance with Section 09 0561.

3.3 INSTALLATION

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions and approved shop drawings.

C. Resilient Sheet Flooring:
1. Unroll flooring and allow to relax before beginning installation.
2. Mix adhesive thoroughly and apply to substrate with notched trowel. Roll flooring into fresh adhesive, overlapping end seams and double cutting, butting factory edges and compression fitting.
3. Roll entire flooring surface with steel roller to assure adhesion to substrate and eliminate air bubbles.
4. Immediately remove any adhesive from flooring surface, using chemical recommended by flooring manufacturer.
5. Weld seams using techniques and equipment recommended by manufacturer.
6. Lay out game lines using tape and taping machine approved by flooring manufacturer. Apply game line paint with roller, and allow to dry before removing tape.
7. Apply transparent top coat over flooring if recommended by manufacturer, to achieve a uniform finished appearance.

3.4 CLEANING

A. Clean flooring using methods recommended by manufacturer.

3.5 PROTECTION

A. Protect finished athletic flooring from construction traffic to ensure that it is without damage upon Date of Substantial Completion.

END OF SECTION 09 6566

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SECTION 09 6623 - RESINOUS MATRIX TERRAZZO FLOORING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Epoxy matrix terrazzo with ground and polished finish.

B. Divider strips.

1.2 ACTION SUBMITTALS

A. Product Data: Provide data for divider strips, control joint strips, expansion joints, and sealer; include printed copy of current NTMA recommendations for type of terrazzo specified.

B. Shop Drawings: Include terrazzo installation requirements. Include plans, sections, component details, and relationship to other work. Show layout of the following:
1. Divider strips.
2. Control-joint strips.
3. Accessory strips.
4. Terrazzo patterns.

C. Samples for Verification: For each type, material, color, and pattern of terrazzo and accessory required showing the full range of color, texture, and pattern variations expected. Label each terrazzo Sample to identify manufacturer's matrix color and aggregate types, sizes, and proportions. Prepare Samples of same thickness and from same material to be used for the Work, in sizes indicated below:
1. Terrazzo: 6 inch square Samples.
2. Accessories: 6 inch long Samples of each exposed strip item required.

1.3 INFORMATIONAL SUBMITTALS

A. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.

B. Manufacturer's Qualification Statement.

C. Installer's Qualification Statement.

1.4 CLOSEOUT SUBMITTALS

A. Cleaning and Maintenance Data: Include procedures for stain removal, stripping, and sealing.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with NTMA recommendations as posted at their web site at www.ntma.com.

B. Installer Qualifications: Company specializing in performing the type of work specified in this section.
1. Minimum five years of documented experience.

2. Approved by matrix manufacturer.
3. Contractor member of the National Terrazzo and Mosaic Association, Inc.

1.6 MOCK-UP

A. Construct mock-up of terrazzo illustrating appearance of finished work in each configuration required. Size mock-up to be not less than 3 by 3 feet.

B. Build mockups for terrazzo including accessories.
1. Include base.

C. Locate where directed.

D. Mock-up may remain as part of the work.

E. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in supplier's original wrappings and containers, labeled with source's or manufacturer's name, material or product brand name, and lot number if any.

B. Store materials in their original, undamaged packages and containers, inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

C. Maintain minimum temperature of 60 degrees F.

D. Keep products away from fire or open flame.

1.8 FIELD CONDITIONS

A. Do not install terrazzo when temperature is below 50 degrees F or above 90 degrees F.

B. Maintain temperature within specified range 24 hours before, during, and 72 hours after installation of flooring.

C. Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during terrazzo installation.

D. Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during terrazzo installation.

E. Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during terrazzo installation.

F. Control and collect water and dust produced by grinding operations. Protect adjacent construction from detrimental effects of grinding operations.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design - Resinous Matrix Terrazzo Flooring: Key Resin; Key Epoxy Terrazzo System or comparable product listed as other acceptable manufacturers.

B. Other Acceptable Manufacturers - Resinous Matrix Terrazzo Flooring:
1. Sherwin-Williams High Performance Flooring.
2. TERRAZZCO, a brand of Concord Terrazzo Company.
3. Terrazzo & Marble Supply Companies.

2.2 EPOXY MATRIX TERRAZZO APPLICATIONS

A. TZ-1, Floors:
1. Thickness: 3/8 inch, nominal.
2. Color(s): As indicated on drawings.
3. Aggregate Type: Marble chips.
4. Aggregate Size: No. 2.

B. B-3, Wall Base:
1. Thickness: Same as floors.
2. Style: Coved.
3. Color(s): As indicated on drawings.
4. Aggregate Type and Size: Same as floors.

2.3 MATERIALS

A. Epoxy Matrix Terrazzo: Aggregate and matrix mix applied to substrate, troweled flat, and ground smooth.
1. Mix Proportions: As required to achieve appearance specified.
2. Physical Properties without Aggregates:
a. Hardness: 60 to 85 per ASTM D2240, Shore D.
b. Minimum Tensile Strength: 3000 psi per ASTM D638 for a 2-inch (51-mm) specimen made using a "C" die per ASTM D412.
c. Minimum Compressive Strength: 10,000 psi per ASTM D695, Specimen B cylinder.
d. Chemical Resistance: No deleterious effects by contaminants listed below after seven-day immersion at room temperature per ASTM D1308.
1) Distilled water.
2) Mineral water.
3) Isopropanol.
4) Ethanol.
5) 0.025 percent detergent solution.
6) 1.0 percent soap solution.
7) 5 percent acetic acid.
8) 10 percent sodium hydroxide.
9) 10 percent hydrochloric acid.
10) 30 percent sulfuric acid.

3. Physical Properties with Aggregates: For terrazzo blended according to manufacturer's recommendations with one part epoxy resin with three parts marble aggregate consisting of 60 percent No. 1 chips and 40 percent No. 0 chips that is ground and grouted to a 1/4 inch nominal thickness, and cured for 7 days at 75 deg F plus or minus 2 deg F and at 50 percent plus or minus 2 percent relative humidity.
   a. Flammability: Self-extinguishing, maximum extent of burning 1/4 inch according to ASTM D635.
   b. Thermal Coefficient of Linear Expansion: 0.0025 inch/inch per deg F according to ASTM C 531.

B. Matrix: Two component resin and epoxy hardener with mineral filler and color pigment, non-volatile, thermo-setting.

C. Aggregate: Type as indicated; sized in accordance with NTMA aggregate gradation standards; color(s) as indicated, uniform in color.
1. Abrasion and Impact Resistance: Less than 40 percent loss per ASTM C131/C131M.
2. 24-Hour Absorption Rate: Less than 0.75 percent.
3. Dust Content: Less than 1.0 percent by weight.

D. Finishing Grout: Epoxy, color to match terrazzo matrix.

2.4 ACCESSORIES

A. Substrate-Crack-Suppression Membrane: Product of terrazzo-resin manufacturer, having minimum 120 percent elongation potential according to ASTM D412.
1. Reinforcement: Fiberglass scrim.

B. Divider Strips: 1/8 inch thick zinc exposed top strip, zinc coated steel concealed bottom strip, with anchoring features.

C. Control Joint Strips: 1/8 inch nominal width zinc exposed top strips, zinc coated steel concealed bottom strips, 1/8 inch wide neoprene filler strip between vertical strips, with anchoring features.

D. Divider and Control Joint Strip Height: To suit thickness of terrazzo topping, with allowance for grinding.

E. Base Cap, Base Divider Strip, and Separator Strip: Match divider strips.

F. Sealer: Colorless, non-yellowing,Slip- and stain-resistant, penetrating-type sealer that is chemically neutral; does not affect terrazzo color or physical properties; and is recommended by sealer manufacturer.
1. Surface Friction: Not less than 0.6 according to ASTM D2047.
2. Acid-Base Properties: With pH factor between 7 and 10.

G. Resinous Matrix Terrazzo Cleaner: Chemically neutral cleaner with pH factor between 7 and 10 that is biodegradable, phosphate free, and recommended by sealer manufacturer for use on terrazzo type indicated.

H. Patching and Fill Material: Terrazzo manufacturer's resinous product approved and recommended by manufacturer for application indicated.

I. Primer: as recommended by manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive terrazzo.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive terrazzo.

C. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of materials to subfloor surfaces.

D. Cementitious Subfloor Surfaces: Verify that substrates are ready for terrazzo flooring installation by testing for moisture and alkalinity (pH).
1. Test in accordance with Section 09 0561.
2. Obtain instructions if test results are not within limits recommended by terrazzo flooring manufacturer.
3. Follow moisture and alkalinity remediation procedures in Section 09 0561.

3.2 PREPARATION

A. Clean substrate of foreign matter.

B. Prepare concrete subfloor by mechanically abrading surface in accordance with manufacturer's instructions.

C. Substrate-Crack-Suppression Membrane: Install to isolate and suppress substrate cracks according to manufacturer's written instructions.
1. Prepare and prefill substrate cracks with membrane material.
2. Install membrane at substrate cracks in areas to receive terrazzo.
3. Reinforce membrane with fiberglass scrim.

D. Protect other work from water and dust generated by grinding operations. Control water and dust to comply with environmental protection regulations.
1. Erect and maintain temporary enclosures and other suitable methods to limit water damage and dust migration and to ensure adequate ambient temperatures and ventilation conditions during installation.
2. Erect and maintain temporary enclosures and other suitable methods to limit water damage and dust migration and to ensure adequate ambient temperatures and ventilation conditions during installation.

E. Apply primer in accordance with manufacturer's instructions.

3.3 INSTALLATION

A. Comply with NTMA's written recommendations for terrazzo and accessory installation.
1. Saw cut substrate to install divider and control joint strips.
2. Install control-joint strips with 1/4 inch gap between strips, and install sealant in gap.
3. Install strips in adhesive setting bed without voids below strips, or mechanically anchor strips as required to attach strips to substrate, as recommended by strip manufacturer.
4. Accessory Strips: Install as required to provide a complete installation.
5. Install terminating cap strip at top of base; attach securely to wall substrate.

B. Apply primer in accordance with manufacturer's instructions.

C. Place, rough grind, grout, cure grout, fine grind, and finish terrazzo according to manufacturer's written instructions.
   1. Installed Thickness: 3/8 inch nominal.
   2. Terrazzo Finishing: Ensure that matrix components and fluids from grinding operations do not stain terrazzo by reacting with divider and control-joint strips.
      a. Finish terrazzo to NTMA requirements.
      b. Rough Grinding: Grind with 24-grit or finer stones or with comparable diamond abrasives. Follow initial grind with 60/80-grit stones or with comparable diamond abrasives.
      c. Grouting: Before grouting, clean terrazzo with water, rinse, and allow to dry. Apply and cure epoxy grout.
      d. Fine Grinding/Polishing: Delay fine grinding until heavy trade work is complete and construction traffic through area is restricted. Grind with 80-grit stones or with comparable diamond abrasives until grout is removed from surface.
   3. Installation Tolerance: Limit variation in terrazzo surface from level to 1/4 inch in 10 feet; noncumulative.

D. Install and finish poured-in-place terrazzo stairs at the same time the adjacent terrazzo flooring is installed.

E. Install and finish poured-in-place terrazzo base at the same time the adjacent terrazzo flooring is installed.

3.4 REPAIR

A. Cut out and replace terrazzo areas that evidence lack of bond with substrate. Cut out terrazzo areas in panels defined by strips and replace to match adjacent terrazzo, or repair panels according to NTMA's written recommendations, as approved by Architect.

3.5 TOLERANCES

A. Maximum Variation from Flat Surface: 1/4 inch in 10 feet.

B. Maximum Variation from Level (Except Surfaces Sloping to Drain): 1/8 inch.

3.6 CLEANING

A. Scrub and clean terrazzo surfaces with neutral pH cleaner in accordance with manufacturer's instructions. Let dry.

B. Immediately after terrazzo has dried, apply sealer in accordance with manufacturer's instructions.

C. Polish surfaces in accordance with manufacturer's instructions.

3.7 PROTECTION

A. Protect finished terrazzo from damage due to subsequent construction until Date of Substantial Completion.

END OF SECTION 09 6623

SECTION 09 6700 - FLUID-APPLIED FLOORING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fluid-applied flooring and base.

B. Section does not include RES-6, high-build wall coating system, refer to Section 09 9600 - High-Performance Coatings.

1.2 ACTION SUBMITTALS

A. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns and colors available.
   1. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention, and application rate for each coat.

B. Shop Drawings: Indicate installation of cove base and termination details, and details at floor material transitions and where adjoining equipment.
   1. Locate and provide detailing for flexible joints required for flooring in area of installation.

C. Samples: Submit two samples, manufacturer's standard size, illustrating color and pattern for each floor material for each color specified.

1.3 INFORMATIONAL SUBMITTALS

A. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.

B. Applicator's Qualification Statement.

C. Daily installation logs.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: Include maintenance procedures, recommended maintenance materials, procedures for stain removal, repairing surface, and suggested schedule for cleaning.

1.5 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the work of this section.
   1. Minimum 3 years of documented experience.
   2. Approved by manufacturer.

B. Installer to keep daily log of the date of installation, room number, type, color, and method of application of product being installed. Log must be available for inspection by the Architect upon request.

1.6 MOCK-UPS

A. Construct mock-up(s) of fluid applied flooring to serve as basis for evaluation of texture and workmanship.
   1. Number of Mock-Ups to be Prepared: One for each type of fluid-applied flooring indicated.
   2. Use same materials and methods for use in the work.
   3. Use approved design samples as basis for mock-ups.
   4. Locate where directed.
   5. Minimum Size: 48 inches by 48 inches.

B. Obtain approval of mock-up by Architect before proceeding with work.

C. Approved mock-up may remain as part of the work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Follow manufacturer's specific instructions and safety practices for storage and handling.

B. All materials shall be delivered to project site in original manufacturer's sealed containers including type of material, batch numbers, date of manufacture, and pertinent labels intact and legible.

C. Store resin materials in a dry, secure area.

D. Store materials in dry protected area at a temperature between 60 degrees F to 80 degrees F.

E. Store materials for three days prior to installation in area of installation to achieve temperature stability.

1.8 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

B. Maintain the ambient room and the floor temperatures at 60 degrees Fahrenheit, or above, for a period extending from 72 hours before, during and after floor installation. Concrete to receive surfacing shall have cured for at least 28 days and shall have been free of water for at least 7 days.

C. Dew Point: Substrate temperature must be minimum of 5 degrees above dew point prior to, during or up to 24 hours after application of flooring system.

D. Illumination: Apply flooring system only where a minimum of 30 footcandles exist when measured 3 feet from surface.

E. Advise other trades of fixtures and fittings not to be installed until flooring is cured and protected.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Products: Refer to Material Finish Key for selected system or provide comparable systems from listed manufacturers.

B. Other acceptable manufacturers:
   1. Sherwin-Williams High-Performance Flooring.

2. Stonhard.

2.2 FLUID-APPLIED FLOORING SYSTEMS

A. Fluid-Applied Flooring RES-1, -2, -3, -4 and B-2: Epoxy base coats, with broadcast aggregate with manufacturer's Crack Isolation and Waterproofing Membrane.
1. Prime Coat: Two component penetrating damp-proof epoxy.
2. Aggregate: Fine silica sand.
3. Grout and Top Coat:
   a. Two component epoxy grout, Key #510 pigmented.
   b. Two component epoxy sealer, Key #450 Urethane pigmented.
4. System Thickness: 1/8 inch, minimum, dry film thickness (DFT).
5. Texture: Slip resistant.
6. Sheen: Matte.
7. Color: As indicated on Material Finish Key.
8. Basis of Design Product: Key Resin Company; Key Mortar SLT System.

B. Fluid-Applied Flooring RES-5 and B-4: Flexible epoxy membrane, polyaspartic aliphatic polyurea body coat(s), with broadcast aggregate.
1. Aggregate: Vinyl flakes.
2. Top Coat: Urethane.
3. System Thickness: 1/8 inch, nominal, dry film thickness (DFT).
4. Texture: Slip resistant.
5. Sheen: satin.
6. Color: Refer to Material Finish Key for selected vinyl flake mix.
7. Basis-of-Design Product:
   a. Key Resin Company; Key Lastic Chip 100 Decorative System.

2.3 ACCESSORIES

A. Subfloor Filler: Type recommended by fluid-applied flooring manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive flooring.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive flooring.

C. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of materials to subfloor surfaces.

D. Cementitious Subfloor Surfaces: Verify that substrates are ready for fluid-applied flooring installation by testing for moisture and alkalinity (pH).

1. Test in accordance with Section 09 0561.
2. Obtain instructions if test results are not within limits recommended by fluid-applied flooring manufacturer.

3.2 PREPARATION

A. Remove subfloor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with subfloor filler.

B. Prepare concrete surfaces according to ICRI 310.2R.

C. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Grind irregularities above the surface level. Prohibit traffic until filler is cured.

D. Route out cracks (larger than hairline width) and fill with manufacturer's Crack Filler or other material approved by Manufacturer of floor materials. Reinforce crack with fiberglass cloth using Primer or the epoxy used to fill the crack.

E. Vacuum clean substrate.

F. Apply primer to surfaces required by flooring manufacturer.

3.3 INSTALLATION - FLOORING

A. Apply in accordance with manufacturer's instructions.
1. Match finished work to approved samples, uniform in thickness, sheen, color, pattern and texture, and free from defects detrimental to appearance.

B. Apply each coat to minimum thickness required by manufacturer.

C. Finish to smooth level surface.

D. Integral Cove Base: Where scheduled, provide integral cove base formed from flooring over tile backerboard as specified in Section 09 2900 - Gypsum Board. Provide cove cap strip at top of base as recommended by flooring manufacturer and trowel material up wall to form smooth, integral transition and base to height indicated on Drawings.

3.4 PROTECTION

A. Prohibit traffic on floor finish for 48 hours after installation.

B. Barricade area to protect flooring until fully cured.

END OF SECTION 09 6700

SECTION 09 6813 - TILE CARPETING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Carpet tile, fully adhered.

1.2 ACTION SUBMITTALS SUBMITTALS

A. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
   1. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

B. Shop Drawings: Indicate layout of joints, direction of carpet pile, and location of edge moldings.

1.3 INFORMATIONAL SUBMITTALS

A. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.

B. Installer's Qualification Statement.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

1.5 MAINTENANCE MATERIALS SUBMITTALS

A. Extra Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.

1.7 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide Basis-of-Design products listed as WOC-# and KX-# or submit for review comparable products by listed acceptable manufacturers.
   1. Provide manufacturer's standard backing unless otherwise indicated.

B. Other Acceptable Manufacturers:
   1. Bentley Mills, Inc
   2. Interface, Inc.
   3. J&J Flooring Group LLC.
   4. Mannington Commercial.
   5. Milliken & Company.
   6. Mohawk Group.
   7. Shaw Industries Group, Inc.; Berkshire Hathaway Company.
   8. Tarkett USA.

2.2 MATERIALS

A. Tile Carpeting Performance Characteristics:
   1. Critical Radiant Flux: Minimum of 0.22 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
   2. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").
   3. Texture Appearance Retention Rating (TARR): Heavy traffic, 3.0 minimum in accordance with ASTM D7330.
   4. Dry Breaking Strength: Not less than 100 lbf (445 N) in accordance with ASTM D2646.
   5. Tuft Bind: Not less than 6.2 lbf in accordance with ASTM D1335.
   6. Delamination: Not less than 3.5 lbf/in. in accordance with ASTM D3936.
   7. Dimensional Tolerance: Within 1/32 inch of specified size dimensions, as determined by physical measurement.
   8. Colorfastness to Crocking: Not less than 4, wet and dry, in accordance with AATCC 165.
   9. Colorfastness to Light: Not less than 4 after 40 AFU (AATCC fading units) in accordance with AATCC 16.3 Option 3.
   10. VOC Content: Comply with Section 01 6116.

B. Applied Treatments:
   1. Soil-Resistance Treatment: Manufacturer's standard treatment.
   2. Antimicrobial Treatment: Manufacturer's standard treatment that protects carpet tiles as follows:
      a. Antimicrobial Activity: Not less than 2 mm halo of inhibition for gram-positive bacteria, not less than 1 mm halo of inhibition for gram-negative bacteria, and no fungal growth, in accordance with AATCC 174.

2.3 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by flooring material manufacturer.

B. Edge Strips: As indicated on Transition Strip details, color as selected by Architect.

C. Adhesives:
   1. Compatible with materials being adhered; maximum VOC content as specified in Section 01 6116.

D. Carpet Tile Adhesive: Recommended by carpet tile manufacturer; releasable type.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.

B. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).
   1. Test in accordance with Section 09 0561.
   2. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.
   3. Follow moisture and alkalinity remediation procedures in Section 09 0561.

3.2 PREPARATION

A. Prepare floor substrates for installation of flooring in accordance with Section 09 0561.

3.3 INSTALLATION

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install carpet tile in accordance with manufacturer's instructions and CRI 104 (Commercial).

C. Blend carpet from different cartons to ensure minimal variation in color match.

D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

E. Lay carpet tile in square pattern, with pile direction parallel to next unit, set parallel to building lines.
   1. WOC-1: Monolithic pattern.
   2. KX-1: 1/4 turn pattern.

F. Locate change of color or pattern between rooms under door centerline.

G. Adhere carpet tile to substrate along centerline of rooms, at perimeter of rooms, where tiles are cut, and at 15 foot intervals throughout rooms. Lay remainder of tile dry over substrate.

H. Trim carpet tile neatly at walls and around interruptions.

I. Complete installation of edge strips, concealing exposed edges.

3.4 CLEANING

A. Remove excess adhesive without damage, from floor, base, and wall surfaces.

B. Clean and vacuum carpet surfaces.

END OF SECTION 09 6813

SECTION 09 7200 - WALL COVERINGS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Wall Coverings.
   2. Accessories.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include data on physical characteristics, durability, fade resistance, and fire-test-response characteristics.

B. Shop Drawings: Show location and extent of each wall-covering type. Indicate pattern placement seams and termination points.

C. Samples for Verification: For each type of wall covering and for each color, pattern, texture, and finish specified, full width by 36 inches long in size.
   1. Wall-Covering Sample: From same production run to be used for the Work, with specified treatments applied.
      a. Show complete pattern repeat.
      b. Mark top and face of fabric.

D. Product Schedule: For wall coverings. Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each wall covering, for tests performed by a qualified testing agency.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For wall coverings to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same production run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Wall-Covering Materials: For each type, color, texture, and finish, full width by length to equal to 5 percent of amount installed.

1.6 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for installation.
   1. Build mockups for each type of wall covering on each substrate required. Comply with requirements in ASTM F1141 for appearance shading characteristics.
   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 deliver or install wall coverings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and HVAC system is operating and maintaining ambient temperature and humidity conditions at levels intended for occupants after Project completion during the remainder of the construction period.

B. Lighting: Do not install wall covering until lighting that matches conditions intended for occupants after Project completion is provided on the surfaces to receive wall covering.

C. Ventilation: Provide continuous ventilation during installation and for not less than the time recommended by wall-covering manufacturer for full drying or curing.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: As determined by testing identical wall coverings applied with identical adhesives to substrates in accordance with test method indicated below by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. 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.
   2. Fire-Growth Contribution: No flashover and heat and smoke release when tested in accordance with NFPA 265.

2.2 MANUFACTURER

A. Provide Basis-of-Design Product indicated on Interior Finish Legend or comparable products by one of the following:
   1. Arc-Com.
   2. Carnegie.
   3. Len-Tex Corporation.
   4. Koroseal.
   5. Maharam.
   6. MDC.

7. Momentum.
8. Versa; LSI Wallcovering.
9. Wolf-Gordon.

2.3 WALLCOVERINGS, WC-#

A. WC-1, Description: Provide products complying with Wallcoverings Association's W-101; free of PVC, chlorine, plasticizers, formaldehyde, heavy metals, and halogenated fire retardants; with water-based inks and coatings; with antimicrobial additives; and in rolls from same production run.
   1. Type: Type II, Medium Duty.

B. WC-2, Description: Magnetic, dry erasewallcovering, free of PFC/PFOA/PFOS, heavy metals, and phthalates.
   1. Content: 100 percen polyethylene facing.
   2. Finish: Gloss sheen with UV coating.
   3. Backing: Cloth.
   4. Fire Rating: per ASTM E84, Class A.

C. General Performance Characteristics:
   1. Mildew Resistance: Rating of zero or 1 when tested in accordance with ASTM G21.
   2. Features:
      a. Stain-Resistant Coating: manufacturer's standard.
      b. Antimicrobial.
      c. Water-based inks.
      d. Phthalate free.
      e. Heavy-metals free.
      f. Halogenated-fire-retardant free.
      g. Microvented.

2.4 ACCESSORIES

A. Adhesive: Mildew-resistant, nonstaining, strippable adhesive, for use with specific wall covering and substrate application indicated and as recommended in writing by wall-covering manufacturer.

B. Primer/Sealer: Mildew resistant, complying with requirements in Section 09 9123 "Interior Painting" and recommended in writing by primer/sealer and wall-covering manufacturers for intended substrate.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation surfaces being true in plane and vertical and horizontal alignment, maximum moisture content, and other conditions affecting performance of the Work.

B. 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 that could impair bond of wall covering, including dirt, oil, grease, mold, and mildew.

C. Prepare substrates to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings, cracks, and defects.
   1. Moisture Content: Maximum of 5 percent on new plaster, concrete, and concrete masonry units when tested with an electronic moisture meter.
   2. Gypsum Board: Apply primer/sealer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
   3. Painted Surfaces:
      a. Check for pigment bleeding. Apply primer/sealer to areas susceptible to pigment bleeding as recommended in writing by primer/sealer manufacturer.
      b. Sand gloss, semigloss, and eggshell finishes with fine sandpaper.

D. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

E. Acclimatize wall-covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.

3.3 INSTALLATION OF WALL COVERING

A. Comply with wall-covering manufacturers' written installation instructions applicable to products and applications indicated.

B. Cut wall-covering strips in roll number sequence. Change the roll numbers at partition breaks and corners.

C. Install strips as directed by manufacturer.

D. Install wall covering without lifted or curling edges and without visible shrinkage.

E. Install seams vertical and plumb at least 6 inches from outside corners and 3 inches from inside corners unless a change of pattern or color exists at corner. Horizontal seams are not permitted.

F. Trim edges and seams for color uniformity, pattern match, and tight closure. Butt seams without overlaps or gaps between strips.

G. Fully bond wall covering to substrate. Remove air bubbles, wrinkles, blisters, and other defects.

3.4 CLEANING

A. Remove excess adhesive at seams, perimeter edges, and adjacent surfaces.

B. Use cleaning methods recommended in writing by wall-covering manufacturer.

C. Replace strips that cannot be cleaned.

D. Reinstall hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

END OF SECTION 09 7200

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SECTION 09 9123 - INTERIOR PAINTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
2. Prime surfaces to receive wall coverings.
3. Mechanical and Electrical:
   a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
   b. In finished areas, paint shop-primed items.
   c. Paint interior surfaces of air ducts and convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.

D. Do Not Paint or Finish the Following Items:
1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
2. Items indicated to receive other finishes.
3. Items indicated to remain unfinished.
4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
5. Stainless steel, anodized aluminum, bronze, terne-coated stainless steel, and lead items.
6. Marble, granite, slate, and other natural stones.
7. Floors, unless specifically indicated.
8. Ceramic and other tiles.
9. Brick, architectural concrete, cast stone, integrally colored plaster, and stucco.
10. Glass.
11. Acoustical materials, unless specifically indicated.
12. Concealed pipes, ducts, and conduits.

1.2 ACTION SUBMITTALS

A. Product Data: Provide complete list of products to be used, with the following information for each:
1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").
2. MPI product number (e.g., MPI #47).

3. Cross-reference to specified paint system products to be used in project; include description of each system.
4. Manufacturer's Instructions: Indicate special surface preparation procedures and substrate conditions requiring special attention.

B. Samples: Submit 1 paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
1. Where sheen is specified, submit samples in only that sheen.
2. Where sheen is not specified, submit each color in each sheen available.
3. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as masonry, have been approved.

C. Samples: Submit two painted samples, illustrating selected colors and textures for each color and system selected with specified coats cascaded. Submit on tempered hardboard, 6 by 6 inch in size.

1.3 INFORMATIONAL SUBMITTALS

A. Certification: By manufacturer that paints and finishes comply with VOC limits specified.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

1.5 MAINTENANCE MATERIALS SUBMITTALS

A. Extra Paint and Finish Materials: 1 gal of each color; from the same product run, store where directed.

B. Label each container with color in addition to the manufacturer's label.

1.6 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 3 years experience and approved by manufacturer.

1.7 MOCK-UP

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.
   a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
   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.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.9 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply materials when relative humidity exceeds 85 percent, at temperatures less than 5 degrees F above the dew point, or to damp or wet surfaces.

D. Minimum Application Temperatures for Paints: 50 degrees F for interiors unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 fc measured mid-height at substrate surface.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
1. If a single manufacturer cannot provide specified products; minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
2. Substitution of MPI-approved products by a different manufacturer is preferred over substitution of unapproved products by the same manufacturer.

B. Paints:
1. Base Manufacturer: Sherwin Williams Company.
2. BEHR Paint Company.
3. Dunn-Edwards Corporation.
4. Pittsburgh Paints.

C. Primer Sealers: Same manufacturer as top coats.

2.2 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.
1. Where MPI paint numbers are specified, provide products listed in Master Painters Institute Approved Product List, current edition available at www.paintinfo.com, for specified MPI categories, except as otherwise indicated.
2. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
3. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
4. Supply each paint material in quantity required to complete entire project's work from a single production run.
5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content: See Section 01 6116.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

E. P-#, Colors: As indicated on Material Finish Key.
1. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling under which they are mounted.
2. Top Coat Sheen: Unless noted otherwise on Material Finish Ke, apply paint systems with following top coat sheen:
a. Flat: MPI gloss level 1; at overhead and ceiling surfaces.
b. Velvet: MPI gloss level 2; not used.
c. Eggshell: MPI gloss level 3; at gypsum board vertical surfaces, typical.
d. Satin: MPI gloss level 4; not used.
e. Semi-Gloss: MPI gloss level 5; use this sheen at door trims and doors, restroom vertical surfaces, and above showers at non-tiled areas.
f. Gloss: MPI gloss level 6; at handrails.

2.3 PAINT SYSTEMS

A. Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, concrete (non traffic surfaces), and concrete masonry units.
1. Two top coats and one coat primer or one coat block filler.
2. Top Coat(s): High Performance Architectural Interior Latex; MPI #138, 139, 139 X-Green, 140, 141, or 142.
a. Products:
1) Sherwin-Williams Pre-Catalyzed Waterbased Epoxy.
2) Sherwin-Williams ProMar 200 HP Series.

B. Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including metals and wood:
   1. Medium duty applications include doors, door frames, railings, handrails, guardrails, and balustrades (Areas and materials not indicated to recieve HPC)
   2. Two top coats and one coat primer.
   3. Top Coat(s): High Performance Architectural Interior Latex; MPI #138, 139, 140, 141, or 142.
      a. Products:
         1) Sherwin-Williams Pro Industrial Pre-Catalyzed Waterbased Epoxy.

C. Medium Duty Vertical and Overhead: Including gypsum board, uncoated steel, and shop primed steel.
   1. Two top coats and one coat primer.
   2. Top Coat(s): High Performance Architectural Interior Latex; MPI #138, 139, 140, 141, or 142.
      a. Products:
         1) Sherwin-Williams Pro Industrial Acrylic Coating.

D. Dry Fall: Metals; exposed structure and overhead-mounted services, including shop primed structural steel, metal fabrications, galvanized ducts, galvanized conduit, galvanized piping, and underside of metal stairs.
   1. Shop primer by others or provide primer recommended by topcoat manufacturer.
   2. One top coat.
   3. Top Coat: Water Based Dry Fall for Galvanized Steel; MPI #131, 133, or 158.
      a. Products:
         1) Sherwin-Williams Pro Industrial Multi-Surface Acrylic.

2.4 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
   1. Alkali Resistant Water Based Primer; MPI #3 or 3 X-Green.
      a. Products:
         1) Sherwin-Williams Loxon Concrete and Masonry Primer Sealer, LX02W50. (MPI #3)
   2. Interior/Exterior Latex Block Filler; MPI #4.
      a. Products:
         1) Sherwin-Williams Loxon Block Surfacer. (MPI #4)
   3. Interior Latex Primer Sealer; MPI #50 or 50 X-Green.
   4. Interior Drywall Primer Sealer; applied at surfaces schedule to receive vinyl wallcoverings.
      a. Products:
         1) Pittsburgh Paints Speedhide Pro-EV Zero Latex Sealer, 12-900XI.
   5. Anti-Corrosive Alkyd Primer for Metal; MPI #79.
   6. Latex Primer for Interior Wood; MPI #39.

2.5 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been adequately prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

D. Test shop-applied primer for compatibility with subsequent cover materials.

E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
1. Gypsum Wallboard: 12 percent.
2. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
3. Interior Wood: 15 percent, measured in accordance with ASTM D4442.

3.2 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Concrete:
1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
2. Clean concrete according to ASTM D4258. Allow to dry.
3. Prepare surface as recommended by top coat manufacturer and in accordance with SSPC-SP 13/NACE No.6.

G. Masonry:
1. Remove efflorescence and chalk. Do not coat surfaces if moisture content, alkalinity of surfaces, or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
2. Prepare surface as recommended by top coat manufacturer.

H. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

I. Insulated Coverings: Remove dirt, grease, and oil from canvas and cotton.

J. Aluminum: Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

K. Galvanized Surfaces:
1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
2. Prepare surface according to SSPC-SP 2.

L. Ferrous Metal:
1. Solvent clean according to SSPC-SP 1.
2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning in accordance with SSPC-SP 6/NACE No.3. Protect from corrosion until coated.

M. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

N. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with clear sealer.

O. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.3 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

C. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

E. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

F. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.

G. Sand wood and metal surfaces lightly between coats to achieve required finish.

H. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

I. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

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

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
   1. Do not clean equipment with free-draining water and prevent solvents, thinners, cleaners, and other contaminants from entering into waterways, sanitary and storm drain systems, and ground.
   2. Dispose of contaminants in accordance with requirements of authorities having jurisdiction.
   3. Allow empty paint cans to dry before disposal.
   4. Collect waste paint by type and deliver to recycling or collection facility.

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 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION 09 9123

SECTION 09 9600 - HIGH-PERFORMANCE COATINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. High performance coatings applied at the following locations:
   1. Exterior surfaces including:
      a. Hollow metal doors and frames.
      b. Railings.
      c. Bollards.
   2. Interior surfaces locations: includes vertical surfaces, doors, door frames, mezzanines, guardrails, ladders, and materials within locations indicated below, unless otherwise indicated.
      a. Apparatus bays.
      b. Decontamination/Transition Areas.
      c. Turnout Gear locker rooms.
      d. Water Sprinkler Rooms.
      e. Mechanical and Electrical Rooms.
      f. Exposed Steel Decking.
   3. As indicated on Drawings.

B. Surface preparation.

1.2 ACTION SUBMITTALS

A. Product Data: Provide complete list of all products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. Cross-reference to specified coating system(s) product is to be used in; include description of each system.
   3. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

B. Samples: Submit two samples 8 by 8 inch in size illustrating colors available for selection.

1.3 INFORMATIONAL SUBMITTALS

A. Manufacturer's Certificate: Certify that high-performance coatings comply with VOC limits specified.

B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: Include cleaning procedures and repair and patching techniques.

1.5 MAINTENANCE MATERIALS SUBMITTALS

A. Extra Coating Materials: 1 gallon of each type and color.

B. Label each container with manufacturer's name, product number, color number, and room names and numbers where used.

1.6 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the work of this section with minimum 3 years documented experience.

1.7 MOCK-UPS

A. Mockups: Apply mockups of each coating system indicated 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 coating system.
      a. Wall and Ceiling 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.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of coating, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Coating Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.9 FIELD CONDITIONS

A. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

B. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the coating product manufacturer.

C. Do not install materials when temperature is below 55 degrees F or above 90 degrees F.

D. Maintain this temperature range, 24 hours before, during, and 72 hours after installation of coating.

E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

F. Restrict traffic from area where coating is being applied or is curing.

1.10 WARRANTY

A. Correct defective Work within a five year period after Date of Substantial Completion.
   1. Warranty: Include coverage for bond to substrate and degradation of chemical resistance.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide high performance coating products from the same manufacturer to the greatest extent possible.
   1. In the event that a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.

B. High-Performance Coatings:
   1. Basis-of-Design Products: provide products listed or comparable product by one of the following:
      a. Pittsburgh Paints.
      b. Sherwin-Williams Company.
      c. Tnemec Company, Inc.
      d. Wolf-Gordon.

2.2 HIGH-PERFORMANCE COATINGS

A. Provide coating systems that meet the following minimum performance criteria, unless more stringent criteria are specified and as indicated for each system noted:
   1. Surface Burning Characteristics: Flame spread/Smoke developed index of 0/0, maximum, when tested in accordance with ASTM E84.
   2. NFPA 101, Class A rated.
   3. Lead Content: Not greater than 0.06 percent by weight of total nonvolatile content.
   4. Volatile Organic Compound (VOC) Content: See Section 01 6116.

B. Exterior Contact Steel and Interior Misc Metal Primer:
   1. Waterborne, containing 1 gram/litre or less VOC.
   2. ASTM D 4060 Abrasion – No more than 149 mg loss after 1,000 cycles.
   3. ASTM D 5441 (Method E, Type V) Adhesion – No less than 1,989 psi after 10 freeze/thaw cycles.
   4. ASTM D 4585 Humidity- NO blistering, cracking, rusting or delamination of the film after 2,000 hours exposure.

C. Exterior Contact Steel, Interior Misc Metal, Interior Washdown Concrete Masonry Block and Gypsum Board, Finish Coat:
   1. Waterborne, containing 93 gram/litre or less VOC.
   2. ASTM D 4060, CS-17 Wheel, 1,000 gram load, Abrasion – No more than 30.7 mg loss after 1,000 cycles.

3. Covered Spot Stain Test – No effect after 24 hours exposure to the following reagents; grape jam, lime juice, dish soap, 409 cleaner, margarine, vegetable oil, lipstick, Clorox, vinegar, crayon, toothpaste.
4. ASTM D 3363, Pencil Hardness – No less than a rating of 5H (gouge).
5. ASTM D 4213, Scrubbability – No more than 80 mg loss after 1,000 cycles.

D. Interior Washdown Concrete Masonry Block and Gypsum Board, First and Second Coat:
1. Waterborne, containing 2.51 gram/litre VOC or less.
2. Maximum thickness in one coat , 12.0 mils.
3. ASTM D1308, Stain Resistance – No effect after 24 hour exposure to the following reagents; 5% soap, 5% sodium hydroxide, 5% ammonium hydroxide, toothpaste, 409 cleaner, tea, dish soap, vegetable oil, black shoe polish, crayon, lipstick, lighter fluid.

2.3 COATING SYSTEMS

A. Coatings - General: Provide complete multi-coat systems formulated and recommended by manufacturer for the applications indicated, in the thicknesses indicated; number of coats specified does not include primer or filler coat.
1. HPC and RES Colors: As indicated on Drawings.

B. Exterior Contact Steel and Interior Miscellaneous Metals:
1. Primer: Tnemec Series 1224 Epoxoline WB at 4.0-6.0 mils DFT or as indicated in specific material schedule. Ensure compatiblity between primer and topcoats.
2. Intermediate and Finish: Tnemec Series 297 EnviroGlaze, two coats each at 2.0-3.0 mils DFT.
3. Application Locations include, but are not limited to, the following:
   a. Exterior Hollow Metal Doors and Frames.
   b. Exterior and Interior Railings and Guards.
   c. Bollards.

C. Dryfall Coating for Interior Steel Decking:
1. Primer: Tnemec Series 115 at 2.0-4.0 mils DFT.
2. Finish Coat: Tnemec Series 115 at 2.0-4.0 mils DFT.
3. Application: As located on Drawings for exposed steel decking.

D. Interior Washdown at concrete masonry block walls:
1. Block Filler: Tnemec Series 130 EnviroFill at approx. 80 ft per gallon.
2. First Coat: Tnemec Series 288 EnviroPox at 4.0-6.0 mils DFT.
3. Second Coat: Tnemec Series 288 EnviroPox at 4.0-6.0 mils DFT.
4. Finish Coat: Tnemec Series 297 Enviro-Glaze at 2.0-3.0 mils DFT.
5. Application Locations include, but are not limited to, the following:
   a. Transition and Decontamination.

E. Interior Washdown at gypsum board ceilings:
1. First Coat: Tnemec Series 288 EnviroPox at 4.0-6.0 mils DFT.
2. Second Coat: Tnemec Series 288 EnviroPox at 4.0-6.0 mils DFT.
3. Finish Coat: Tnemec Series 297 Enviro-Glaze at 2.0-3.0 mils DFT.
4. Application Locations include, but are not limited to, the following:
   a. Toilet & Shower Rooms.

F. Interior High Performance at concrete masonry block walls:
   1. Block Filler: Tnemec Series 130 EnviroFill at approx. 80 ft per gallon.
   2. Intermediate and Finish: Tnemec Series 1028 EnduraTone, two coats each at 2.0-3.0 mils DFT.
   3. Application Locations include, but are not limited to, the following:
      a. Turnout Gear Locker Rooms.
      b. Tool Room
      c. SCBA Room.
      d. Apparatus Bays.

G. Interior High Performance at gypsum board walls and ceilings:
   1. Primer: Tnemec Series 151-1051 ElastoGrip at 0.7-1.5 mils DFT
   2. Intermediate and Finish: Tnemec Series 1028 EnduraTone, two coats each at 2.0-3.0 mils DFT
   3. Application Locations include, but are not limited to, the following:
      a. Training Areas.
      b. Locker Rooms.
      c. Water/Sprinkler.
      d. Mechanical Room.
      e. Electrical Room.

H. High-Build Epoxy Coating, Type RES-6:
   1. Number of Coats: Two.
   2. Product Characteristics:
      a. Percentage of solids by volume, 100, minimum.
   3. Top Coat(s): Epoxy/Urethane, High-Build.
      a. Sheen: Gloss.
      b. Products: As indicated on Material Finish Key.
   4. Primer: As recommended by coating manufacturer for specific substrate.

I. Shellac: Pure, white type.

2.4 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of coated surfaces.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Do not begin application of coatings until substrates have been properly prepared.

C. Verify that substrate surfaces are ready to receive work as instructed by the coating manufacturer. Obtain and follow manufacturer's instructions for examination and testing of substrates.

D. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

E. Test shop-applied primer for compatibility with subsequent cover materials.

F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
1. Cementitious Substrates: Do not begin application until substrate has cured 28 days minimum and measured moisture content is not greater than 12 percent.
2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
3. Concrete Floors and Traffic Surfaces: 8 percent.

G. Masonry: Verify masonry joints are struck flush.

H. Proceed with coating application only after unacceptable conditions have been corrected.
1. Commencing coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Protect adjacent surfaces and materials not receiving coating from spatter and overspray; mask if necessary to provide adequate protection. Repair damage.

B. Clean surfaces of loose foreign matter.

C. Remove substances that would bleed through finished coatings. If unremovable, seal surface with shellac.

D. Remove finish hardware, fixture covers, and accessories and store.

E. Concrete:
1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
2. Prepare surface as recommended by coating manufacturer and in accordance with SSPC-SP 13/NACE No.6.

F. Masonry:
1. Remove efflorescence and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
2. Prepare surface as recommended by coating manufacturer.

G. Galvanized Surfaces:
1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
2. Prepare surface according to SSPC-SP 2.

H. Ferrous Metal:
1. Solvent clean according to SSPC-SP 1.
2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.
3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning in accordance with SSPC-SP 6/NACE No.3, and protect from corrosion until coated.

3.3 PRIMING

A. Apply primer to all surfaces, unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.

B. Concrete: Prior to priming, patch with masonry filler to produce smooth surface.

C. Concrete Masonry: Apply masonry filler to thickness required to fill holes and produce smooth surface; minimum thickness of 30 mils.

3.4 COATING APPLICATION

A. Apply coatings in accordance with manufacturer's written instructions, to thicknesses specified and recommendations in MPI - Architectural Painting and Specification Manual.

B. Apply in uniform thickness coats, without runs, drips, pinholes, brush marks, or variations in color, texture, or finish. Finish edges, crevices, corners, and other changes in dimension with full coating thickness.

3.5 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

B. Clean surfaces immediately of overspray, splatter, and excess material.

C. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.

3.6 PROTECTION

A. Protect finished work from damage.

END OF SECTION 09 9600

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SECTION 10 1100 - VISUAL DISPLAY UNITS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Porcelain enamel steel markerboards.

1.2 ACTION SUBMITTALS

A. Product Data: Provide manufacturer's data on porcelain enamel steel markerboard, trim, and accessories.

B. Shop Drawings: Indicate wall elevations, dimensions, joint locations .

1.3 INFORMATIONAL SUBMITTALS

PART 2 PRODUCTS

2.1 VISUAL DISPLAY UNITS

A. EQ42, EQ45: Porcelain Enamel Steel Markerboards: Magnetic type.
1. Provide Basis-of-Design Product indicated on Equipment Schedule or comparable product by one of the following:
   a. Manufacturers:
      1) Claridge Products and Equipment, Inc.
      2) Egan Visual Corporation.
      3) Ghent.
      4) Quartet.
2. Color: White.
3. Steel Face Sheet Thickness: 24 gauge, 0.0239 inch .
4. Core: Manufacturer's standard, manufacturer's standard thickness, laminated to face sheet.
5. Backing: Galvanized steel sheet, laminated to core.
6. Size: As indicated on drawings.
7. Frame: Extruded aluminum , with concealed fasteners.
8. Frame Finish: Anodized, natural.
9. Accessories: Provide marker tray.

2.2 ACCESSORIES

A. Temporary Protective Cover: Sheet polyethylene, 8 mil thick.

B. Marker Tray: Aluminum, manufacturer's standard profile, one piece full length of chalkboard, concealed fasteners, same finish as frame.

C. Mounting Brackets: Concealed.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that internal wall blocking is ready to receive work and positioning dimensions are as indicated on shop drawings.

3.2 PREPARATION

A. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install boards in accordance with manufacturer's instructions.

B. Install with bottom of perimeter frame at 30 inches above finished floor.

C. Secure units level and plumb.

3.4 CLEANING

A. Clean board surfaces in accordance with manufacturer's instructions.

B. Cover with protective cover, taped to frame.

C. Remove temporary protective cover at Date of Substantial Completion.

END OF SECTION 10 1100

SECTION 10 1419 - DIMENSIONAL LETTER SIGNAGE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Dimensional letter signage.

B. Illumination system.

1.2 ACTION SUBMITTALS

A. Product Data: Manufacturer's product literature for each type of dimensional letter sign, indicating style, font, colors, locations, and overall dimensions of each sign.
   1. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

B. Shop Drawings:
   1. Include dimensions, locations, elevations, materials, text and graphic layout, and attachment details.
   2. Show locations of electrical service connections.
   3. Include diagrams for power, signal, and control wiring.

C. Samples: Submit one sample of each type of dimensional letter sign of size similar to that required for project, indicating sign style, font, and method of attachment.

1.3 INFORMATIONAL SUBMITTALS

A. Manufacturer's qualification statement.

1.4 QUALITY ASSURANCE

A. 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. Package dimensional letter signs as required to prevent damage before installation.

B. Store under cover and elevated above grade.

1.6 FIELD CONDITIONS

A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

B. Maintain minimum ambient temperature during and after installation.

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. A.R.K. Ramos.
2. ACE Sign Systems, Inc.
3. ASI Sign Systems, Inc.
4. Cosco.
5. Gemini Incorporated.
6. Matthews International Corporation; Bronze Division.
7. Metal Arts.
8. Metallic Arts.
9. Southwell Company (The).
10. Takeform.

2.2 DIMENSIONAL LETTERS

A. Applications: Building identification and Monument signage.
1. Use individual metal letters.
2. Mounting Location: Exterior as indicated on drawings.

B. Metal Letters:
1. Material: Aluminum sheet, fabricated reverse channel.
2. Thickness: Manufacturer's standard for letter size.
3. Letter Height: As indicated on drawings.
4. Text and Typeface:
   a. Character Font: As indicated on Drawings.
   b. Character Case: Upper and lower case (title case).
5. Finish: Brushed, satin.
6. Color: As selected.
7. Mounting: Projected mount with collars.
8. Illumination System: Halo-lit reverse channel letters.
   a. Provide products that are listed and labeled as complying with UL 879, where applicable.
   b. Power: 120 V, 60 Hz, 1 phase, 15 A.

2.3 ACCESSORIES

A. Concealed Screws: Noncorroding metal; stainless steel.

B. Electrical Components and Devices: Listed and labeled as defined in NFPA 70 by a qualified testing agency.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

B. Verify that electrical service is correctly sized and located to accommodate dimensional letter signs.

C. Notify Architect if conditions are not suitable for installation of signs; do not proceed until conditions are satisfactory.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install with horizontal edges level.

C. Protect from damage until Substantial Completion; repair or replace damaged items.

END OF SECTION 10 1419

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SECTION 10 1423.16 - ROOM-IDENTIFICATION PANEL SIGNAGE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Interior room-identification signs attached to interior partitions or interior glazing.

1.2 DEFINITIONS

A. Accessible: In accordance with the accessibility standard.

1.3 COORDINATION

A. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.

B. Conduct pre-installation survey prior to manufacturing to verify copy and sign location.
1. Note each location using a low tack vinyl reproduction of actual sign.
2. Provide full scale renderings of directories.
3. Submit location discrepancy or message issues to Architect for review.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For room-identification 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.
4. Location plan noting location of signage and cross referenced to message schedule and Drawings. Do not submit Contract Drawings as shop drawing.

C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.
1. Include representative Samples of available typestyles and graphic symbols.

D. 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. Room-Identification Signs: Full-size Sample.
2. 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.
3. Exposed Accessories: Full-size Sample of each accessory type.
4. Full-size Samples, if approved, will be returned to Contractor for use in Project.

E. Product Schedule: For room-identification signs. Use same designations indicated on Drawings or specified.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs 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.
   1. Variable Component Materials: 12 replaceable text inserts and interchangeable characters (letters, numbers, and graphic elements) of each type.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer of products.

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".

2.2 MANUFACTURER

A. Basis of Design Product: APCO Graphics, Inc; Elevate Framless Sign System or provide comparable products by one of the following:
1. ASI Sign Systems, Inc.
2. Best Sign Systems, Inc.
3. Mohawk Sign Systems.
4. Nelson-Harkins Industries.
5. Takeform.

2.3 ROOM-IDENTIFICATION SIGNS

A. General: Sign System shall be frameless and shall feature solutions for all required sign types, including but not limited to wall mounted personnel signs, primary room identification, restroom signs, and changeable signs.

B. Sign Assembly: Sign system shall incorporate fully recessed chassis to which modular display panels securely engage, creating a frameless look with the appearance that display panes are floating off of the mounting surface.

C. Room-Identification Sign: Sign system with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
1. Laminated-Sheet Sign: Acrylic face sheet with raised graphics laminated to acrylic backing sheet to produce composite sheet.
   a. Composite-Sheet Thickness: Manufacturer's standard for size of sign.
   b. Subsurface Graphics: Slide-in changeable insert.
   c. Color(s): As selected by Architect from manufacturer's full range .
2. Dual display signs shall be separated with a satin anodized aluminum horizontal divider bar flush with display panel surface. Bar shall be 1/4 inch wide by 1/8 inch thick. Bar shall have a reveal of 1/16 inch between display panels.
   a. Header/Base/Binding:
      1) Header: None
      2) Base: None
      3) Binding: Sign panels shall have a binding bar located on the left side of the display panel. Binding bar shall not be divided by horizontal dividing bar and shall have a 1/16 reveal between binding and display panels. Binding Bar shall be 1/2 inch by height of sign.
3. Sign-Panel Perimeter: Finish edges smooth.
   a. Edge Condition: Square cut.
   b. Corner Condition in Elevation: Square.
4. Mounting: Surface mounted to wall with two-face tape and aluminum standoff.
5. Text and Typeface: Accessible raised characters and Braille and typeface as indicated by manufacturer's designation. Finish raised characters to contrast with background color, and finish Braille to match background color.

2.4 SIGN MATERIALS

A. Aluminum Sheet and Plate: ASTM B 209 (ASTM B 209M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

B. Aluminum Extrusions: ASTM B221 (ASTM B 221M), 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. 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:
   1. Use concealed fasteners and anchors unless indicated to be exposed.
   2. Sign Mounting Fasteners:
      a. Through Fasteners: Exposed metal fasteners matching sign finish, with type of head indicated, and installed in predrilled holes.
         1) Sign Standoff: 1/2-inch diameter by 1-inch, clear anodized alumunim; includes stud-cap and standoff spacer/barrell.

B. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch thick, with adhesive on both sides.

2.6 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. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
   3. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
   4. 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-Etched Graphics: Reverse etch back face of clear face-sheet material. Fill resulting copy with manufacturer's standard enamel. Apply opaque manufacturer's standard background color coating over enamel-filled copy.

C. Signs with Changeable Message Capability: Fabricate signs to allow insertion of changeable messages as follows:
   1. For slide-in changeable inserts, fabricate slot without burrs or constrictions that inhibit function. Furnish initial changeable insert. Subsequent changeable inserts are by Owner .

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.

PART 3 EXECUTION

3.1 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. Accessibility: Install signs in locations on walls as indicated on Drawings and according to the accessibility standard .

C. Mounting Methods:
1. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position with aluminum standoffs. Install through fasteners and tighten.
2. 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.

3.2 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.

3.3 SIGNAGE SCHEDULE

Type	Text Copy and Braille	Location
Permanent Rooms and Spaces	Room name, stairs or floor level.	Adjacent to entry of room or on door
Restroom / Bathroom ADA, Single Occupancy	"RESTROOM" with pictogram symbols for male, female, and accessibility, and Braille.	*

Type	Text Copy and Braille	Location
Restroom / Bathroom ADA, Male Occupancy	"MEN" with pictogram symbol for male and accessibility, and Braille.	*
Restroom / Bathroom ADA, Female Occupancy	"WOMEN" with pictogram symbol for Female and Accessibilty, and Braille.	*
Automatic Sprinkler System Riser Rooms and Fire Pump Rooms	Text Copy approved by AHJ	Room door or adjacent wall to room entry.
Fire Department Connections *	"AUTOMATIC SPRINKLERS" "STANDPIPES" "TEST CONNECTIONS"	Fire Department Connections.
Emergency Responder Safety Features, Shaftway Markings*	"SHAFTWAY"	Door or window openings to a hoistway or shaftway.
Exit Signage	"EXIT"	Egress stairway, exit passageway, and exit discharge.
Exit Signage, Directional signage indicated means of egress	Directional signage indicated the location of all other means of egress and which of those are accessible means of egress.	Elevator landings,Exits not serving accessible spaces, within areas of refuge
Area of Refuge*	"AREA OF REFUGE", International Symbol of Accessibility, and Braille per ICC A117.1	Each door providing access to an area of refuge from an adjacent floor area.
Area of Refuge, Exterior Assisted Rescue*	"EXTERIOR AREA FOR ASSISTED RESCUE"	Each door providing access to an exterior area for assisted rescue.

A. Note: Refer to applicable Codes for additional requirements and exemptions.

END OF SECTION 10 1423.16

SECTION 10 2113.17 - PHENOLIC TOILET COMPARTMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Phenolic toilet compartments.

B. Urinal screens.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the work with placement of support framing and anchors in walls and ceilings.

1.3 ACTION SUBMITTALS

A. Product Data: Provide data on panel construction, hardware, and accessories.

B. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall and floor supports, door swings.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: provide Bradley; Phenolic Privacy Partitions or comparable product submitted for Architect's review from one of the listed manufacturers.

B. Manufacturers:
1. ASI Accurate Partitions.
2. Hadrian.
3. Partition Systems International of South Carolina.

2.2 PHENOLIC TOILET COMPARTMENTS, TA16 & TA18

A. Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid phenolic core panels with integral melamine finish, floor-mounted headrail-braced.

B. Doors:
1. Thickness: 3/4 inch.
2. Width: 24 inch.
3. Width for Handicapped Use: 36 inch, out-swinging.
4. Height: 58 inch.

C. Panels:
1. Thickness: 1/2 inch.

2. Height: 58 inch.
3. Depth: As indicated on drawings.

D. Pilasters:
1. Thickness: 3/4 inch.
2. Width: As required to fit space; minimum 3 inch.

E. Screens: Without doors; to match compartments; mounted to wall with two panel brackets with vertical support/bracing same as compartments.

2.3 ACCESSORIES

A. Pilaster Shoes: Formed ASTM A666 Type 304 stainless steel with No. 4 finish, 3 inch high, concealing floor fastenings.
1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.

B. Head Rails: Hollow anodized aluminum, 1 inch by 1-1/2 inch size, with anti-grip profile and cast socket wall brackets.

C. Wall and Pilaster Brackets: Polished stainless steel; manufacturer's standard type for conditions indicated on drawings.

D. Attachments, Screws, and Bolts: Stainless steel , tamper proof type.

E. Hardware: Polished stainless steel:
1. Pivot hinges, gravity type, adjustable for door close positioning; two per door.
2. Door Latch: Slide type with exterior emergency access feature.
3. Door strike and keeper with rubber bumper; mounted on pilaster in alignment with door latch.
4. Coat hook with rubber bumper; one per compartment, mounted on door.
5. Provide door pull for outswinging doors.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify correct spacing of and between plumbing fixtures.

B. Verify correct location of built-in framing, anchorage, and bracing.

3.2 INSTALLATION

A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.

B. Maintain 3/8 inch to 1/2 inch space between wall and panels and between wall and end pilasters.

C. Attach panel brackets securely to walls using anchor devices.

D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.

E. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

3.3 TOLERANCES

A. Maximum Variation From True Position: 1/4 inch.

B. Maximum Variation From Plumb: 1/8 inch.

3.4 ADJUSTING

A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.

B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.

C. Adjust adjacent components for consistency of line or plane.

END OF SECTION 10 2113.17

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SECTION 10 2600 - WALL AND DOOR PROTECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Corner guards.

1.2 ACTION SUBMITTALS

A. Product Data: Indicate physical dimensions, features, and anchorage details.

B. Shop Drawings: Include plans, elevation, sections, and attachment details.

C. Maintenance Data: Manufacturer's instructions for care and cleaning of each type of product. Include information about both recommended and potentially detrimental cleaning materials and methods.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Deliver wall and door protection items in original, undamaged protective packaging. Label items to designate installation locations.

B. Protect work from moisture damage.

C. Protect work from UV light damage.

D. Do not deliver products to project site until areas for storage and installation are fully enclosed, and interior temperature and humidity are in compliance with manufacturer's recommendations for each type of item.

E. Store products in either horizontal or vertical position, in compliance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. CG-1, Corner Guards:
1. Basis-of-Design Product: Construction Specialties, Inc; Acrovyn Corner Guards CO-8 or comparable product by one of the following:
   a. Inpro Corporation.
   b. Koroseal Interior Products.

2.2 PRODUCT TYPES

A. Corner Guards - Surface Mounted:
1. Material: Type 304 stainless steel, No.4 finish, 16-gauge thick.
2. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.

3. Width of Wings: 2 inches.
4. Corner: Square.
5. Color: As indicated.
6. Length: One piece, 48 inches.
7. Mounting: Clear adhesive.

B. Adhesives and Primers: As recommended by manufacturer.

2.3 FABRICATION

A. Fabricate components with tight joints, corners and seams.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.

B. Verify that substrate surfaces for adhered items are clean and smooth.
1. Test painted or wall covering surfaces for adhesion in inconspicuous area, as recommended by manufacturer. Follow adhesive manufacturer's recommendations for remedial measures at locations and/or application conditions where adhesion test's results are unsatisfactory.

C. Start of installation constitutes acceptance of project conditions.

3.2 INSTALLATION

A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.

B. Position corner guard 4 inches above finished floor to height indicated on drawings.

3.3 TOLERANCES

A. Maximum Variation From Required Height: 1/4 inch.

B. Maximum Variation From Level or Plane For Visible Length: 1/4 inch.

3.4 CLEANING

A. Clean wall and door protection items of excess adhesive, dust, dirt, and other contaminants.

END OF SECTION 10 2600

SECTION 10 2800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Commercial toilet accessories.

B. Commercial shower and bath accessories.

C. Diaper changing stations.

D. Utility room accessories.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement to receive anchor attachments.

1.3 ACTION SUBMITTALS

A. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

B. 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.

C. Delegated Design Submittals: For grab bars and shower seats.

D. Include structural design calculations indicating compliance with specified structural-performance requirements.

1.4 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: 15 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Design accessories and fasteners to comply with the following requirements:
   1. Grab Bars: Installed units are able to resist 250 lbf concentrated load applied in any direction and at any point.

2. Shower Seats: Installed units are able to resist 250 lbf concentrated load applied in any direction and at any point.

2.2 MANUFACTURERS

A. Provide Basis-of-Design Products listed in Toilet Room Accessories Schedule or comparable products from the following submitted for Architect's review:
1. American Specialties, Inc.
2. Bradley Corporation.
3. Bobrick.
4. Georgia-Pacific Professional.
5. Kimberly-Clark Corporation.

B. Provide products of each category type by single manufacturer.

2.3 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
1. Grind welded joints smooth.
2. Fabricate units made of metal sheet of seamless sheets with flat surfaces.

B. Keys: Provide 6 keys for each accessory to Owner; master key lockable accessories.

2.4 TOILET ACCESSORIES

A. TA1 thru TA5, Grab Bars: Stainless steel, peened surface.
1. Standard Duty Grab Bars:
   a. Push and Pull Point Load: Minimum 250 lbf.
   b. Dimensions: 1-1/4 inch outside diameter, minimum 18-gauge, 0.05-inch steel thickness, concealed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
   c. Finish: Satin.
   d. Length and Configuration: As indicated on drawings.

B. Soap Dispenser:
1. TA9, Liquid soap dispenser, wall-mounted, surface, with stainless steel cover and vertical stainless steel tank and working parts; push type soap valve, check valve, and window gauge refill indicator, tumbler lock.
   a. ADA compliant, less than 5 lbs of force to operate push valve.
   b. Minimum Capacity: 40 ounces.
   c. Concealed, vandal-resistant mounting.

C. Mirrors: Stainless steel framed, 1/4 inch thick tempered safety glass; ASTM C1048.
1. 10A, Frame: 3/4 inchangle shapes, with mitered and welded and ground corners, and tamperproof hanging system; matte black finish finish.
2. 10B, Frame: 1/2 inchchannel shapes, with mitered and welded and ground corners, and tamperproof hanging system; satin finish.

3. Backing: Full-mirror sized, minimum 0.03 inch galvanized steel sheet and nonabsorptive filler material.

D. Paper Towel Dispenser:
1. TA11, Folded paper type, stainless steel, surface-mounted, with viewing slots on sides as refill indicator and tumbler lock.
   a. Capacity: 400 C-fold; 525 multifold minimum.
   b. ADA compliant.

E. Sanitary Napkin Disposal Unit:
1. 10A, Stainless steel, surface-mounted, self-closing door with full-length stainless steel piano-type hinge, removable receptacle.
   a. Capacity: 1.0 gal.
   b. ADA Compliant.
2. 10B, Stainless steel, back-to-back partition mounting with adjustable flanges, self-closing door with full-length stainless steel piano-type hinge, removable receptacle.
   a. Capacity: 1.0 gal.
   b. ADA Compliant.

F. Toilet Paper Dispener:
1. TA15A, Toilet Paper Dispenser: Double roll, surface mounted, for cored type rolls.
   a. Mounting: Surface.
   b. Theft resistant spindles.
   c. Material: Stainless Steel, type 304.
   d. Finish: Satin.
   e. Construction: all-welded.
2. TA15B, Double roll, surface mounted bracket type, stainless steel, spindleless type for tension spring delivery designed to prevent theft of tissue roll.

G. TA25, Combination Sanitary Napkin/Tampon Dispenser: Stainless steel, recessed.
1. Door: Seamless door with returned edges and tumbler lock.
2. Cabinet: Fully welded, 0.048 inch thick sheet.
3. Operation: No charge; no coin slots.
4. Identify dispensers slots without using brand names.
5. Minimum capacity: 20 napkins and 30 tampons.

2.5 COMMERCIAL SHOWER AND BATH ACCESSORIES

A. TA7, Folding Shower Seat: Wall-mounted surface; welded tubular seat frame, structural support members, hinges, and mechanical fasteners of Type 304 stainless steel, L-shaped, right hand and L-shaped, left hand seat (reversible).
1. Seat: Phenolic or polymeric composite one-piece seat or seat slats, of white color.
2. Size: ADA Standards compliant.

B. TA12, Robe Hook: Heavy-duty stainless steel, double-prong, rectangular-shaped bracket and backplate for concealed attachment, satin finish.

2.6 DIAPER CHANGING STATIONS

A. TA6, Diaper Changing Station: Wall-mounted folding diaper changing station for use in commercial toilet facilities, meeting or exceeding ASTM F2285.
   1. Material: Plastic molded interior with Stainless steel shell.
   2. Mounting: Recessed.
   3. Minimum Rated Load: 250 pounds.
   4. ADA Compliant.

2.7 UTILITY ROOM ACCESSORIES

A. TA21, Combination Utility Shelf/Mop and Broom Holder: 0.05 inch thick stainless steel, Type 304, with 3/4 inch returned edges, 0.06 inch steel wall brackets.
   1. Hooks: 4, 0.06 inch stainless steel rag hooks at shelf front.
   2. Mop/broom holders: Three spring-loaded rubber cam holders at shelf front.
   3. Length: 34 inches.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. See Section 06 1053 - Miscellaneous Rough Carpentry and 09 2216 - Non-Structural Metal Framing for installation of blocking, reinforcing plates, and concealed anchors in walls.

3.2 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.3 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.

D. Grab Bars: Install to comply with specified structural-performance requirements.

E. Shower Seats: Install to comply with specified structural-performance requirements.

3.4 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION 10 2800

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SECTION 10 2819 - TUB AND SHOWER ENCLOSURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Tub and shower surrounds.

1.2 ACTION SUBMITTALS

A. Product Data: Provide manufacturer's literature for enclosure.
   1. Manufacturer's Installation Instructions: Indicate complete preparation, installation, and cleaning requirements.

B. Shop Drawings: Indicate layout, dimensions, identification of components, and interface with adjacent construction.
   1. Include plans, elevations, sections, and attachment details.

C. Verification Samples: Two samples, minimum size of 2 by 3 inches, representing actual material and finish of exposed cast polymer.

D. Product Schedule: For shower enclosures. Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

A. Manufacturer's qualification statement.

B. Installer's qualification statement.

C. Specimen warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For shower enclosures to include in maintenance manuals.

B. Executed warranty.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with minimum 3 years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified, with minimum 3 years of documented experience.

1.6 FIELD CONDITIONS

A. Verify dimensions by field measurements before fabrication and indicate on Shop Drawings.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products under cover and elevated above grade in manufacturer's unopened packaging until installation.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of tub and shower doors and enclosures that fail in materials or workmanship within specified warranty period, without monetary limitation.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including excessive deflection.
      b. Deterioration of metals, metal finishes, and other materials beyond normal use.

B. Warranty Period: 2 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide Basis-of-Design product indicated on Material Finish Key/Equipment Schedule or comparable product, submitted for Architect's review, from one of the listed manufacturers.

B. Cast Polymer Tub and Shower Surrounds:
   1. Corian.
   2. Inpro.
   3. Swan Surfaces.
   4. Wilsonart.

2.2 TUB AND SHOWER ENCLOSURES - GENERAL

A. Concealed Fasteners: Manufacturer's standard stainless steel.

2.3 TUB AND SHOWER SURROUNDS, SS-2/EQ-61

A. Description: Cast polymer panels over continuous substrate; installed in alcove above shower receptor; available as individual panels or as kits.
   1. See Plumbing Specifications for shower receptors.
   2. Panel Thickness: 1/4 inch thick, minimum.

B. Configuration and Dimensions: As indicated on drawings.

C. Panel: Smooth.

D. Trims: Inside Wedge Corner Molding and Outside Corner Perimeter Trim.

E. Seams: Soft seam with batten strip.

2.4 MATERIALS

A. Cast Polymer Surround Material: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, renewable material filler, and pigments; homogenous, nonporous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
   1. Resin: Proprietary; integrally-colored, stain-resistant and resistant to domestic chemicals and cleaners.
   2. Surface Burning Characteristics: Flame spread index of 25 or less, and smoke developed index of 450 or less, Class A, when tested in accordance with ASTM E84.
   3. Color and Pattern: As indicated.

B. Sealant: One-part mildew-resistant silicone sealant, complying with ASTM C920, clear.

2.5 ACCESSORIES

A. Shelves: Polymer material with mold-resistant coating.
   1. Type: Accessory.
   2. Size: As indicated on drawings.
   3. Products: Inpro; Prim Solid Surface 12" by 18" Toiletry Shelf.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Do not begin installation until supports and adjacent substrates are complete.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean substrates thoroughly prior to installation.

B. Prepare substrates as recommended by the manufacturer.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved shop drawings.

B. Clean substrates, removing projections, filling voids, and sealing joints.

C. Set units level, plumb, and true to line, without warp or rack of frames and panels, and anchor securely in place.

D. Fasten components securely in place, with provisions for thermal movement. Install with concealed fasteners unless otherwise indicated.

E. Repair, refinish, or replace components damaged during installation.

3.4 FIELD QUALITY CONTROL

A. Verify enclosure does not leak while shower is running.

3.5 CLEANING

A. Remove protective film and temporary stickers from exposed metal and glass surfaces.

3.6 PROTECTION

A. Protect installed products until Date of Substantial Completion.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 10 2819

SECTION 10 4400 - FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

1.2 ACTION SUBMITTALS

A. Product Data: Provide extinguisher operational features, extinguisher ratings and classifications, and color and finish.

B. Shop Drawings: Indicate locations of cabinets, cabinet physical dimensions, rough-in measurements for recessed cabinets, locations of individual fire extinguishers, mounting measurements for wall bracket, anchorage details, and accessories required for complete installation.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Include test, refill, or recharge schedules and recertification requirements.

1.4 FIELD CONDITIONS

A. Do not install extinguishers when ambient temperature causes freezing of extinguisher ingredients.

1.5 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.6 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.

B. Warranty Period: Six years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Products: Provide products indicated as Basis-of-Design or comparable products by manufacturers listed.

B. Fire Extinguishers:
1. Activar Construction Products Group, Inc. - JL Industries; Cosmic Extinguisher - Multipurpose Chemical.
2. Ansul, a Tyco Business.
3. Kidde, a unit of United Technologies Corp.
4. Oval Brand Fire Products.

C. Fire Extinguisher Cabinets and Accessories:
1. Activar Construction Products Group, Inc. - JL Industries; Ambassador Series.
2. Kidde, a unit of United Technologies Corp.
3. Larsen's Manufacturing Co.
4. Oval Brand Fire Products.

2.2 FIRE EXTINGUISHERS

A. General Requirements: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated on drawings.

B. Multipurpose Dry-Chemical-Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
1. Class: A:B:C.
2. Size: 5 lb.
3. Finish: Baked polyester powder coat; color as selected by Architect.
4. Temperature Range: Minus 65 to 120 degrees F.

2.3 FIRE EXTINGUISHER CABINETS

A. Fire Rating: Listed and labeled in accordance with ASTM E814 requirements for fire-resistance rating of walls where cabinet installed.

B. Cabinet Construction: Non-fire rated.
1. Formed primed steel sheet; 20-gauge, 0.036-inch thick base metal.

C. Fire-Rated Cabinet Construction: One-hour fire rated.
1. Steel; double wall or outer and inner boxes with 5/8-inch thick fire barrier material.

D. Cabinet Configuration: Recessed type.
1. Size to accommodate accessories.
2. Trim: Flat square edge, with 2-inch wide face.
3. Provide cabinet enclosure with right-angle inside corners and seams and with formed perimeter trim.

E. Door: 20-gauge, 0.036-inch metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180-degree opening with two butt hinges.

F. Door Glazing: Float glass, clear, 1/8 inch thick, and set in resilient channel glazing gasket.

G. Cabinet Mounting Hardware: Appropriate to cabinet, with predrilled holes for placement of anchors.

H. Fabrication: Weld, fill, and grind components smooth.

I. Finish of Cabinet Exterior Trim and Door: Primed for field paint finish.
   1. See Section 09 9123 for field painting.

J. Finish of Cabinet Interior: White colored enamel.

2.4 ACCESSORIES

A. Extinguisher Brackets: Formed steel, chrome-plated.

B. Lettering: FIRE EXTINGUISHER text on decal or self-adhesive vinyl, prespaced black lettering in accordance with authorities having jurisdiction.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify dimensions, tolerances, and interfaces with other work.

B. Verify substrate and site conditions for product installation are in accordance with manufacturer's written instructions.

C. Verify rough openings for cabinet are sized and located in accordance with manufacturer's written instructions.

D. Notify Architect in writing of conditions detrimental to completion of work. Do not proceed with installation until detrimental conditions are corrected.

3.2 INSTALLATION

A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction and manufacturer's instructions.

B. Install cabinets plumb and level in wall openings, 42 inches from finished floor to inside bottom of cabinet.

C. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.
   1. Mounting Height: Top of fire extinguisher to be at 42 inches above finished floor.

D. Place extinguishers and accessories in cabinets and on wall brackets.

E. Position cabinet signage at left of cabinet.

3.3 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 10 4400

SECTION 10 5126 - PLASTIC LOCKERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Solid plastic lockers.

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 lockers can be supported and installed as indicated.

1.3 ACTION SUBMITTALS

A. Product Data: Manufacturer's published data on locker construction, sizes and accessories.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal locker.

B. Shop Drawings: Indicate locker plan layout, numbering plan.
1. Include plans, elevations, sections, and attachment details.
2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
3. Show locations and sizes of cutouts and holes for items installed in lockers.
4. Show locker fillers, trim, base, sloping tops, and accessories.
5. Include locker identification system and numbering sequence.

C. Samples: Submit two samples 3 by 6 inches in size, of each color scheduled.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms 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. The following metal locker hardware items equal to 20 percent of amount installed for each type and finish installed, but no fewer than 10 units:
a. Locks.
b. Blank identification plates.

c. Hooks.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum 5 years documented experience.

B. Installer's Qualifications: Engage an installer, with minimum 3 years experience, who has successfully completed installation of the type of lockers and extent to that indicated for this project.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Environmental Limitations: Do not deliver or install lockers until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F during the remainder of the construction period.

B. Field Measurements: Where lockers are 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 lockers by field measurements before being enclosed, and indicate measurements on Shop Drawings.

C. Protect locker finish and adjacent surfaces from damage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Solid Plastic Lockers: Provide basis-of-Design product indicated on Equipment Schedule (EQ-#) or submit for Architect's review comparable product by one of the following:
1. Columbia Lockers, a division of PSiSC.
2. Scranton Products.

2.2 LOCKER APPLICATIONS

A. EQ26: Solid plastic lockers, recessed mounted.
1. Locker Configuration: Six tier.
2. Fittings: Size and configuration as indicated on drawings.
3. Locking: Padlock hasps, for padlocks provided by Owner.

B. EQ27: Solid plastic lockers, recessed mounted.
1. Locker Configuration: Single tier.
2. Fittings: Size and configuration as indicated on drawings.
3. Locking: Padlock hasps, for padlocks provided by Owner.

C. EQ39: Solid plastic lockers, recessed mounted.
1. Locker Configuration: Two tier.
2. Fittings: Size and configuration as indicated on drawings.
3. Locking: Padlock hasps, for padlocks provided by Owner.

2.3 SOLID PLASTIC LOCKERS

A. Accessibility: Comply with ICC A117.1 and ADA Standards.

B. Lockers: Factory assembled, made of solid plastic panels, tested in accordance with NFPA 286, homogenous color throughout.
1. Material: Solid high density polyethylene (HDPE).
2. Doors: Full overlay without frame.
3. Locker Body Construction: Manufacturer's standard for selected product.
4. Where locker ends or sides are exposed, provide same finish as fronts or provide extra panels to match fronts.
5. Provide filler strips where indicated, securely attached to lockers.
6. Body and Door Color: as indicated on Equipment Schedule.

C. Component Thicknesses:
1. Doors: 1/2 inch minimum thickness.
2. Locker Body: Tops, bottoms, backs, and shelves 3/8 inch minimum.
3. End Panels and Filler Panels: 1/2 inch minimum thickness.

D. Hinges: Full height of locker, manufacturer's standard heavy duty type.

E. Coat Hooks: High impact plastic.

F. Number Plates: Provide rectangular shaped aluminum plates. Form numbers 1/2 inch high of block font style with ADA designation, in contrasting color.

G. Built-In Lock Boxes: Same material as locker, manufacturer's standard size, with padlock hasps, for padlocks provided by Owner.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that prepared bases are in correct position and configuration.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Place and secure on prepared base.

C. Install lockers level, plumb, and true; shim as required, using concealed shims.
1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion.
2. Anchor single rows of plastic lockers to walls near top and bottom of lockers.

D. Secure lockers with anchor devices to suit substrate materials. Minimum Pullout Force: 100 pounds.

E. Bolt adjoining locker units together to provide rigid installation.

F. Install filler panels.

G. Trim: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.
1. Attach recess trim to recessed plastic lockers with concealed clips.
2. Attach filler panels with concealed fasteners. Locate filler panels where indicated on Drawings or where required to close off spaces between end lockers and adjacent construction.
3. Attach finished end panels using fasteners only at perimeter to conceal exposed ends of nonrecessed plastic lockers.

H. Install fittings if not factory installed.

I. Replace components that do not operate smoothly.

3.3 ADJUSTING

A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding. Verify that integral locking devices operate properly.

3.4 PROTECTION AND CLEANING

A. Protect plastic lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.

B. Touch up marred finishes, or replace plastic lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

C. Clean locker interiors and exterior surfaces.

END OF SECTION 10 5126

SECTION 10 7316.13 - METAL CANOPIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Attached metal canopies.

1.2 ACTION SUBMITTALS

A. Product Data: Submit product data sheets, including material descriptions and finishes, and preparation instructions and recommendations.

B. Shop Drawings: Prior to commencement of fabrication, submit detailed shop drawings, showing profiles, sections of components, finishes, and fastening details.

C. Design Data: Submit comprehensive structural analysis of design for the specified loads. Stamp and sign calculations by professional engineer.

1.3 INFORMATIONAL SUBMITTALS

A. Designer's Qualification Statement.

B. Manufacturer's Qualification Statement.

C. Erector's Qualification Statement.

D. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.4 QUALITY ASSURANCE

A. Designer Qualifications: Perform design under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
   1. Comply with applicable code for submission of design calculations as required for acquiring permits.
   2. Cooperate with regulatory agency or authorities having jurisdiction (AHJ), and provide data as requested.

B. Manufacturer Qualifications: Company specializing in the manufacture of products similar to those required for this project.
   1. Not less than three years of documented experience.

C. Erector Qualifications: Company specializing in performing the work of this section.
   1. Not less than three years of documented experience and approved by canopy manufacturer.

D. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and no more than 12 months before start of scheduled welding work.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site ready for erection.

B. Package using methods that prevent damage during shipping and storage on site.

C. Store materials under cover and elevated above grade.

1.6 WARRANTY

A. Metal Canopies: Correct defective work within a two year period after Date of Substantial Completion.

B. Finish Warranty: Provide manufacturer's one year warranty on factory finish against cracking, peeling, and blistering.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Metal Canopies: Provide Basis-of-Design product indicated or comparable product submitted for Architect's review.
1. Basis-of-Design Product: Mapes Industries; Super Lumideck.

2.2 METAL CANOPIES

A. Configuration: Layout and dimensions, column layout, canopy clearance, fascia profile, and roof covering design as indicated on drawings.
1. Installation: Cantilever-mounted to building structure with tension members.
2. Structural Framing System: Aluminum.
3. Covering Material: Aluminum.
4. Drainage Concept: Water collected in decking conducted into perimeter gutters and discharged through downspouts.

B. Performance Requirements:
1. Design and fabricate metal canopy system to resist wind, snow, live, and seismic loads without failure, damage, or permanent deflection in accordance with ASCE 7:
   a. Loads: As indicated on drawings.
2. Thermal Movement: Design canopy system to accommodate thermal movement caused by ambient temperature range of 120 degrees F and surface temperature range of 180 degrees F without buckling, failure of joint seals, undue stress on fasteners or other detrimental effects on assembly components.

2.3 COMPONENTS

A. Structural Aluminum Framing: Alloy and temper 6063-T5, 6063-T6, or 6061-T6.

1. Extruded Shapes and Tubes: ASTM B221 (ASTM B221M).
2. Rolled or Extruded Structural Shapes: ASTM B308/B308M.
3. Extruded Structural Pipe and Tube: ASTM B429/B429M.
4. Sheet and Plate: Alloy 5052, 5005, or 6061-T651, ASTM B209/B209M.

B. Covering:
1. Aluminum Decking:
a. Interlocking extruded aluminum decking modules.
1) Extruded Decking: ASTM B221 (ASTM B221M), Alloy and temper 6005-T5, 6061-T6, or 6063-T6.
b. Decking Orientation: Perpendicular to sidewalk.

C. Fascia: Same material as structural framework, 3 inches high.

D. Anchor Bolts: ASTM A307 or ASTM A572/A572M, formed with bent shank, assembled with template for casting into concrete.
1. Minimum exposed thread of 7 inches above footing and 23 inch minimum embedment.
2. Provide nuts and washers as required for column leveling and plumbing.

E. Concrete Footings: Refer to Section 03 3000 for additional requirements.

F. Exposed Gutters and Downspouts: Anodized aluminum , color to match canopy covering, manufacturer's recommended size for canopy specified.

2.4 SHOP FABRICATION

A. Provide a complete system ready for erection at project site.

B. Shop fabricate to the greatest extent possible; disassemble if necessary for shipping.

C. Weld aluminum members in accordance with AWS D1.2/D1.2M.

D. Fabricate connections for bolt, nut, and washer connectors.

2.5 FINISHES

A. Aluminum Framing and Decking:
1. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41, clear anodic coating not less than 0.7 mils thick.

2.6 ACCESSORIES

A. Structural Bolts: ASTM F3125/F3125M, Grade A325, minimum 3/4 inch diameter.

B. Trim, Closure Pieces, and Flashings: Same material, thickness and finish as sheet metal decking; factory-fabricated to required profiles.
1. Exposed Fasteners: Not permitted.

C. Fasteners, Non-Structural: ASTM F593 stainless steel or ASTM A307 carbon steel.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates and site area for conditions that might prevent satisfactory installation.

B. Verify placed anchors are in correct position.

C. Verify that bearing surfaces are ready to receive this work.

D. Do not proceed with installation until all conditions are satisfactory.

3.2 INSTALLATION - FRAMING

A. Provide for erection and wind loads. Provide temporary bracing to maintain structure plumb and in alignment until completion of erection and installation.

B. Set column base plates with non-shrink grout to achieve full plate bearing.

C. Do not field cut or alter structural members without approval.

D. After erection, prime welds, abrasions, and surfaces not shop primed.

3.3 INSTALLATION - CANOPY COVERING

A. Install in accordance with manufacturer's instructions.

B. Fasten metal decking to metal support members, aligned level and plumb.

C. Install fascia panels, trim, and flashing.

D. Separate dissimilar metals using concealed bituminous paint.

E. Touch-up damaged finish coating using material provided by manufacturer to match original coating.

3.4 TOLERANCES

A. Maximum Variation from Level: Plus/Minus 1/8 inch.

3.5 CLEANING

A. Clean surfaces of dust and debris; follow manufacturer's cleaning instructions for the finish used.

3.6 PROTECTION

A. Protect canopy after installation to prevent damage due to other work until Date of Substantial Completion.

END OF SECTION 10 7316.13

SECTION 10 7500 - FLAGPOLES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Aluminum Flagpoles.

1.2 ACTION SUBMITTALS

A. Product Data: Provide data on pole, accessories, and configurations.

B. Shop Drawings: Indicate detailed dimensions of individual components and profiles, base details, anchor requirements, and imposed loads.

1.3 INFORMATIONAL SUBMITTALS

A. Designer's Qualification Statement.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: Provide lubrication and periodic maintenance requirement schedules.

1.5 QUALITY ASSURANCE

A. Designer Qualifications: Design flagpole foundation under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed the State in which the Project is located.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Spiral wrap flagpole with protective covering and pack in protective shipping tubes or containers.

B. Protect flagpole and accessories from damage or moisture.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Flagpoles: Provide Basis-of-Design product indicated or comparable product by one of the listed manufacturers.
   1. Liberty Flagpoles.
   2. Concord American Flagpole.
   3. Morgan-Francis Flagpoles & Accessories.
   4. Pole-Tech Co, Inc.
   5. Eder Flags.

2.2 FLAGPOLES

A. Flagpoles: Designed in accordance with NAAMM FP 1001
   1. Pole #1: Tallest
      a. Basis of Design Product: Eder Flags; ECX30 - External Double Halyard.
      b. Material: Aluminum.
      c. Design: Cone tapered.
      d. Mounting: Ground mounted type.
      e. Outside Butt Diameter: 5 inches.
      f. Outside Tip Diameter: 3 inches.
      g. Nominal Wall Thickness: 0.125 inches.
      h. Nominal Height: 30 feet; measured from nominal ground elevation.
      i. Halyard: External type, cleat.
      j. Finial: Eagle; Aluminum.
      k. Flag Type:
         1) Flags shall be provided Owner.
   2. Pole #2: Mid-height
      a. Basis of Design Product: Eder Flags; ECX25 - External Double Halyard.
      b. Material: Aluminum.
      c. Design: Cone tapered.
      d. Mounting: Ground mounted type.
      e. Outside Butt Diameter: 5 inches.
      f. Outside Tip Diameter: 3 inches.
      g. Nominal Wall Thickness: 0.125 inches.
      h. Nominal Height: 25 feet; measured from nominal ground elevation.
      i. Halyard: External type, cleat.
      j. Finial: Ball; Aluminum.
      k. Flag Type:
         1) Flags shall be provided Owner.

B. Performance Requirements:
   1. Wind Pressure Loading on Flagpole with Flag: Resistant without permanent deformation to 120 miles/hr wind speed, in accordance with NAAMM FP 1001; the factor of safety used is 2.5.

2.3 POLE MATERIALS

A. Aluminum: ASTM B241/B241M , 6063 alloy , T6 temper.

2.4 ACCESSORIES

A. Finial Ball: Aluminum, 5 inch diameter.

B. Finial Eagle: Aluminum, Architect to select from manufacturer's full range.

C. Truck Assembly: Cast aluminum; revolving, stainless steel ball bearings, non-fouling.

D. Flag: Owner-Furnished, Owner-Installed.

E. Cleats: 9 inch size, aluminum with galvanized steel fastenings, one per halyard.

F. Cleat Box: Aluminum, with built-in hinge and hasp assembly, attached to pole with tamper proof screws inside box.

G. Halyard: 5/16 inch diameter polypropylene, braided, white.

H. Flash Collar: Aluminum collar; snug fit to pole covering foundation sleeve/concrete joint at base of pole.

2.5 MOUNTING COMPONENTS

A. Foundation Tube Sleeve: AASHTO M 36, corrugated 16 gauge, 0.0598 inch steel, galvanized, depth of 26 inches.

B. Pole Base Attachment: Sleeve; aluminum base with base cover.

C. Lightning Ground Rod: 12 inch long copper rod, 3/4 inch diameter.

2.6 FINISHING

A. Metal Surfaces in Contact With Concrete: Asphaltic paint.

B. Concealed Steel Surfaces: Galvanized to ASTM A123/A123M requirements.

C. Aluminum: Architect to select from Manufacturer's full range.

D. Finial: Gold anodized finish.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that concrete foundation is ready to receive work and dimensions are as indicated on shop drawings.

3.2 PREPARATION

A. Coat metal sleeve surfaces below grade and surfaces in contact with dissimilar materials with asphaltic paint.

3.3 INSTALLATION

A. Install flagpole, base assembly, and fittings in accordance with manufacturer's instructions.

B. Electrically ground flagpole installation.

C. Fill foundation tube sleeve with sand and compact.

D. Install foundation plate and centering wedges for flagpoles base set in concrete base and fasten.

3.4 TOLERANCES

A. Maximum Variation From Plumb: 1 inch.

3.5 ADJUSTING

A. Adjust operating devices so that halyard and flag function smoothly.

END OF SECTION 10 7500

SECTION 11 9000 - MISCELLANEOUS EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Air Reels.

B. Power Reel.

1.2 ACTION SUBMITTALS

A. Product Data: for each type of product.
   1. Allow for Architect to select options not identified in Drawings or specifications.

PART 2 PRODUCTS

2.1 MANUFACTURED UNITS

A. Basis-of-Design Products: Provide the following units as indicated on Equipment Schedule or comparable products submitted for Architect's review:
   1. EQ30: Air Hose Reel: Low pressure 3-inch inside diameter hose with reel.
      a. Cable Length: 70 ft.
      b. Max Pressure: 300 psi.
      c. Input Hose Fitting: 3/8.
      d. Outside Diameter: 0.65 inch.
      e. Features:
         1) Spring rewind and ratchet hook.
         2) multi-position four roller guide and adjustable hose stop.
   2. EQ34: Electrical Hose Reel: Cord and cable reel, 25-feet, 10A 125V with manufacturer's connector.
      a. UL 355 Listed.
      b. Cable Length: 25 ft.
      c. Amps: 10
      d. Volts: 125 AC.
      e. Cable type: #16/3 SJT.
      f. Watts, max: 1250.
      g. Features:
         1) Automatic ratchchet lock holds cord and provides retraction of cord.
         2) attached plug for power cord requires no wiring.
   3. EQ35: Air Compressor: Cast-iron, electric 2-stage compressor.
      a. Capacity: 60 gallons.
      b. 5 horsepower.
      c. Pressure: 14.3 ACFM @ 175 PSIG.
      d. Reciever: 60 vertical.

e. Weight: 400 pounds.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install per manufacturer's installation instructions at locations indicated on drawings.

END OF SECTION 11 9000

SECTION 12 2400 - WINDOW SHADES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Interior manual roller shades.

1.2 ACTION SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets, including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.
   1. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.

B. Shop Drawings: Include shade schedule indicating size, location and keys to details, head, jamb and sill details, mounting dimension requirements for each product and condition, and operation direction.

C. Verification Samples: Minimum size 6 inches square, representing actual materials, color and pattern.

1.3 INFORMATIONAL SUBMITTALS

A. Certificates: Manufacturer's documentation that line voltage components are UL listed or UL recognized.

B. Source Quality Control Submittals: Provide test reports indicating compliance with specified fabric properties.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of shop drawings.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of this type with minimum 3 years of documented experience with shading systems of similar size and type.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.

B. Handle and store shades in accordance with manufacturer's recommendations.

1.7 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Interior Manually Operated Roller Shades: Provide products indicated on Equipment Schedule or submit for Architect's review comparable products from one of the following:
1. Draper, Inc.
2. Hunter Douglas Architectural.
3. Inpro Corporation.
4. SWFcontract, a division of Springs Window Fashions, LLC..

2.2 ROLLER SHADES

A. General:
1. Provide shade system components that are easy to remove or adjust without removal of mounted shade brackets.
2. Provide shade system that operates smoothly when shades are raised or lowered.

B. Roller Shades Type EQ37:
1. Description - Interior Roller Shades: Single roller, manually operated fabric window shade system complete with mounting brackets, roller tubes, hembars, hardware, and accessories.
   a. Drop Position: Regular roll.
   b. Roll Direction: Roll down, closed position is at window sill.
   c. Size: As indicated on drawings.
   d. Fabric: As indicated under Shade Fabric article.
2. Brackets and Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
   a. Material: Stamped steel.
3. Roller Tubes: As required for type of shade operation.
   a. Material: Extruded aluminum, clear anodized finish.
   b. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.
   c. Fabric Attachment: Utilize extruded channel in tube to accept vinyl spline welded to fabric edge.
4. Hembars: Designed to maintain bottom of shade straight and flat.
   a. Style: Full wrap fabric covered bottom bar, flat profile with heat sealed closed ends.

C. Roller Shades Type EQ38:
1. Description - Interior Roller Shades: Double roller, manually operated fabric window shade system complete with mounting brackets, roller tubes, hembars, hardware, and accessories.
   a. Drop Position: Regular roll.
   b. Roll Direction: Roll down, closed position is at window sill.
   c. Size: As indicated on drawings.
   d. Fabric: As indicated under Shade Fabric article.
2. Brackets and Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
   a. Per drawings, provide manufacturer's bracket #10.
   b. Material: Stamped steel.

c. Double Roller Brackets: Configured for light-filtering and room-darkening shades in one opening.
   1) Light-Filtering Fabric: Room-side of opening.
   2) Room-Darkening Fabric: Glass-side of opening.

3. Roller Tubes: As required for type of shade operation.
   a. Material: Extruded aluminum, clear anodized finish.
   b. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.
   c. Fabric Attachment: Utilize extruded channel in tube to accept vinyl spline welded to fabric edge.
4. Hembars: Designed to maintain bottom of shade straight and flat.
   a. Style: Full wrap fabric covered bottom bar, flat profile with heat sealed closed ends.

2.3 SHADE FABRIC

A. Fabric for Light-Filtering Shades: Nonflammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.
   1. Material: 100 percent polyester.
   2. Material Certificates and Product Disclosures:
      a. Cradle to Cradle Material Health Certificate: Achievement level of Bronze.
      b. Health Product Declaration (HPD): Complete, published declaration with full disclosure of known hazards.
      c. Environmental Product Declaration (EPD): Complete, published declaration and life cycle analysis.
      d. Declare Label: Published label with disclosure of Red List status.
   3. Performance Requirements:
      a. Flammability: Pass NFPA 701 large and small tests.
   4. Openness Factor: 1 %.
   5. Weight: 8.88 ounces per square yard.
   6. Roll Width: 118 inches.

B. Fabric for Room-Darkening Shades: Nonflammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.
   1. Material: Polyester with acrylic backing.
   2. Material Certificates and Product Disclosures:
      a. Health Product Declaration (HPD): Complete, published declaration with full disclosure of known hazards.
      b. Environmental Product Declaration (EPD): Complete, published declaration and life cycle analysis.
   3. Performance Requirements:
      a. Flammability: Pass NFPA 701 large and small tests.
   4. Weight: 11.50 ounces per square yard.
   5. Roll Width: 126 inches.

2.4 ROLLER SHADE FABRICATION

A. Field measure finished openings prior to ordering or fabrication.

B. Dimensional Tolerances: Fabricate shades to fit openings within specified tolerances.
   1. Vertical Dimensions: Fill openings from head to sill with 1/2 inch space between bottom bar and window sill.
   2. Horizontal Dimensions - Inside Mounting: Fill openings from jamb to jamb.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine finished openings for deficiencies that may preclude satisfactory installation.

B. Start of installation shall be considered acceptance of substrates.

3.2 PREPARATION

A. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.

B. Coordinate with window installation and placement of concealed blocking to support shades.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.

B. Replace shades that exceed specified dimensional tolerances at no extra cost to Owner.

C. Adjust level, projection, and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.4 CLEANING

A. Clean soiled shades and exposed components as recommended by manufacturer.

B. Replace shades that cannot be cleaned to "like new" condition.

3.5 PROTECTION

A. Protect installed products from subsequent construction operations.

B. Touch-up, repair, or replace damaged products before Substantial Completion.

END OF SECTION 12 2400

SECTION 12 3661 - SIMULATED STONE COUNTERTOPS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Simulated stone countertops.
2. Simulated stone backsplashes.
3. Simulated stone end splashes.
4. Simulated stone apron fronts.

1.2 ACTION SUBMITTALS

A. Product Data: For countertop materials and accessories.

B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for fittings and 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.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For simulated stone countertop 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.

1.5 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 indicated on Drawings.

2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 FIELD CONDITIONS

A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

1.7 COORDINATION

A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Countertops and supports: in accordance with ANSI/AWI 1236 - Countertops.

2.2 COUNTERTOP MATERIALS

A. SS-1, Solid Surface Material: Homogeneous-filled plastic resin complying with ISFA 2-01.
1. Basis-of-Design Products: per Interior Material Schedule or submit for Architect's review comparable products by one of the following:
   a. Corian.
   b. Formica Corporation.
   c. LX Hausys.
   d. Krion.
   e. Meganite Inc.
   f. Terreon.
   g. Wilsonart LLC.
2. Type: Provide Standard type unless Special Purpose type is indicated.
3. Colors and Patterns: As indicated by manufacturer's designations.

B. QZ-1 and QZ-2, Quartz Agglomerate: Solid sheets consisting of quartz aggregates bound together with a matrix of polymers, resins, and pigment and complying with ISFA 3-01.
1. Basis-of-Design Products: per Interior Material Schedule or submit for Architect's review comparable products by one of the following:
   a. Evero.
   b. Cambria.
   c. Cosentino North America; C&C North America, Inc.
   d. Corian.
   e. LX Hausys.
   f. Meganite Inc.
   g. MSI Surfaces.
   h. Wilsonart LLC.
2. Colors and Patterns: As indicated by manufacturer's designations.
3. QZ-1, Surface finish: Gloss.

C. Composite Wood Products: Formaldehyde emission rates shall not be greater than the following when tested according to ASTM D 6007 or ASTM E1333:
   1. Hardwood Plywood: 0.05 ppm.

D. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

2.3 FABRICATION

A. Fabricate countertops according to simulated stone countertop manufacturer's written instructions and to the AWI/AWMAC/WI's "Architectural Woodwork Standards."
   1. Grade: Premium.

B. Countertops:
   1. 3/4-inch- (19-mm-) thick, simulated stone countertop with front edge built up with same material.

C. Backsplashes: 3/4-inch- (19-mm-) thick, simulated stone countertop.

D. Fabricate tops with shop-applied edges unless otherwise indicated. Comply with simulated stone countertop manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
   1. Fabricate with loose backsplashes for field assembly.

E. Joints:
   1. Fabricate countertops without joints, unless unavoidable.
   2. Fabricate countertops in sections for joining in field.
      a. 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.
      b. For quartz agglomerate countertops:
         1) Joint Type, Bonded: 1/32 inch or less in width.
         2) Joint Type, Grouted: 1/16 inch in width.
         3) Joint Type, Sealant Filled: 1/16 inch in width.
      c. Splined Joints: Accurately cut kerfs in edges at joints for insertion of metal splines to maintain alignment of surfaces at joints where indicated. Make width of cuts slightly more than thickness of splines to provide snug fit. Provide at least three splines in each joint.

F. 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.

2.4 INSTALLATION MATERIALS

A. Adhesive: Product recommended by simulated stone countertop manufacturer.
   1. Adhesives shall have a VOC content of 70 g/L or less.

B. Sealant for Countertops: Comply with applicable requirements in Section 07 9200 - Joint Sealants.

C. Countertop Support Brackets:
1. Manufacturer: Centerline Brackets or comparable manufacturer submitted for Architect's review.
2. Bracket Types:
   a. Concealed Island Support.
   b. Floating Wall Mount Bracket.
   c. T-Bracket or Hidden flat bracket designed for hidden countertop support, ponywall support, or island support.
3. Length: provide as required to support weight and overhang length of countertop.
4. Loads: furnish brackets designed to withstand loads of countertops.

2.5 ACCESSORIES

A. Grommets:
1. EQ56, Trash Management:
   a. Basis-of-Design: Doug Mockett; TM12B or submit comparable product for Architect's review.
2. Finish: matte black.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates to receive simulated stone countertop 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 subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.

C. Secure countertops to subtops with adhesive according to simulated stone countertop manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

D. 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. 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.

E. 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.

F. 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.

G. 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.

H. Apply sealant to gaps at walls; comply with Section 07 9200 - Joint Sealants.

END OF SECTION 12 3661

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SECTION 13 3419 - METAL BUILDING SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Manufacturer-engineered, shop-fabricated structural steel building frame.

B. Insulated Metal wall and roof panels including gutters and downspouts.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.
1. Review methods and procedures related to metal building systems including, but not limited to, the following:
   a. Condition of foundations and other preparatory work performed by other trades.
   b. Structural load limitations.
   c. Construction schedule. Verify availability of materials and erector's personnel, equipment, and facilities needed to make progress and avoid delays.
   d. Required tests, inspections, and certifications.
   e. Unfavorable weather and forecasted weather conditions and impact on construction schedule.
2. Review methods and procedures related to metal roof panel assemblies including, but not limited to, the following:
   a. Compliance with requirements for purlin and rafter conditions, including flatness and attachment to structural members.
   b. Structural limitations of purlins and rafters during and after roofing.
   c. Flashings, special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect metal roof panels.
   d. Temporary protection requirements for metal roof panel assembly during and after installation.
   e. Roof observation and repair after metal roof panel installation.
3. Review methods and procedures related to metal wall panel assemblies including, but not limited to, the following:
   a. Compliance with requirements for support conditions, including alignment between and attachment to structural members.
   b. Structural limitations of girts and columns during and after wall panel installation.
   c. Flashings, special siding details, wall penetrations, openings, and condition of other construction that will affect metal wall panels.
   d. Temporary protection requirements for metal wall panel assembly during and after installation.
   e. Wall observation and repair after metal wall panel installation.

1.3 ACTION SUBMITTALS

A. Product Data: Provide data on profiles, component dimensions, fasteners.

B. Shop Drawings: Indicate assembly dimensions, locations of structural members, connections, attachments, openings, cambers, and loads; wall and roof system dimensions, panel layout, general construction details, anchors and methods of anchorage, and installation; framing anchor bolt settings, sizes, locations from datum, and foundation loads; indicate welded connections with AWS A2.4 welding symbols; indicate net weld lengths; provide professional seal and signature.
   1. Metal Wall Panel Layout Drawings: Show layouts of panels including methods of support. Include details of edge conditions, joints, panel profiles, corners, anchorages, clip spacing, trim, flashings, closures, and special details. Distinguish between factory- and field-assembled work; show locations of exposed fasteners.
      a. Show wall-mounted items including personnel doors, vehicular doors, windows, louvers, and lighting fixtures.
   2. Accessory Drawings: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches:
      a. Flashing and trim.
      b. Gutters.
      c. Downspouts.

C. Delegated Design Submittals: For metal building systems.
   1. Include analysis data indicating compliance with performance requirements and design data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Manufacturer's Instructions: Indicate preparation requirements, anchor bolt placement.

E. Erection Drawings: Indicate members by label, assembly sequence, and temporary erection bracing.

1.4 INFORMATIONAL SUBMITTALS

A. Designer's Qualification Statement.

B. Manufacturer's Qualification Statement: Provide documentation showing metal building manufacturer is accredited under IAS AC472.
   1. Include statement that manufacturer designs and fabricates metal building system as integrated components and assemblies, including but not limited to primary structural members, secondary members, joints, roof, and wall cladding components specifically designed to support and transfer loads and properly assembled components form a complete or partial building shell.

C. Erector's Qualification Statement.

D. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

E. Letter of Design Certification: Signed and sealed by a qualified professional engineer. Include the following:
   1. Name and location of Project.
   2. Order number.
   3. Name of manufacturer.
   4. Name of Contractor.
   5. Building dimensions including width, length, height, and roof slope.

6. Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard.
7. Governing building code and year of edition.
8. Design Loads: Include dead load, roof live load, collateral loads, roof snow load, deflection, wind loads/speeds and exposure, seismic design category or effective peak velocity-related acceleration/peak acceleration, and auxiliary loads.
9. Load Combinations: Indicate that loads were applied acting simultaneously with concentrated loads, according to governing building code.
10. Building-Use Category: Indicate category of building use and its effect on load importance factors.

F. Material Test Reports: For each of the following products:
1. Structural steel including chemical and physical properties.
2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
3. Tension-control, high-strength, bolt-nut-washer assemblies.
4. Shop primers.

1.5 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of concealed components and utilities.

1.6 QUALITY ASSURANCE

A. Designer Qualifications: Design structural components, develop shop drawings, and perform shop and site work under direct supervision of a Professional Structural Engineer experienced in design of this type of work.
1. Design Engineer Qualifications: Licensed in the State in which the Project is located.
2. Cooperate with regulatory agency or authorities having jurisdiction (AHJ), and provide data as requested.

B. Perform work in accordance with AISC 360 and MBMA (MBSM).
1. Maintain one copy on site.

C. Manufacturer Qualifications: Company specializing in the manufacture of products similar to those required for this project.
1. Not less than three years of documented experience.
2. Accredited by IAS in accordance with IAS AC472.
3. Engineering Responsibility: Preparation of comprehensive engineering analysis and Shop Drawings by a professional engineer who is legally qualified to practice in jurisdiction where Project is located.

D. Erector Qualifications: An experienced erector who specializes in erecting and installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer.

E. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and AWS D1.3, and no more than 12 months before start of scheduled welding work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, sheets, panels, and other manufactured items so as not to be damaged or deformed.

B. Unload, store, and erect materials in a manner to prevent bending, warping, twisting, and surface damage.

1.8 WARRANTY

A. Provide 20 year manufacturer warranty for metal building system.
   1. Include coverage for exterior pre-finished surfaces to cover pre-finished color coat against chipping, cracking or crazing, blistering, peeling, chalking, or fading. Include coverage for weather tightness of building enclosure elements after installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Metal Buildings Systems:
   1. Butler Manufacturing Company.
   2. Ceco Building Systems.
   3. Chief Buildings.
   4. Kirby Building Systems, a Nucor Company.
   5. Metallic Building Systems.
   6. Nucor Building Systems.
   7. Red Dot Buildings.
   8. VP Buildings.

2.2 SYSTEM DESCRIPTION

A. Provide a complete, integrated set of mutually dependent components and assemblies that form a metal building system capable of withstanding structural and other loads, thermally induced movement, and exposure to weather without failure or infiltration of water into building interior.

2.3 ASSEMBLIES

A. Rigid Modular: Solid-member, structural-framing system with interior columns.

B. Primary Framing: Rigid frame of rafter beams and columns, intermediate columns, braced end frames, and end wall columns, and wind bracing.

C. Secondary Framing: Purlins, Girts, and Eave struts, and other items detailed.

D. Wall System: Preformed metal panels of vertical profile, with sub-girt framing/anchorage assembly and insulation, and accessory components. Refer to Section 07 4213 - Metal Wall Panels for selected materials and installation requirements.

E. Roof System: Preformed metal panels oriented parallel to eave, with sub-girt framing/anchorage assembly and insulation, and accessory components. Refer to Section 07 4113 - Metal Roof Panels for selected materials and instalaltion requirements.

2.4 PERFORMANCE REQUIREMENTS

A. Installed Thermal Resistance of Wall System: R-value of 30.

B. Installed Thermal Resistance of Roof System: R-Value of 30.

C. Design structural members to withstand dead load, applicable snow load, and design loads due to pressure and suction of wind calculated in accordance with design load schedule.
   1. Deflection and Drift Limits:
      a. No greater than the following:
         1) Purlins and Rafters: Vertical deflection of 1/240 of the span.
         2) Girts: Horizontal deflection of 1/240 of the span, except at brick veneer locations where deflection shall be 1/600 of the span.
         3) Metal Roof Panels: Vertical deflection of 1/240 of the span.
         4) Design secondary-framing system to accommodate deflection of primary framing and construction tolerances, and to maintain clearances at openings.
            a) Framing at Masonry Veneer Assemblies: Horizontal deflection of 1/600 of the span.
            b) Framing at Metal Wall Panel Assemblies: Horizontal deflection of 1/240 of the span.
         5) Lateral Drift: Maximum of 1/600 of the building height.

D. Design structural members to withstand Class 90 wind uplift in accordance with UL 580.

E. Exterior wall and roof system shall withstand imposed loads with maximum allowable deflection of 1/90 of span.

F. Provide drainage to exterior for water entering or condensation occurring within wall or roof system.

G. Permit movement of components without buckling, failure of joint seals, undue stress on fasteners or other detrimental effects, when subject to temperature range of 120 deg F, ambient; 180 deg F, material surfaces

H. Size and fabricate wall and roof systems free of distortion or defects detrimental to appearance or performance.

2.5 MATERIALS - FRAMING

A. Structural Steel: Comply with AISC 360, "Specification for Structural Steel Buildings."

B. Structural Steel Members: ASTM A36/A36M, ASTM A572/A572M Grade 50, or ASTM A992/A992M.

C. Structural Tubing: ASTM A500/A500M Grade C cold-formed.

D. Plate or Bar Stock: ASTM A529/A529M, Grade 50.

E. Bolted Connections: Comply with RCSC's "Specification for Structural Joints Using High-Strength Bolts."

F. Anchor Bolts: ASTM F1554, Grade 36, Class 1A, with hot dip type for protective coating.

G. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1; galvanized to ASTM A153/A153M.

H. Cold-Formed Steel: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" for design requirements and allowable stresses.

I. Welding Materials: Perform in accordance with AWS D1.1/D1.1M.

J. Primer: SSPC-Paint 20 zinc rich.

2.6 MATERIALS - WALLS AND ROOF

A. Steel Sheet: Hot-dipped galvanized steel sheet, ASTM A653/A653M, Designation SS (structural steel), Grade 33 (230), with G90/Z275 coating.

B. Insulation: Refer to Section 07 2100 - Thermal Insulation.

C. Joint Seal Gaskets: Manufacturer's standard type.

D. Fasteners: Manufacturer's standard type, galvanized to comply with requirements of ASTM A153/A153M, finish to match adjacent surfaces when exterior exposed.

E. Bituminous Paint: Asphaltic type.

F. Sealant: ASTM C920, elastomeric sealant with movement capability of at least plus/minus 50 percent; 100 percent silicone; for exposed applications, match adjacent colors as closely as possible.

G. Trim, Closure Pieces, Caps, Flashings, Gutters, Downspouts, Fascias and Infills: Same material, thickness and finish as exterior sheets; brake formed to required profiles.

2.7 COMPONENTS

A. Doors and Frames: See Section 08 1113.

B. Overhead Doors: See Section 08 3613.

C. Overhead Door Frame: Formed steel sections braced to building frame; see Section 05 5000.

2.8 FABRICATION

A. General: Design components and field connections required for erection to permit easy assembly.
1. Mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and instruction manuals.
2. Fabricate structural framing to produce clean, smooth cuts and bends. Punch holes of proper size, shape, and location. Members to be free of cracks, tears, and ruptures.

B. Tolerances: Comply with MBMA's "Metal Building Systems Manual" for fabrication and erection tolerances.

2.9 FABRICATION - FRAMING

A. Primary Framing: Shop fabricate framing components to indicated size and section, with baseplates, bearing plates, stiffeners, and other items required for erection welded into place. Cut, form, punch, drill, and weld framing for bolted field assembly.
1. Make shop connections by welding or by using high-strength bolts.
2. Join flanges to webs of built-up members by a continuous, submerged arc-welding process.
3. Brace compression flange of primary framing with steel angles or cold-formed structural tubing between frame web and purlin web or girt web, so flange compressive strength is within allowable limits for any combination of loadings.
4. Weld clips to frames for attaching secondary framing if applicable, or punch for bolts.

5. Shop Priming: Prepare surfaces for shop priming according to SSPC-SP 2. Shop prime primary framing with specified primer after fabrication.

B. Secondary Framing: Shop fabricate framing components to indicated size and section by roll forming or break forming, with baseplates, bearing plates, stiffeners, and other plates required for erection welded into place. Cut, form, punch, drill, and weld secondary framing for bolted field connections to primary framing.
   1. Make shop connections by welding or by using non-high-strength bolts.
   2. Shop Priming: Prepare uncoated surfaces for shop priming according to SSPC-SP 2. Shop prime uncoated secondary framing with specified primer after fabrication.

C. Fabricate members in accordance with AISC 360 for plate, bar, tube, or rolled structural shapes.

D. Anchor Bolts: Formed with straight shank, assembled with template for casting into concrete.

E. Provide wall opening framing for doors, windows, and other accessory components.

2.10 FABRICATION - WALL AND ROOF PANELS

A. Siding: Refer to Section 04 2000 - Unit Masonry and 07 4213 - Metal Wall Panels.

B. Roofing: Refer to Section 07 4113 - Metal Roof Panels.

C. Girts/Purlins: Rolled formed structural shape to receive siding, roofing sheet.

D. Internal and External Corners: Same material thickness and finish as adjacent material, profile brake formed to required angles. Back brace mitered internal corners with ____ inch thick sheet.

E. Flashings, Closure Pieces, Fascia: Same material and finish as adjacent material, profile to suit system.

F. Fasteners: To maintain load requirements and weather tight installation, same finish as cladding, non-corrosive type.

2.11 FINISHES

A. Framing Members: Clean, prepare, and shop prime. Do not prime surfaces to be field welded.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with erector present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Before erection proceeds, survey elevations and locations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments to receive structural framing, with erector present, for compliance with requirements and metal building system manufacturer's tolerances.

C. Verify that foundation, floor slab, mechanical and electrical utilities, and placed anchors are in correct position.

D. Proceed with erection only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition.

B. Provide temporary shores, guys, braces, and other supports during erection to keep structural framing secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural framing, connections, and bracing are in place unless otherwise indicated.

3.3 ERECTION - FRAMING

A. Erect framing in accordance with AISC 360.

B. Provide for erection and wind loads. Provide temporary bracing to maintain structure plumb and in alignment until completion of erection and installation of permanent bracing. Locate braced bays as indicated.

C. Set structural framing accurately in locations and to elevations indicated, according to AISC specifications referenced in this Section. Maintain structural stability of frame during erection.

D. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
3. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

E. Align and adjust structural framing before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with framing. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
1. Level and plumb individual members of structure.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure will be completed and in service.

F. Primary Framing and End Walls: Erect framing level, plumb, rigid, secure, and true to line. Level baseplates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use grout to obtain uniform bearing and to maintain a level base-line elevation. Moist-cure grout for not less than seven days after placement.
1. Make field connections using high-strength bolts installed according to RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt type and joint type specified.
2. Joint Type: Snug tightened or pretensioned as required by manufacturer.

G. Secondary Framing: Erect framing level, plumb, rigid, secure, and true to line. Field bolt secondary framing to clips attached to primary framing.
1. Provide rake or gable purlins with tight-fitting closure channels and fasciae.

2. Locate and space wall girts to suit openings such as doors and windows.
3. Provide supplemental framing at entire perimeter of openings, including doors, windows, louvers, ventilators, and other penetrations of roof and walls.

H. Bracing: Install bracing in roof and sidewalls where indicated on erection drawings.
1. Tighten rod and cable bracing to avoid sag.
2. Locate interior end-bay bracing only where indicated.

I. Framing for Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work. Securely attach to structural framing.

J. Erection Tolerances: Maintain erection tolerances of structural framing within AISC 303.

K. Do not field cut or alter structural members without approval.

L. After erection, prime welds, abrasions, and surfaces not shop primed.

3.4 ERECTION - WALL AND ROOF PANELS

A. Install in accordance with manufacturer's instructions.

B. Exercise care when cutting prefinished material to ensure cuttings do not remain on finish surface.

C. Fasten cladding system to structural supports, aligned level and plumb.

D. Locate end laps over supports. End laps minimum 2 inches. Place side laps over bearing.

E. Provide expansion joints where indicated.

F. Use concealed fasteners.

G. Install sealant and gaskets, providing weather tight installation.

3.5 ACCESSORY INSTALLATION

A. Rigidly support and secure components. Join lengths with formed seams sealed watertight. Flash and seal gutters to downspouts.
1. Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by manufacturer.

B. 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. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
1. Install exposed flashing and trim that is without excessive oil-canning, 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 and weather-resistant 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 or bayonet-type expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

3.6 INSTALLATION - ACCESSORY COMPONENTS IN WALL SYSTEM

A. Install door frames and insulation in accordance with manufacturer's instructions. Refer to individual technical sections for materials and installation requirements.

3.7 TOLERANCES

A. Framing Members: 1/4 inch from level; 1/8 inch from plumb.

B. Siding and Roofing: 1/8 inch from true position.

END OF SECTION 13 3419

SECTION 21 0500 - COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Above ground piping.

B. Buried piping.

C. Escutcheons.

D. Mechanical couplings.

E. Pipe hangers and supports.

F. Pipe sleeves.

1.2 REFERENCE STANDARDS

A. ASME A112.18.1 - Plumbing Supply Fittings; 2018.

B. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing and Fusing Operators; 2017.

C. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2015.

D. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2016.

E. ASME B16.4 - Gray Iron Threaded Fittings: Classes 125 and 250; 2016.

F. ASME B16.5 - Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inch Standard; 2017.

G. ASME B16.9 - Factory-Made Wrought Buttwelding Fittings; 2018.

H. ASME B16.11 - Forged Fittings, Socket-welding and Threaded; 2016 (Errata 2017).

I. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2012.

J. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2018.

K. ASME B16.25 - Buttwelding Ends; 2012.

L. ASME B36.10M - Welded and Seamless Wrought Steel Pipe; 2018.

M. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2018).

N. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2018.

O. ASTM A135/A135M - Standard Specification for Electric-Resistance-Welded Steel Pipe; 2009 (Reapproved 2014).

P. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2018a.

Q. ASTM A536 - Standard Specification for Ductile Iron Castings; 1984 (Reapproved 2014).

R. ASTM A795/A795M - Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use; 2013.

S. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).

T. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

U. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2010.

V. AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings; 2012.

W. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2017.

X. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast; 2017.

Y. AWWA C606 - Grooved and Shouldered Joints; 2015.

Z. FM (AG) - FM Approval Guide; current edition.

AA. ITS (DIR) - Directory of Listed Products; current edition.

BB. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

CC. NFPA 14 - Standard for the Installation of Standpipe and Hose Systems; 2016.

DD. UL (DIR) - Online Certifications Directory; Current Edition.

1.3 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's catalog information. Indicate valve data and ratings.

C. Shop Drawings: Indicate pipe materials used, jointing methods, supports, and floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.

D. Project Record Documents: Record actual locations of components and tag numbering.

E. Operation and Maintenance Data: Include installation instructions and spare parts lists.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 6000 - Product Requirements, for additional provisions.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Comply with FM (AG), UL (DIR), and ITS (DIR) or Warnock Hersey requirements.

C. Valves: Bear FM (AG), UL (DIR), and ITS (DIR) or Warnock Hersey product listing label or marking. Provide manufacturer's name and pressure rating marked on valve body.

D. Products Requiring Electrical Connection: Listed and classified as suitable for the purpose specified and indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store valves in shipping containers, with labeling in place.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Sprinkler-based System:
1. Comply with NFPA 13.
2. See Section 21 1300.

B. Welding Materials and Procedures: Comply with ASME BPVC-IX.

C. Provide system pipes, fittings, sleeves, escutcheons, seals, and other related accessories.

2.2 BURIED PIPING

A. Steel Pipe: ASTM A53/A53M Schedule 40, ASTM A135/A135M Schedule 10, ASTM A795/A795M Standard Weight, or ASME B36.10M Schedule 40, black, with AWWA C105/A21.5 polyethylene jacket, or double layer, half-lapped polyethylene tape.
1. Steel Fittings: ASME B16.9, wrought steel, buttwelded, ASME B16.25, buttweld ends, ASTM A234/A234M, wrought carbon steel or alloy steel, ASME B16.5, steel flanges and fittings, or ASME B16.11, forged steel socket welded and threaded; with double layer, half-lapped polyethylene tape.
2. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings.
3. Joints: Welded in accordance with AWS D1.1/D1.1M.
4. Casing: Closed glass cell insulation.

B. Ductile Iron Pipe: AWWA C151/A21.51.
1. Fittings: AWWA C110/A21.10, standard thickness.
2. Joints: AWWA C111/A21.11, styrene-butadiene rubber (SBR) or vulcanized SBR gasket.
3. Mechanical Couplings: Shaped composition sealing gasket, steel bolts, nuts, and washers.

2.3 ABOVE GROUND PIPING

A. Steel Pipe: ASTM A53 Schedule 40 or ASTM A135/A135M Schedule 10, black.
1. Steel Fittings: ASME B16.9 wrought steel, buttwelded, ASME B16.25 buttweld ends, ASTM A234/A234M wrought carbon steel or alloy steel, ASME B16.5 steel flanges and fittings, or ASME B16.11 forged steel socket welded and threaded.
2. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings and ASME B16.4, threaded fittings.
3. Malleable Iron Fittings: ASME B16.3, threaded fittings and ASTM A47/A47M.
4. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.
5. Mechanical Formed Fittings: Carbon steel housing with integral pipe stop and O-ring pocked and O-ring, uniformly compressed into permanent mechanical engagement onto pipe.

2.4 PIPE SLEEVES

A. Plastic, Sheet Metal, or Moisture-Resistant Fiber: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.

B. Pipe Passing Through Below Grade Exterior Walls:
1. Zinc-coated or cast-iron pipe.
2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.

C. Not required for wall hydrants for fire department connections or in drywall construction.

D. Clearances:
1. Provide allowance for insulated piping.
2. Wall, Floor, Floor, Partitions, and Beam Flanges: 1 inch greater than external; pipe diameter.
3. Rated Openings: Caulked tight with firestopping material complying with ASTM E814 in accordance with Section 07 8400 to prevent the spread of fire, smoke, and gases.

2.5 ESCUTCHEONS

A. Material:
1. Metals and Finish: Comply with ASME A112.18.1.

B. Construction:
1. One-piece for mounting on chrome-plated tubing or pipe and one-piece or split-pattern type elsewhere.
2. Internal spring tension devices or setscrews to maintain a fixed position against a surface.

2.6 PIPE HANGERS AND SUPPORTS

A. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.

B. Hangers for Pipe Sizes 2 inches and Over: Carbon steel, adjustable, clevis.

C. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

D. Wall Support for Pipe Sizes to 3 inches: Cast iron hook.

E. Wall Support for Pipe Sizes 4 inches and Over: Welded steel bracket and wrought steel clamp.

F. Vertical Support: Steel riser clamp.

G. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

2.7 MECHANICAL COUPLINGS

A. Rigid Mechanical Couplings for Grooved Joints:
1. Dimensions and Testing: Comply with AWWA C606.
2. Minimum Working Pressure: 300 psig.
3. Housing Material: Fabricate of ductile iron complying with ASTM A536.
4. Housing Coating: Factory applied orange enamel.
5. Gasket Material: EPDM suitable for operating temperature range from minus 30 degrees F to 230 degrees F.
6. Bolts and Nuts: Hot-dipped-galvanized or zinc-electroplated steel.

PART 3 EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and foreign material, from inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATION

A. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.

B. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

C. Install piping to conserve building space, to not interfere with use of space and other work.

D. Group piping whenever practical at common elevations.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Pipe Hangers and Supports:
1. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
2. Place hangers within 12 inches of each horizontal elbow.
3. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
4. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

G. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.

H. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welding.

I. Do not penetrate building structural members unless indicated.

J. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.

K. Manufactured Sleeve-Seal Systems:
1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
3. Locate piping in center of sleeve or penetration.
4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
5. Tighten bolting for a watertight seal.
6. Install in accordance with manufacturer's recommendations.

L. Escutcheons:
1. Install and firmly attach escutcheons at piping penetrations into finished spaces.
2. Provide escutcheons on both sides of partitions separating finished areas through which piping passes.
3. Use chrome plated escutcheons in occupied spaces and to conceal openings in construction.

M. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, unions, and couplings for servicing are consistently provided.

3.3 CLEANING

A. Upon completion of work, clean all parts of the installation.

B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

END OF SECTION 21 0500

SECTION 21 0548 - VIBRATION AND SEISMIC CONTROLS FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Vibration isolation requirements.

B. Seismic control requirements.
   1. Includes requirements for seismic qualification of equipment not specified in this section.

C. Vibration isolators.

D. External seismic snubber assemblies.

E. Seismic restraint systems

1.2 DEFINITIONS

A. Fire Suppression Component: Where referenced in this section in regards to seismic controls, applies to any portion of the fire suppression system subject to seismic evaluation in accordance with applicable codes, including distributed systems (e.g., piping).

B. Seismic Restraint: Structural members or assemblies of members or manufactured elements specifically designed and applied for transmitting seismic forces between components and the seismic force-resisting system of the structure.

1.3 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

B. ASCE 19 - Structural Applications of Steel Cables for Buildings; 2016.

C. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; Most Recent Edition Cited by Referring Code or Reference Standard.

D. FEMA 412 - Installing Seismic Restraints for Mechanical Equipment; 2002.

E. FEMA 413 - Installing Seismic Restraints for Electrical Equipment; 2004.

F. FEMA 414 - Installing Seismic Restraints for Duct and Pipe; 2004.

G. FEMA E-74 - Reducing the Risks of Nonstructural Earthquake Damage; 2012.

H. FM 1950 - Seismic Sway Braces for Automatic Sprinkler Systems; 2010.

I. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. ICC-ES AC156 - Acceptance Criteria for Seismic Certification by Shake-Table Testing of Nonstructural Components; 2010, with Editorial Revision (2015).

K. MFMA-4 - Metal Framing Standards Publication; 2004.

L. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

M. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; 2008.

N. UL 203A - Standard for Sway Brace Devices for Sprinkler System Piping; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
1. Coordinate selection and arrangement of vibration isolation and/or seismic control components with the actual equipment to be installed.
2. Coordinate the work with other trades to provide additional framing and materials required for installation.
3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
4. Seismic Controls:
   a. Coordinate the arrangement of seismic restraints with piping, conduit, equipment, and other potential conflicts installed under other sections or by others.
   b. Coordinate the work with other trades to accommodate relative positioning of essential and nonessential components in consideration of seismic interaction.
5. Notify DEDC, LLC of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 3000.

1.5 SUBMITTALS

A. Design Documents: Prepare and submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, details, and calculations.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.
1. Vibration Isolators: Include rated load capacities and deflections; include information on color coding or other identification methods for spring element load capacities.
2. Seismic Controls: Include seismic load capacities.

C. Shop Drawings - Seismic Controls:

1. Include dimensioned plan views and sections indicating proposed fire suppression component locations and distributed system routing, with locations and details of gravity supports and seismic restraints and associated attachments.
2. Identify mounting conditions required for equipment seismic qualification.
3. Identify anchor manufacturer, type, minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
4. Indicate proposed arrangement of distributed system trapeze support groupings.
5. Indicate proposed locations for distributed system flexible fittings and/or connections.
6. Indicate locations of seismic separations where applicable.

D. Seismic Design Data:
1. Include structural calculations, stamped or sealed by seismic controls designer, demonstrating suitability of seismic controls for seismic design forces.

E. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

F. Manufacturer’s detailed field testing and inspection procedures.

1.6 QUALITY ASSURANCE

A. Comply with applicable building code.

B. Seismic Controls Designer Qualifications: Registered professional engineer licensed in Pennsylvania and with minimum five years experience designing seismic restraints for nonstructural components.
1. Designer may be employed by the manufacturer of the seismic restraint products.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 VIBRATION ISOLATION REQUIREMENTS

A. Design and provide vibration isolation systems to reduce vibration transmission to supporting structure from vibration-producing fire suppression equipment.

B. Comply with applicable general recommendations of ASHRAE (HVACA), where not in conflict with other specified requirements:

C. General Requirements:
1. Select vibration isolators to provide required static deflection.

2. Select vibration isolators for uniform deflection based on distributed operating weight of actual installed equipment.

2.2 SEISMIC CONTROL REQUIREMENTS

A. Design and provide fire suppression component restraints, supports, and attachments suitable for seismic loads determined in accordance with applicable codes, as well as gravity and operating loads and other structural design considerations of the installed location. Consider wind loads for outdoor fire suppression components.

B. Seismic Design Criteria: As indicated on drawings.

C. Component Importance Factor (Ip): Fire suppression components to be assigned a component importance factor (Ip) of 1.5 unless otherwise indicated.

D. Seismic Qualification of Equipment:
1. Provide special certification for fire suppression equipment furnished under other sections and assigned a component importance factor (Ip) of 1.5, certifying that equipment will remain operable following a design level earthquake.
2. Seismic qualification to be by shake table testing in accordance with recognized testing standard procedure, such as ICC-ES AC156, acceptable to authorities having jurisdiction.
3. Notify DEDC, LLC and obtain direction where mounting restrictions required by conditions of seismic certification conflict with specified requirements.
4. Seismically qualified equipment to be furnished with factory-installed labels referencing certificate of compliance and associated mounting restrictions.

E. Seismic Restraints:
1. Provide seismic restraints for fire suppression components except where exempt according to applicable codes and specified seismic design criteria, as approved by authorities having jurisdiction.
2. Seismic Restraint Exemptions, All Seismic Design Categories:
    a. Fire Suppression Piping Exemptions, All Seismic Design Categories:
        1) Lateral sway bracing for piping individually supported within 6 inches of the structure measured between the top of pipe and the point of attachment to the structure, where all conditions for exception specified in NFPA 13 are met.
        2) Lateral sway bracing for branch lines smaller than 2-1/2 inches in diameter, where branch line restraint is provided in accordance with NFPA 13.
3. Comply with applicable general recommendations of the following, where not in conflict with applicable codes, seismic design criteria, or other specified requirements:
    a. ASHRAE (HVACA).
    b. FEMA 412.
    c. FEMA 413.
    d. FEMA 414.
    e. FEMA E-74.
    f. SMACNA (SRM).
4. Seismic restraint capacities to be verified by a Nationally Recognized Testing Laboratory (NRTL) or certified by an independent third-party registered professional engineer acceptable to authorities having jurisdiction.
5. Seismic Type Vibration Isolators:

a. Comply with seismic design requirements, including conditions of equipment seismic certification where applicable.

6. External Seismic Snubber Assemblies:
   a. Provide quantity and arrangement of external seismic snubber assemblies as required to restrain equipment in all directions (both lateral and vertical).
   b. Do not use external seismic snubber assemblies that restrain equipment only in one or more lateral directions (but not vertical) except where uplift forces are zero or are addressed by other restraints.
7. Seismic Restraint Systems:
   a. Arrange restraint elements to avoid obstruction of sprinklers in accordance with NFPA 13.
   b. Except where otherwise restricted, use of either cable or rigid restraints is permitted.
   c. Use only cable restraints to restrain vibration-isolated fire suppression components.
   d. Use only one restraint system type for a given fire suppression component or distributed system (e.g., piping) run; mixing of cable and rigid restraints on a given component/run is not permitted.
   e. Size restraint elements, including anchorage, to resist seismic loads as necessary to restrain fire suppression component in all lateral directions; consider bracket geometry in anchor load calculations.
   f. Use rod stiffener clips to attach bracing to hanger rods as required to prevent rod buckling from vertical (upward) compressive load introduced by cable or rigid restraints loaded in tension, in excess of downward tensile load due to supported fire suppression component weight.
   g. Select hanger rods and associated anchorage as required to accommodate vertical (downward) tensile load introduced by rigid restraints loaded in compression, in addition to downward tensile load due to supported fire suppression component weight.
   h. Clevis hangers may only be used for attachment of transverse restraints; do not use for attachment of longitudinal restraints.
   i. Where seismic restraints are attached to clevis hangers, provide clevis bolt reinforcement accessory to prevent clevis hanger deformation.
   j. Do not introduce lateral loads on open bar joist chords or the weak axis of beams, or loads in any direction at other than panel points unless approved by project Structural Engineer of Record.

F. Seismic Attachments:
1. Comply with support and attachment requirements of NFPA 13.
2. Attachments to be bolted, welded, or otherwise positively fastened without consideration of frictional resistance produced by the effects of gravity.
3. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) or qualified evaluation service acceptable to authorities having jurisdiction for compliance with applicable building code, and qualified for seismic applications; concrete anchors to be qualified for installation in both cracked and uncracked concrete.
4. Do not use power-actuated fasteners.
5. Do not use friction clips (devices that rely on mechanically applied friction to resist loads). Beam clamps may be used for supporting sustained loads where provided with restraining straps, but not for sway bracing attachments as prohibited by NFPA 13.
6. Comply with anchor minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
7. Concrete Housekeeping Pads:
   a. Increase size of pad as required to comply with anchor requirements.

b. Provide pad reinforcement and doweling to ensure integrity of pad and connection and to provide adequate load path from pad to supporting structure.

G. Seismic Interactions:
1. Include provisions to prevent seismic impact between fire suppression components and other structural or nonstructural components.
2. Include provisions such that failure of a component, either essential or nonessential, does not cause the failure of an essential component.
3. Comply with minimum clearance requirements between other equipment, distribution systems, and associated supports and fire protection sprinkler system drops and sprigs.

H. Seismic Relative Displacement Provisions:
1. Use suitable fittings or flexible connections, in accordance with NFPA 13, to accommodate:
a. Relative displacements at connections between components, including distributed systems (e.g., piping); do not exceed load limits for equipment utility connections.
b. Relative displacements between component supports attached to dissimilar parts of structure that may move differently during an earthquake.
c. Design displacements at seismic separations.
d. Anticipated drifts between floors.
2. Provide clearance around fire suppression system piping extending through walls, floors, platforms, and foundations in accordance with NFPA 13.

2.3 VIBRATION ISOLATORS

A. Manufacturers:
1. Vibration Isolators:
a. Kinetics Noise Control, Inc; None - N/A: www.kineticsnoise.com.
b. Mason Industries; None - N/A: www.mason-ind.com.
c. Vibration Eliminator Company, Inc; None - N/A: www.veco-nyc.com.

B. General Requirements:
1. Resilient Materials for Vibration Isolators: Oil, ozone, and oxidant resistant.
2. Spring Elements for Spring Isolators:
a. Color code or otherwise identify springs to indicate load capacity.
b. Lateral Stability: Minimum lateral stiffness to vertical stiffness ratio of 0.8.
c. Designed to operate in the linear portion of their load versus deflection curve over deflection range of not less than 50 percent above specified deflection.
d. Designed to provide additional travel to solid of not less than 50 percent of rated deflection at rated load.
e. Selected to provide designed deflection of not less than 75 percent of specified deflection.
f. Selected to function without undue stress or overloading.
3. Seismic Snubbing Elements for Seismic Isolators:
a. Air Gap: Between 0.125 inches and 0.25 inches unless otherwise indicated.
b. Points of Contact: Cushioned with resilient material, minimum 0.25 inch thick; capable of being visually inspected for damage and replaced.

C. Vibration Isolators for Seismic Applications:

1. Resilient Material Isolator Mounts, Seismic:
    a. Description: Mounting assemblies for bolting equipment to supporting structure utilizing elastomeric (e.g., neoprene, rubber) isolator material; specifically designed and rated for seismic applications with integral snubbing in all directions.
2. Restrained Spring Isolators, Seismic:
    a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) in series with elastomeric (e.g., neoprene, rubber) isolator material within a metal housing designed to prevent movement of supported equipment above an adjustable vertical limit stop; specifically designed and rated for seismic applications with integral snubbing in all directions.
    b. Bottom Load Plate: Steel with provisions for bolting to supporting structure as required.
    c. Furnished with integral leveling device for positioning and securing supported equipment.
    d. Provides constant free and operating height.
3. Resilient Material Isolator Hangers, Seismic:
    a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing elastomeric (e.g., neoprene, rubber) isolator material for the lower hanger rod connection; specifically designed and rated for seismic applications with vertical limit stop to prevent upward travel of hanger rod and cushion impact.
4. Spring Isolator Hangers, Seismic:
    a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) in series with an elastomeric element for the lower hanger rod connection; specifically designed and rated for seismic applications with vertical limit stop to prevent upward travel of hanger rod and cushion impact.
    b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.
5. Combination Resilient Material/Spring Isolator Hangers, Seismic:
    a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) for the lower hanger rod connection and elastomeric (e.g., neoprene, rubber) isolator material for the upper hanger rod connection; specifically designed and rated for seismic applications with vertical limit stop to prevent upward travel of hanger rod and cushion impact.
    b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.

2.4 EXTERNAL SEISMIC SNUBBER ASSEMBLIES

A. Description: Steel snubbing assemblies designed for external attachment to both equipment and supporting structure that, as part of a complete system, restrain equipment motion in all directions during a seismic event while maintaining vibration isolation during normal operation.

B. Seismic Snubbing Elements:
1. Air Gap: Between 0.125 inches and 0.25 inches unless otherwise indicated.
2. Points of Contact: Cushioned with resilient material, minimum 0.25 inch thick; capable of being visually inspected for damage and replaced.

2.5 SEISMIC RESTRAINT SYSTEMS

A. Description: System components and accessories specifically designed for field assembly and attachment of seismic restraints.

B. Where required by NFPA 13, provide products listed as complying with UL 203A or FM 1950.

C. Cable Restraints:
1. Comply with ASCE 19.
2. Cables: Pre-stretched, galvanized steel wire rope with certified break strength.
3. Cable Connections: Use only swaged end fittings. Cable clips and wedge type end fittings are not permitted in accordance with ASCE 19.
4. Use protective thimbles for cable loops where potential for cable damage exists.

D. Rigid Restraints: Use MFMA-4 steel channel (strut), steel angle, or steel pipe for structural element; suitable for both compressive and tensile design loads.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

C. Secure fasteners according to manufacturer's recommended torque settings.

D. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

E. Vibration Isolation Systems:
1. Spring Isolators:
a. Position equipment at operating height; provide temporary blocking as required.
b. Lift equipment free of isolators prior to lateral repositioning to avoid damage to isolators.
c. Level equipment by adjusting isolators gradually in sequence to raise equipment uniformly such that excessive weight or stress is not placed on any single isolator.
2. Isolator Hangers:
a. Use precompressed isolator hangers where required to facilitate installation and prevent damage to equipment utility connection provisions.

b. Locate isolator hangers at top of hanger rods in accordance with manufacturer's instructions.

3. Clean debris from beneath vibration-isolated equipment that could cause short-circuiting of isolation.
4. Use elastomeric grommets for attachments where required to prevent short-circuiting of isolation.
5. Adjust isolators to be free of isolation short circuits during normal operation.
6. Do not overtighten fasteners such that resilient material isolator pads are compressed beyond manufacturer's maximum recommended deflection.

F. Seismic Controls:

1. Provide specified snubbing element air gap; remove any factory-installed spacers, debris, or other obstructions.
2. Use only specified components, anchorage, and hardware evaluated by seismic design. Comply with conditions of seismic certification where applicable.
3. Where mounting hole diameter exceeds bolt diameter by more than 0.125 inch, use epoxy grout, elastomeric grommet, or welded washer to reduce clearance to 0.125 inch or less.
4. Equipment with Sheet Metal Housings:
   a. Use Belleville washers to distribute stress over a larger surface area of the sheet metal connection interface as approved by manufacturer.
   b. Attach additional steel as approved by manufacturer where required to transfer loads to structure.
   c. Where mounting surface is irregular, do not shim housing; reinforce housing with additional steel as approved by manufacturer.
5. Concrete Housekeeping Pads:
   a. Size in accordance with seismic design to meet anchor requirements.
   b. Install pad reinforcement and doweling in accordance with seismic design to ensure integrity of pad and associated connection to slab.
6. Seismic Restraint Systems:
   a. Do not attach seismic restraints and gravity supports to dissimilar parts of structure that may move differently during an earthquake.
   b. Install restraints within permissible angles in accordance with seismic design.
   c. Install cable restraints straight between component/run and structural attachment; do not bend around other nonstructural components or structural elements.
   d. Install cable restraints for vibration-isolated components slightly slack to prevent short-circuiting of isolation.
   e. Install hanger rod stiffeners where indicated using only specified clamps; do not weld stiffeners to hanger rod.

3.3 FIELD QUALITY CONTROL

A. Inspect vibration isolation and/or seismic control components for damage and defects.

B. Vibration Isolation Systems:

1. Verify isolator static deflections.
2. Verify vibration isolation performance during normal operation; investigate sources of isolation short circuits.

C. Seismic Controls:

1. Verify snubbing element air gaps.

D. Correct deficiencies and replace damaged or defective vibration isolation and/or seismic control components.

END OF SECTION 21 0548

SECTION 21 0553 - IDENTIFICATION FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Stencils.

D. Pipe markers.

E. Ceiling tacks.

1.2 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2015.

B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2017.

1.3 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.

C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

D. Manufacturer's Installation Instructions: Indicate special procedures, and installation instructions.

E. Project Record Documents: Record actual locations of tagged valves.

PART 2 PRODUCTS

2.1 IDENTIFICATION APPLICATIONS

A. Automatic Controls: Tags.

B. Control Panels: Nameplates.

C. Instrumentation: Tags.

D. Major Control Components: Nameplates.

E. Piping: Tags.

F. Pumps: Nameplates.

G. Relays: Tags.

H. Small-sized Equipment: Tags.

I. Thermostats: Nameplates.

J. Valves: Nameplates and ceiling tacks where above lay-in ceilings.

2.2 NAMEPLATES

A. Description: Laminated three-layer plastic with engraved letters.
1. Letter Color: White.
2. Letter Height: 1/4 inch.
3. Background Color: Black.
4. Thickness: 1/8 inch.
5. Plastic: Comply with ASTM D709.

2.3 TAGS

A. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

2.4 STENCILS

A. Stencils: With clean cut symbols and letters of following size:
1. 3/4 to 1-1/4 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 1/2 inch high letters.
2. 1-1/2 to 2 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 3/4 inch high letters.
3. 2-1/2 to 6 inch Outside Diameter of Insulation or Pipe: 12 inch long color field, 1-1/4 inch high letters.

B. Paint for Stencils: As specified in Section 09 9123, semi-gloss enamel, colors complying with ASME A13.1.

2.5 PIPE MARKERS

A. Color: Comply with ASME A13.1.

B. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.

D. Underground Plastic Pipe Markers: Bright-colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil, 0.004 inch thick, manufactured for direct burial service.

E. Color code as follows:
1. Fire Quenching Fluids: Red with white letters.

2.6 CEILING TACKS

A. Description: Steel with 3/4 inch diameter color coded head.

PART 3 EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces in accordance with Section 09 9123 for stencil painting.

3.2 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Apply stencil painting in accordance with Section 09 9123.

D. Install plastic pipe markers in accordance with manufacturer's instructions.

E. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

F. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.

G. Use tags on piping 3/4 inch diameter and smaller.
   1. Identify service, flow direction, and pressure.
   2. Install in clear view and align with axis of piping.
   3. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

H. Locate ceiling tacks to locate valves above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION 21 0553

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SECTION 21 1300 - FIRE-SUPPRESSION SPRINKLER SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wet-pipe sprinkler system.

B. System design, installation, and certification.

C. Fire department connections.

1.2 REFERENCE STANDARDS

A. FM (AG) - FM Approval Guide; current edition.

B. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2015.

C. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements; 2015.

D. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2015.

E. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2016.

F. ITS (DIR) - Directory of Listed Products; current edition.

G. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. NFPA 1963 - Standard for Fire Hose Connections; 2014.

I. UL (DIR) - Online Certifications Directory; Current Edition.

J. UL 405 - Fire Department Connection Devices; Current Edition; Including All Revisions.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

C. Shop Drawings:

1. Submit preliminary layout of finished ceiling areas indicating only sprinkler locations coordinated with ceiling installation.
2. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components, and accessories. Indicate system controls.
3. Submit shop drawings to Authorities Having Jurisdiction for approval. Submit proof of approval to DEDC, LLC.

D. Manufacturer's Certificate: Certify that system has been tested and meets or exceeds specified requirements and code requirements.

E. Operation and Maintenance Data: Include components of system, servicing requirements, record drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 6000 - Product Requirements for additional provisions.
2. Extra Sprinklers: Type and size matching those installed in quantity required by referenced NFPA design and installation standard.
3. Sprinkler Wrenches: For each sprinkler type.

1.5 QUALITY ASSURANCE

A. Comply with FM (AG) requirements.

B. Designer Qualifications: Design system under direct supervision of a Professional Engineeror NICET Level III designer experienced in design of this type of work and licensed in the State of Maryland.

C. Equipment and Components: Provide products that bear FM (AG) label or marking.

D. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Sprinklers, Valves, and Equipment:
1. Tyco Fire Protection Products: www.tyco-fire.com/#sle.
2. Viking Corporation: www.vikinggroupinc.com/#sle.
3. Substitutions: See Section 01 6000 - Product Requirements.

B. UL Listed for Fire Protection Services

2.2 SPRINKLER SYSTEM

A. Sprinkler System: Provide coverage for entire building.

B. Interface system with building fire and smoke alarm system.

C. Provide fire department connections where indicated.

D. Storage Cabinet for Spare Sprinklers and Tools: Steel, located adjacent to alarm valve.

2.3 SPRINKLERS

A. Suspended Ceiling Type: Semi-recessed pendant type with matching push on escutcheon plate.
1. Response Type: Quick.
2. Finish: Brass.
3. Escutcheon Plate Finish: Antique Brass.

B. Exposed Area Type: Standard upright type with guard (where sprinkler is lower than seven feet above finished floor
1. Response Type: Quick.
2. Coverage Type: Standard.

C. Sidewall Type: Semi-recessed horizontal sidewall type with matching push on escutcheon plate.
1. Response Type: Quick.
2. Coverage Type: Standard.
3. Finish: Brass.
4. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

D. Storage Sprinklers: Pendant type with guard.
1. Response Type: Standard.
2. Coverage Type: Standard.
3. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

E. Guards: Finish to match sprinkler finish.

F. Flexible Drop System: Stainless steel, multiple use, open gate type.
1. Application: Use to properly locate sprinkler heads.
2. Include all supports and bracing.
3. Provide braided type tube as required for the application.

2.4 PIPING SPECIALTIES

A. Backflow Preventer: Reduced pressure principle valve assembly backflow preventer with drain and OS & Y gate valve on each end.

B. Test Connections:
1. Inspector's Test Connection:
   a. AGF Test and Drain or equal. Drain outside of building.
2. Backflow Preventer Test Connection:
   a. Furnish one valve for each 250 gpm of system demand or fraction thereof.

b. Provide permanent sign reading "Test Valve" in accordance with Section 21 0553.

C. Water Flow Switch: Vane type switch for mounting horizontal or vertical, with two contacts; rated 10 amp at 125 volt AC and 2.5 amp at 24 volt DC.

D. Fire Department Connections:
1. Type: Flush, wall mount made of corrosion resistant metal complying with UL 405.
a. Inlets: Two way, 2-1/2 inch swivel fittings, internal threaded. Thread size and inlets according to NFPA 1963 or Authority Having Jurisdiction. Brass caps with gaskets, chains, and lugs.
b. Configuration: Horizontal.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with referenced NFPA design and installation standard.

B. Install equipment in accordance with manufacturer's instructions.

C. Locate fire department connection with sufficient clearance from walls, obstructions, or adjacent siamese connectors to allow full swing of fire department wrench handle.

D. Place pipe runs to minimize obstruction to other work.

E. Place piping in concealed spaces above finished ceilings.

F. Center sprinklers in two directions in ceiling tile and provide piping offsets as required.

G. Flush entire piping system of foreign matter.

H. Install guards on sprinklers in exposed ceilings where less than seven feet above finished floor..

I. Hydrostatically test entire system.

J. Require test be witnessed by Fire Marshal.

3.2 INTERFACE WITH OTHER PRODUCTS

A. Ensure required devices are installed and connected as required to fire alarm system.

3.3 SCHEDULES

A. System Hazard Areas: As indicated on Drawings

END OF SECTION 21 1300

SECTION 22 0500 - 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. Mechanical sleeve seals.
4. Sleeves.
5. Escutcheons.
6. Grout.
7. Plumbing demolition.
8. Equipment installation requirements common to equipment sections.
9. Concrete bases.
10. 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.

1.3 SUBMITTALS

A. Welding certificates.

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.
      a. 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.

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.

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: AWS A5.8, BCuP Series or BAg1, unless otherwise indicated.

F. Welding Filler Metals: Comply with AWS D10.12.

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.
   5. 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.

2.3 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

B. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.

C. Pressure Plates: Carbon steel. Include two for each sealing element.

D. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.4 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.

2.5 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 and rough brass.

D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
1. Finish: Polished chrome-plated and rough brass.

2.6 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 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.

3.2 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.

3.3 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.

3.4 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.

3.5 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."

3.6 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.

D. ERECTION OF WOOD SUPPORTS AND ANCHORAGES

E. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor plumbing materials and equipment.
1. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
2. Attach to substrates as required to support applied loads.

3.7 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.

CURE PLACED GROUT. END OF SECTION 220500 22 0500

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SECTION 22 0516 - EXPANSION FITTINGS AND LOOPS FOR PLUMBING PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Flexible pipe connectors.

B. Expansion joints and compensators.

C. Pipe loops, offsets, and swing joints.

1.2 REFERENCE STANDARDS

A. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015a.

B. EJMA (STDS) - EJMA Standards; Tenth Edition.

1.3 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data:
1. Flexible Pipe Connectors: Indicate maximum temperature and pressure rating, face-to-face length, live length, hose wall thickness, hose convolutions per foot and per assembly, fundamental frequency of assembly, braid structure, and total number of wires in braid.
2. Expansion Joints: Indicate maximum temperature and pressure rating, and maximum expansion compensation.

C. Design Data: Indicate selection calculations.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 6000 - Product Requirements for additional provisions.
2. Extra Packing for Packed Expansion Joints: One set for each joint.

PART 2 PRODUCTS

2.1 FLEXIBLE PIPE CONNECTORS - STEEL PIPING

A. Manufacturers:
1. Mercer Rubber Company: www.mercer-rubber.com/#sle.
2. Substitutions: See Section 01 6000 - Product Requirements.

B. Inner Hose: Stainless steel.

C. Exterior Sleeve: Single braided, stainless steel.

D. Pressure Rating: 125 psi up to 12 inch.

E. End Connections: Threaded.

F. Size: Use pipe sized units.

G. Maximum offset: 3/4 inch on each side of installed center line.

2.2 FLEXIBLE PIPE CONNECTORS - COPPER PIPING

A. Manufacturers:
1. Mercer Rubber Company: www.mercer-rubber.com/#sle.
2. The Metraflex Company: www.metraflex.com/#sle.
3. Substitutions: See Section 01 6000 - Product Requirements.

B. Inner Hose: Bronze.

C. Exterior Sleeve: Braided bronze.r

D. End Connections: Flanged.

E. Size: Use pipe sized units.

F. Maximum offset: 3/4 inch on each side of installed center line.

G. Application: Copper piping.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install flexible pipe connectors on pipes connected to vibration isolated equipment. Provide line size flexible connectors.

C. Install flexible connectors at right angles to displacement. Install one end immediately adjacent to isolated equipment and anchor other end. Install in horizontal plane unless indicated otherwise.

D. Provide support and equipment required to control expansion and contraction of piping. Provide loops, pipe offsets, and swing joints, or expansion joints where required.

END OF SECTION 22 0516

SECTION 22 0523 - 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. Iron, single-flange butterfly valves.
4. Iron, grooved-end butterfly valves.
5. Bronze lift check valves.
6. Bronze swing check valves.
7. Iron swing check valves.
8. Iron, grooved-end swing check valves.
9. Bronze gate valves.
10. Bronze globe valves.
11. Chainwheels.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer 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. Product Data: For each type of valve indicated.

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.
4. 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, grooves, and weld ends.
3. Set angle, gate, and globe valves closed to prevent rattling.
4. Set ball and plug valves open to minimize exposure of functional surfaces.
5. Set butterfly valves closed or slightly open.
6. Block check valves in either closed or open position.

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.
3. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Refer to valve schedule articles for applications of valves.

B. Valves shall be American made.

C. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

D. Valve Sizes: Same as upstream piping unless otherwise indicated.

E. Valve Actuator Types:
1. Gear Actuator: For quarter-turn valves NPS 8 (DN 200) and larger.
2. Handwheel: For valves other than quarter-turn types.
3. Handlever: For quarter-turn valves NPS 6 (DN 150) and smaller[except plug valves].
4. Wrench: For plug valves with square heads. Furnish Cleveland Clinic with 1 wrench for every [5] [10] plug valves, for each size square plug-valve head.
5. Chainwheel: Device for attachment to valve handwheel, stem, or other actuator; of size and with chain for mounting height, as indicated in the "Valve Installation" Article.

F. Valves in Insulated Piping: With 2-inch (50-mm) stem extensions and the following features:
1. Gate Valves: With rising stem.
2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.

3. Butterfly Valves: With extended neck.

G. Valve-End Connections:
1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Grooved: With grooves according to AWWA C606.
3. Solder Joint: With sockets according to ASME B16.18.
4. Threaded: With threads according to ASME B1.20.1.

H. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRASS BALL VALVES

A. Two-Piece, Full-Port, Brass Ball Valves with Brass Trim:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Hammond Valve.
   b. Milwaukee Valve Company.
   c. Mueller.
   d. Watts.
   e. Conbraco Industries, Inc.; Apollo Valves.
2. Description:
   a. Standard: MSS SP-110.
   b. SWP Rating: 150 psig (1035 kPa).
   c. CWP Rating: 600 psig (4140 kPa).
   d. Body Design: Two piece.
   e. Body Material: Forged brass.
   f. Ends: Threaded.
   g. Seats: PTFE or TFE.
   h. Stem: Brass.
   i. Ball: Chrome-plated brass.
   j. Port: Full.

B. Two-Piece, Full-Port, Brass Ball Valves with Stainless-Steel Trim:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Hammond Valve.
   b. Milwaukee Valve Company.
   c. Mueller
   d. Watts.
   e. Conbraco Industries, Inc.; Apollo Valves.
2. Description:
   a. Standard: MSS SP-110.
   b. SWP Rating: 150 psig (1035 kPa).
   c. CWP Rating: 600 psig (4140 kPa).
   d. Body Design: Two piece.
   e. Body Material: Forged brass.
   f. Ends: Threaded.
   g. Seats: PTFE or TFE.
   h. Stem: Stainless steel.

i. Ball: Stainless steel, vented.
j. Port: Full.

C. Three-Piece, Full-Port, Brass Ball Valves with Brass Trim:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
b. Conbraco Industries, Inc.; Apollo Valves.
2. Description:
a. Standard: MSS SP-110.
b. SWP Rating: 150 psig (1035 kPa).
c. CWP Rating: 600 psig (4140 kPa).
d. Body Design: Three piece.
e. Body Material: Forged brass.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Brass.
i. Ball: Chrome-plated brass.
j. Port: Full.

D. Three-Piece, Full-Port, Brass Ball Valves with Stainless-Steel Trim:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Mueller.
b. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
c. Conbraco Industries, Inc.; Apollo Valves.
2. Description:
a. Standard: MSS SP-110.
b. SWP Rating: 150 psig (1035 kPa).
c. CWP Rating: 600 psig (4140 kPa).
d. Body Design: Three piece.
e. Body Material: Forged brass.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Stainless steel.
i. Ball: Stainless steel, vented.
j. Port: Full.

2.3 BRONZE BALL VALVES

A. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. American Valve, Inc.
b. Conbraco Industries, Inc.; Apollo Valves.
c. Hammond Valve.
d. Milwaukee Valve Company.
e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:
a. Standard: MSS SP-110.

b. SWP Rating: 150 psig (1035 kPa).
c. CWP Rating: 600 psig (4140 kPa).
d. Body Design: Two piece.
e. Body Material: Bronze.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Bronze.
i. Ball: Chrome-plated brass.
j. Port: Full.

B. Two-Piece, Full-Port, Bronze Ball Valves with Stainless-Steel Trim:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Conbraco Industries, Inc.; Apollo Valves.
b. Hammond Valve.
c. Milwaukee Valve Company.
d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:
a. Standard: MSS SP-110.
b. SWP Rating: 150 psig (1035 kPa).
c. CWP Rating: 600 psig (4140 kPa).
d. Body Design: Two piece.
e. Body Material: Bronze.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Stainless steel.
i. Ball: Stainless steel, vented.
j. Port: Full.

C. Three-Piece, Full-Port, Bronze Ball Valves with Bronze Trim:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Conbraco Industries, Inc.; Apollo Valves.
b. Hammond Valve.
c. Milwaukee Valve Company.
d. Red-White Valve Corporation.
2. Description:
a. Standard: MSS SP-110.
b. SWP Rating: 150 psig (1035 kPa).
c. CWP Rating: 600 psig (4140 kPa).
d. Body Design: Three piece.
e. Body Material: Bronze.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Bronze.
i. Ball: Chrome-plated brass.
j. Port: Full.

D. Three-Piece, Full-Port, Bronze Ball Valves with Stainless-Steel Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Conbraco Industries, Inc.; Apollo Valves.
   b. Hammond Valve.
   c. Milwaukee Valve Company.
2. Description:
   a. Standard: MSS SP-110.
   b. SWP Rating: 150 psig (1035 kPa).
   c. CWP Rating: 600 psig (4140 kPa).
   d. Body Design: Three piece.
   e. Body Material: Bronze.
   f. Ends: Threaded.
   g. Seats: PTFE or TFE.
   h. Stem: Stainless steel.
   i. Ball: Stainless steel, vented.
   j. Port: Full.

2.4 IRON, SINGLE-FLANGE BUTTERFLY VALVES

A. 200 CWP, Iron, Single-Flange Butterfly Valves with EPDM Seat and Aluminum Bronze Disc:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Conbraco Industries, Inc.; Apollo Valves.
   b. Crane Co.; Crane Valve Group; Center Line.
   c. Crane Co.; Crane Valve Group; Stockham Division.
   d. DeZurik Water Controls.
   e. Hammond Valve.
   f. Milwaukee Valve Company.
   g. Mueller Steam Specialty; a division of SPX Corporation.
   h. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:
   a. Standard: MSS SP-67, Type I, API 609.
   b. CWP Rating: 200 psig (1380 kPa).
   c. Body Design: Lug type; suitable for bidirectional double dead-end service at full rated pressure 2” through 12” without use of downstream flange. Field replaceable hard phenolic backed liner.
   d. Stem: One- or two-piece 416 stainless steel.
   e. Disc: Aluminum bronze.

B. 200 CWP, Iron, Single-Flange Butterfly Valves with NBR Seat:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Conbraco Industries, Inc.; Apollo Valves.
   b. Crane Co.; Crane Valve Group; Center Line.
   c. Crane Co.; Crane Valve Group; Stockham Division.
   d. DeZurik Water Controls.
   e. Hammond Valve.
   f. Milwaukee Valve Company.
   g. Mueller Steam Specialty; a division of SPX Corporation.
   h. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:

a. Standard: MSS SP-67, Type I, API 609.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Design: Lug type; suitable for bidirectional double dead-end service at full rated pressure 2" through 12" without use of downstream flange. Field replaceable hard phenolic backed liner.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: NBR.
f. Stem: One- or two-piece 416 stainless steel.
g. Disc: Nickel-plated[or -coated] ductile iron.

C. 200 CWP, Iron, Single-Flange Butterfly Valves with EPDM Seat and Stainless-Steel Disc:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Conbraco Industries, Inc.; Apollo Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. DeZurik Water Controls.
e. Hammond Valve.
f. Milwaukee Valve Company.
g. Mueller Steam Specialty; a division of SPX Corporation.
h. Red-White Valve Corporation.
i. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:
a. Standard: MSS SP-67, Type I.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Design: Lug type; suitable for bidirectional double dead-end service at full rated pressure 2" through 12" without use of downstream flange. Field replaceable hard phenolic backed liner.
d. Stem: One- or two-piece stainless steel.
e. Disc: Stainless steel.

D. 200 CWP, Iron, Single-Flange Butterfly Valves with NBR Seat and Stainless-Steel Disc:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Conbraco Industries, Inc.; Apollo Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Div.
d. DeZurik Water Controls.
e. Hammond Valve.
f. Milwaukee Valve Company.
g. Mueller Steam Specialty; a division of SPX Corporation.
h. Red-White Valve Corporation.
i. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:
a. Standard: MSS SP-67, Type I.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Design: Lug type; suitable for bidirectional double dead-end service at full rated pressure 2" through 12" without use of downstream flange. Field replaceable hard phenolic backed cartridge.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: NBR.

f. Stem: One- or two-piece 416 stainless steel.
g. Disc: Stainless steel.

2.5 IRON, GROOVED-END BUTTERFLY VALVES

A. 175 CWP, Iron, Grooved-End Butterfly Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Kennedy Valve; a division of McWane, Inc.
b. Shurjoint Piping Products.
c. Tyco Fire Products LP; Grinnell Mechanical Products.
d. Victaulic Company.
e. Conbraco Industries, Inc.; Apollo Valves.
2. Description:
a. Standard: MSS SP-67, Type I.
b. CWP Rating: 175 psig (1200 kPa).
c. Body Material: Coated, ductile iron.
d. Stem: Two-piece stainless steel.
e. Disc: Coated, ductile iron.
f. Seal: EPDM.

B. 300 CWP, Iron, Grooved-End Butterfly Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Anvil International, Inc.
b. Kennedy Valve; a division of McWane, Inc.
c. Mueller Steam Specialty; a division of SPX Corporation.
d. Shurjoint Piping Products.
e. Tyco Fire Products LP; Grinnell Mechanical Products.
f. Victaulic Company.
g. Conbraco Industries, Inc.; Apollo Valves.
2. Description:
a. Standard: MSS SP-67, Type I.
b. NPS 8 (DN 200) and Smaller CWP Rating: 300 psig (2070 kPa).
c. NPS 10 (DN 250) and Larger CWP Rating: 200 psig (1380 kPa).
d. Body Material: Coated, ductile iron.
e. Stem: Two-piece stainless steel.
f. Disc: Coated, ductile iron.
g. Seal: EPDM.

2.6 BRONZE LIFT CHECK VALVES

A. Class 125, Lift Check Valves with Bronze Disc:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Conbraco Industries, Inc.; Apollo Valves.
2. Description:

a. Standard: MSS SP-80, Type 1.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Design: Vertical flow.
d. Body Material: ASTM B 61 or ASTM B 62, bronze.
e. Ends: Threaded.
f. Disc: Bronze.

B. Class 125, Lift Check Valves with Nonmetallic Disc:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Flo Fab Inc.
b. Hammond Valve.
c. Kitz Corporation.
d. Milwaukee Valve Company.
e. Mueller Steam Specialty; a division of SPX Corporation.
f. Red-White Valve Corporation.
g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
h. Conbraco Industries, Inc.; Apollo Valves.
2. Description:
a. Standard: MSS SP-80, Type 2.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Design: Vertical flow.
d. Body Material: ASTM B 61 or ASTM B 62, bronze.
e. Ends: Threaded.
f. Disc: NBR, PTFE, or TFE.

2.7 BRONZE SWING CHECK VALVES

A. Class 125, Bronze Swing Check Valves with Bronze Disc:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Hammond Valve.
e. Milwaukee Valve Company.
f. Red-White Valve Corporation.
g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
h. Conbraco Industries, Inc.; Apollo Valves
i. Description:
1) Standard: MSS SP-80, Type 3.
2) CWP Rating: 200 psig (1380 kPa).
3) Body Design: Horizontal flow.
4) Body Material: ASTM B 62, bronze.
5) Ends: Threaded.
6) Disc: Bronze.

B. Class 150, Bronze Swing Check Valves with Bronze Disc:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Milwaukee Valve Company.
e. Red-White Valve Corporation.
f. Conbraco Industries, Inc.; Apollo Valves.

2. Description:
a. Standard: MSS SP-80, Type 3.
b. CWP Rating: 300 psig (2070 kPa).
c. Body Design: Horizontal flow.
d. Body Material: ASTM B 62, bronze.
e. Ends: Threaded.
f. Disc: Bronze.

2.8 IRON SWING CHECK VALVES

A. Class 125, Iron Swing Check Valves with Metal Seats:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Hammond Valve.
e. Legend Valve.
f. Milwaukee Valve Company.
g. Red-White Valve Corporation.
h. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
i. Conbraco Industries, Inc.; Apollo Valves.
2. Description:
a. Standard: MSS SP-71, Type I.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Design: Clear or full waterway.
d. Body Material: ASTM A 126, gray iron with bolted bonnet.
e. Ends: Flanged.
f. Trim: Bronze.
g. Gasket: Asbestos free.

B. Class 125, Iron Swing Check Valves with Nonmetallic-to-Metal Seats:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Stockham Division.
c. Conbraco Industries, Inc.; Apollo Valves.
2. Description
a. Standard: MSS SP-71, Type I.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Design: Clear or full waterway.
d. Body Material: ASTM A 126, gray iron with bolted bonnet.
e. Ends: Flanged.

f. Trim: Composition.
g. Seat Ring: Bronze.
h. Disc Holder: Bronze.
i. Disc: PTFE or TFE.
j. Gasket: Asbestos free.

2.9 IRON, GROOVED-END SWING CHECK VALVES

A. 300 CWP, Iron, Grooved-End Swing Check Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Anvil International, Inc.
b. Shurjoint Piping Products.
c. Tyco Fire Products LP; Grinnell Mechanical Products.
d. Victaulic Company.
2. Description:
a. CWP Rating: 300 psig (2070 kPa).
b. Body Material: ASTM A 536, ductile iron.
c. Seal: EPDM.
d. Disc: Spring-operated, ductile iron or stainless steel.

2.10 BRONZE GATE VALVES

A. Class 125, NRS Bronze Gate Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. American Valve, Inc.
b. Crane Co.; Crane Valve Group; Crane Valves.
c. Crane Co.; Crane Valve Group; Jenkins Valves.
d. Crane Co.; Crane Valve Group; Stockham Division.
e. Hammond Valve.
f. Milwaukee Valve Company.
g. Red-White Valve Corporation.
h. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
i. Conbraco Industries, Inc.; Apollo Valves.
j. Standard: MSS SP-80, Type 1.
k. CWP Rating: 200 psig (1380 kPa).
l. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
m. Ends: Threaded[or solder joint].
n. Stem: Bronze.
o. Disc: Solid wedge; bronze.
p. Packing: Asbestos free.
q. Handwheel: Malleable iron[, bronze, or aluminum].
2. Class 125, RS Bronze Gate Valves:
a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1) Crane Co.; Crane Valve Group; Crane Valves.
2) Crane Co.; Crane Valve Group; Jenkins Valves.

3) Crane Co.; Crane Valve Group; Stockham Division.
4) Hammond Valve.
5) Milwaukee Valve Company.
6) Powell Valves.
7) Watts Regulator Co.; a division of Watts Water Technologies, Inc.
8) Conbraco Industries, Inc.; Apollo Valves.
9) Description:
    a) Standard: MSS SP-80, Type 2.
    b) CWP Rating: 200 psig (1380 kPa).
    c) Body Material: ASTM B 62, 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].

3. Class 150, NRS Bronze Gate Valves:
    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
        1) Hammond Valve.
        2) Milwaukee Valve Company.
        3) Red-White Valve Corporation.
        4) Watts Regulator Co.; a division of Watts Water Technologies, Inc.
        5) Conbraco Industries, Inc.; Apollo Valves.
        6) Description:
            a) Standard: MSS SP-80, Type 1.
            b) CWP Rating: 300 psig (2070 kPa).
            c) Body Material: ASTM B 62, 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].
4. Class 150, RS Bronze Gate Valves:
    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
        1) Crane Co.; Crane Valve Group; Crane Valves.
        2) Crane Co.; Crane Valve Group; Stockham Division.
        3) Hammond Valve.
        4) Milwaukee Valve Company.
        5) Watts Regulator Co.; a division of Watts Water Technologies, Inc.
        6) Conbraco Industries, Inc.; Apollo Valves.
        7) Description:
            a) Standard: MSS SP-80, Type 2.
            b) CWP Rating: 300 psig (2070 kPa).
            c) Body Material: ASTM B 62, 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].

2.11 BRONZE GLOBE VALVES

A. Class 125, Bronze Globe Valves with Bronze Disc:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Stockham Division.
c. Hammond Valve.
d. Milwaukee Valve Company.
e. Red-White Valve Corporation.
f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
g. Conbraco Industries, Inc.; Apollo Valves.
2. Description:
a. Standard: MSS SP-80, Type 1.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
d. Ends: Threaded[or solder joint].
e. Stem and Disc: Bronze.
f. Packing: Asbestos free.
g. Handwheel: Malleable iron[, bronze, or aluminum].

B. Class 125, Bronze Globe Valves with Nonmetallic Disc:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Stockham Division.
c. Red-White Valve Corporation.
d. Conbraco Industries, Inc.; Apollo Valves.
2. Description:
a. Standard: MSS SP-80, Type 2.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
d. Ends: Threaded[or solder joint].
e. Stem: Bronze.
f. Disc: PTFE or TFE.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron[, bronze, or aluminum].

C. Class 150, Bronze Globe Valves with Nonmetallic Disc:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Crane Co.; Crane Valve Group; Crane Valves.
b. Hammond Valve.
c. Milwaukee Valve Company.
d. Red-White Valve Corporation.

e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
f. Conbraco Industries, Inc.; Apollo Valves.

2. Description:
   a. Standard: MSS SP-80, Type 2.
   b. CWP Rating: 300 psig (2070 kPa).
   c. Body Material: ASTM B 62, bronze with integral seat and union-ring bonnet.
   d. Ends: Threaded.
   e. Stem: Bronze.
   f. Disc: PTFE or TFE.
   g. Packing: Asbestos free.
   h. Handwheel: Malleable iron[, bronze, or aluminum].

2.12 CHAINWHEELS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Babbitt Steam Specialty Co.
   2. Roto Hammer Industries.
   3. Trumbull Industries.

B. Description: Valve actuation assembly with sprocket rim, brackets, and chain.
   1. Brackets: Type, number, size, and fasteners required to mount actuator on valve.
   2. Attachment: For connection to [ball] [butterfly] [and] [plug] valve stems.
   3. Sprocket Rim with Chain Guides: Ductile iron, of type and size required for valve.
   4. Chain: Hot-dip, galvanized steel, of size required to fit sprocket rim.

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 chainwheels on operators for [ball] [butterfly] [gate] [and] [globe] valves NPS 4 (DN 100) and larger and more than 96 inches (2400 mm) above floor. Extend chains to 60 inches (1520 mm) above finished floor.

F. Install check valves for proper direction of flow and as follows:
1. Swing Check Valves: In horizontal position with hinge pin level.
2. Lift Check Valves: With stem upright and plumb.

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 valve applications are not indicated, use the following:
1. Shutoff Service: Ball, butterfly, or gate valves.
2. Butterfly Valve Dead-End Service: Single-flange (lug) type.
3. Throttling Service: Ball with memory stop, circuit setter, or flow control valves.
4. Pump-Discharge Check Valves:
   a. NPS 2 (DN 50) and Smaller: Bronze swing check valves with [bronze] [or] [nonmetallic] disc.
   b. NPS 2-1/2 (DN 65) and Larger for Domestic Water: Brass swing check valves with lever and weight or with spring or iron, center-guided, [metal] [or] [resilient]-seat check valves.
   c. NPS 2-1/2 (DN 65) and Larger for Sanitary Waste and Storm Drainage: Iron swing check valves with lever and weight or spring.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:
1. For Copper Tubing, NPS 2 (DN 50) and Smaller: Threaded ends except where solder- joint valve-end option is indicated in valve schedules below.
2. For Copper Tubing, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends except where threaded valve-end option is indicated in valve schedules below.
3. For Copper Tubing, NPS 5 (DN 125) and Larger: Flanged ends.
4. For Steel Piping, NPS 2 (DN 50) and Smaller: Threaded ends.
5. For Steel Piping, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends except where threaded valve-end option is indicated in valve schedules below.
6. For Steel Piping, NPS 5 (DN 125) and Larger: Flanged ends.
7. For Grooved-End [Copper Tubing] [and] [Steel Piping]: Valve ends may be grooved.

3.5 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 4 (DN 100) and Smaller:
1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.

2. Bronze Angle Valves: Class 125, bronze disc.
3. Ball Valves: Three piece, full port, bronze with brass trim.

END OF SECTION 220523 22 0523

SECTION 22 0548 - VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Seismic control requirements.

B. Vibration-isolated equipment support bases.

C. Vibration isolators.

D. External seismic snubber assemblies.

E. Seismic restraint systems.

F. Vibration-isolated and/or seismically engineered roof curbs.

G. Inertia bases.

H. Vibration isolators.

1.2 DEFINITIONS

A. Plumbing Component: Where referenced in this section in regards to seismic controls, applies to any portion of the plumbing system subject to seismic evaluation in accordance with applicable codes, including distributed systems (e.g., piping).

B. Seismic Restraint: Structural members or assemblies of members or manufactured elements specifically designed and applied for transmitting seismic forces between components and the seismic force-resisting system of the structure.

1.3 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

B. ASCE 19 - Structural Applications of Steel Cables for Buildings; 2016.

C. FEMA 412 - Installing Seismic Restraints for Mechanical Equipment; 2002.

D. FEMA 413 - Installing Seismic Restraints for Electrical Equipment; 2004.

E. FEMA 414 - Installing Seismic Restraints for Duct and Pipe; 2004.

F. FEMA E-74 - Reducing the Risks of Nonstructural Earthquake Damage; 2012.

G. MFMA-4 - Metal Framing Standards Publication; 2004.

H. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; 2008.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
1. Coordinate selection and arrangement of vibration isolation and/or seismic control components with the actual equipment to be installed.
2. Coordinate the work with other trades to provide additional framing and materials required for installation.
3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
4. Seismic Controls:
   a. Coordinate the arrangement of seismic restraints with piping, conduit, equipment, and other potential conflicts installed under other sections or by others.
   b. Coordinate the work with other trades to accommodate relative positioning of essential and nonessential components in consideration of seismic interaction.
5. Notify DEDC, LLC of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 3000.

1.5 SUBMITTALS

A. Design Documents: Prepare and submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, details, and calculations.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.
1. Vibration Isolators: Include rated load capacities and deflections; include information on color coding or other identification methods for spring element load capacities.
2. Seismic Controls: Include seismic load capacities.

C. Shop Drawings - Vibration Isolation Systems:
1. Include dimensioned plan views and sections indicating proposed arrangement of vibration isolators; indicate equipment weights and static deflections.

D. Shop Drawings - Seismic Controls:
1. Include dimensioned plan views and sections indicating proposed plumbing component locations and distributed system routing, with locations and details of gravity supports and seismic restraints and associated attachments.
2. Identify anchor manufacturer, type, minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
3. Indicate proposed arrangement of distributed system trapeze support groupings.
4. Indicate proposed locations for distributed system flexible fittings and/or connections.
5. Indicate locations of seismic separations where applicable.

E. Seismic Design Data:

1. Include structural calculations, stamped or sealed by seismic controls designer, demonstrating suitability of seismic controls for seismic design forces.

F. Shop Drawings: Indicate inertia bases and locate vibration isolators, with static and dynamic load on each.

1.6 QUALITY ASSURANCE

A. Comply with applicable building code.

B. Seismic Controls Designer Qualifications: Registered professional engineer licensed in Pennsylvania and with minimum five years experience designing seismic restraints for nonstructural components.
1. Designer may be employed by the manufacturer of the seismic restraint products.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 SEISMIC CONTROL REQUIREMENTS

A. Design and provide plumbing component restraints, supports, and attachments suitable for seismic loads determined in accordance with applicable codes, as well as gravity and operating loads and other structural design considerations of the installed location. Consider wind loads for outdoor plumbing components.

B. Seismic Design Criteria: As indicated on drawings.

C. Component Importance Factor (Ip): Plumbing components essential to life safety to be assigned a component importance factor (Ip) of 1.5 as indicated or as required. This includes but is not limited to:
1. Plumbing components required to function for life safety purposes after an earthquake.
2. Plumbing components that support or otherwise contain hazardous substances.

D. Seismic Restraints:
1. Provide seismic restraints for plumbing components except where exempt according to applicable codes and specified seismic design criteria, as approved by authorities having jurisdiction.
2. Seismic Restraint Exemptions:
a. Exemptions for Seismic Design Category C:
1) Plumbing components where either of the following apply:
a) The component importance factor (Ip) is 1.0 and the component is positively attached to the structure.
b) The component weighs 20 pounds or less or, in the case of a distributed system, 5 pounds per foot or less.
2) Plumbing piping with component importance factor (Ip) of 1.5 and nominal pipe size of 2 inch or less, where flexible connections, expansion loops, or other assemblies are provided

between piping and associated components, and where piping is positively attached to the structure; exemption does not apply to piping constructed of low-deformability materials (e.g., cast iron, glass, nonductile plastics).

b. Plumbing Piping Exemptions, All Seismic Design Categories:
   1) Plumbing piping where flexible connections, expansion loops, or other assemblies are provided between piping and associated components, where piping is positively attached to the structure, and where one of the following apply:
      a) Trapeze supported piping weighing less than 10 pounds per foot, where all pipes supported meet size requirements for exemption as single pipes described under specific seismic design category exemptions above.
      b) Trapeze supported piping with trapeze assemblies using 3/8 inch diameter rod hangers not exceeding 12 inches in length from support point connection to the supporting structure, where all pipes supported have a component importance factor (Ip) of 1.0 and meet size requirements for exemption as single pipes described under specific seismic design category exemptions above, and where the total weight supported by any single trapeze is 100 pounds or less.
      c) Trapeze supported piping with trapeze assemblies using 1/2 inch diameter rod hangers not exceeding 12 inches in length from support point connection to the supporting structure, where all pipes supported have a component importance factor (Ip) of 1.0 and meet size requirements for exemption as single pipes described under specific seismic design category exemptions above, and where the total weight supported by any single trapeze is 200 pounds or less.
      d) Trapeze supported piping with trapeze assemblies using 1/2 inch diameter rod hangers not exceeding 24 inches in length from support point connection to the supporting structure, where all pipes supported have a component importance factor (Ip) of 1.0 and meet size requirements for exemption as single pipes described under specific seismic design category exemptions above, and where the total weight supported by any single trapeze is 100 pounds or less.
      e) Hanger supported piping with individual rod hangers 3/8 inch or 1/2 inch in diameter not exceeding 12 inches in length from support point connection to the supporting structure, where pipe has a component importance factor (Ip) of 1.0 and meets size requirements for exemption as single pipes described under specific seismic design category exemptions above, and where the total weight supported by any single rod is 50 pounds or less.

3. Comply with applicable general recommendations of the following, where not in conflict with applicable codes, seismic design criteria, or other specified requirements:
   a. FEMA 412.
   b. FEMA 413.
   c. FEMA 414.
   d. FEMA E-74.
   e. SMACNA (SRM).
4. Seismic restraint capacities to be verified by a Nationally Recognized Testing Laboratory (NRTL) or certified by an independent third-party registered professional engineer acceptable to authorities having jurisdiction.
5. Seismic Type Vibration Isolators:
   a. Comply with seismic design requirements, including conditions of equipment seismic certification where applicable.
6. External Seismic Snubber Assemblies:

a. Provide quantity and arrangement of external seismic snubber assemblies as required to restrain equipment in all directions (both lateral and vertical).
b. Do not use external seismic snubber assemblies that restrain equipment only in one or more lateral directions (but not vertical) except where uplift forces are zero or are addressed by other restraints.

7. Seismic Restraint Systems:
   a. Except where otherwise restricted, use of either cable or rigid restraints is permitted.
   b. Use only cable restraints to restrain vibration-isolated plumbing components, including distributed systems.
   c. Use only one restraint system type for a given plumbing component or distributed system (e.g., piping) run; mixing of cable and rigid restraints on a given component/run is not permitted.
   d. Size restraint elements, including anchorage, to resist seismic loads as necessary to restrain plumbing component in all lateral directions; consider bracket geometry in anchor load calculations.
   e. Use rod stiffener clips to attach bracing to hanger rods as required to prevent rod buckling from vertical (upward) compressive load introduced by cable or rigid restraints loaded in tension, in excess of downward tensile load due to supported plumbing component weight.
   f. Select hanger rods and associated anchorage as required to accommodate vertical (downward) tensile load introduced by rigid restraints loaded in compression, in addition to downward tensile load due to supported plumbing component weight.
   g. Clevis hangers may only be used for attachment of transverse restraints; do not use for attachment of longitudinal restraints.
   h. Where seismic restraints are attached to clevis hangers, provide clevis bolt reinforcement accessory to prevent clevis hanger deformation.
   i. Do not introduce lateral loads on open bar joist chords or the weak axis of beams, or loads in any direction at other than panel points unless approved by project Structural Engineer of Record.

E. Seismic Attachments:
   1. Attachments to be bolted, welded, or otherwise positively fastened without consideration of frictional resistance produced by the effects of gravity.
   2. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) or qualified evaluation service acceptable to authorities having jurisdiction for compliance with applicable building code, and qualified for seismic applications; concrete anchors to be qualified for installation in both cracked and uncracked concrete.
   3. Do not use power-actuated fasteners.
   4. Do not use friction clips (devices that rely on mechanically applied friction to resist loads). Beam clamps may be used for supporting sustained loads where provided with restraining straps.
   5. Comply with anchor minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
   6. Concrete Housekeeping Pads:
      a. Increase size of pad as required to comply with anchor requirements.
      b. Provide pad reinforcement and doweling to ensure integrity of pad and connection and to provide adequate load path from pad to supporting structure.

F. Seismic Interactions:
   1. Include provisions to prevent seismic impact between plumbing components and other structural or nonstructural components.

2. Include provisions such that failure of a component, either essential or nonessential, does not cause the failure of an essential component.

G. Seismic Relative Displacement Provisions:
1. Use suitable fittings or flexible connections to accommodate:
   a. Relative displacements at connections between components, including distributed systems (e.g., piping); do not exceed load limits for equipment utility connections.
   b. Relative displacements between component supports attached to dissimilar parts of structure that may move differently during an earthquake.
   c. Design displacements at seismic separations.
   d. Anticipated drifts between floors.

2.2 MANUFACTURERS

A. Isolation Technology, Inc: www.isolationtech.com.

2.3 VIBRATION ISOLATORS

A. Manufacturers:
1. Vibration Isolators:
   a. Kinetics Noise Control, Inc; None - N/A: www.kineticsnoise.com/#sle.
   b. Mason Industries; None - N/A: www.mason-ind.com/#sle.
   c. Vibration Eliminator Company, Inc; None - N/A: www.veco-nyc.com/#sle.

B. General Requirements:
1. Resilient Materials for Vibration Isolators: Oil, ozone, and oxidant resistant.
2. Spring Elements for Spring Isolators:
   a. Color code or otherwise identify springs to indicate load capacity.
   b. Lateral Stability: Minimum lateral stiffness to vertical stiffness ratio of 0.8.
   c. Designed to operate in the linear portion of their load versus deflection curve over deflection range of not less than 50 percent above specified deflection.
   d. Designed to provide additional travel to solid of not less than 50 percent of rated deflection at rated load.
   e. Selected to provide designed deflection of not less than 75 percent of specified deflection.
   f. Selected to function without undue stress or overloading.
3. Seismic Snubbing Elements for Seismic Isolators:
   a. Air Gap: Between 0.125 inches and 0.25 inches unless otherwise indicated.
   b. Points of Contact: Cushioned with resilient material, minimum 0.25 inch thick; capable of being visually inspected for damage and replaced.

C. Vibration Isolators for Seismic Applications:
1. Resilient Material Isolator Mounts, Seismic:
   a. Description: Mounting assemblies for bolting equipment to supporting structure utilizing elastomeric (e.g., neoprene, rubber) isolator material; specifically designed and rated for seismic applications with integral snubbing in all directions.
2. Restrained Spring Isolators, Seismic:
   a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) in series with elastomeric (e.g., neoprene, rubber) isolator material within a metal

housing designed to prevent movement of supported equipment above an adjustable vertical limit stop; specifically designed and rated for seismic applications with integral snubbing in all directions.
   b. Bottom Load Plate: Steel with provisions for bolting to supporting structure as required.
   c. Furnished with integral leveling device for positioning and securing supported equipment.
   d. Provides constant free and operating height.
3. Resilient Material Isolator Hangers, Seismic:
   a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing elastomeric (e.g., neoprene, rubber) isolator material for the lower hanger rod connection; specifically designed and rated for seismic applications with vertical limit stop to prevent upward travel of hanger rod and cushion impact.
4. Spring Isolator Hangers, Seismic:
   a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) in series with an elastomeric element for the lower hanger rod connection; specifically designed and rated for seismic applications with vertical limit stop to prevent upward travel of hanger rod and cushion impact.
   b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.
5. Combination Resilient Material/Spring Isolator Hangers, Seismic:
   a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) for the lower hanger rod connection and elastomeric (e.g., neoprene, rubber) isolator material for the upper hanger rod connection; specifically designed and rated for seismic applications with vertical limit stop to prevent upward travel of hanger rod and cushion impact.
   b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.

2.4 EXTERNAL SEISMIC SNUBBER ASSEMBLIES

A. Manufacturers:
1. External Seismic Snubber Assemblies:
   a. Kinetics Noise Control, Inc; None - N/A: www.kineticsnoise.com/#sle.
   b. Mason Industries; None - N/A: www.mason-ind.com/#sle.
   c. Vibration Eliminator Company, Inc; None - N/A: www.veco-nyc.com/#sle.

B. Description: Steel snubbing assemblies designed for external attachment to both equipment and supporting structure that, as part of a complete system, restrain equipment motion in all directions during a seismic event while maintaining vibration isolation during normal operation.

C. Seismic Snubbing Elements:
1. Air Gap: Between 0.125 inches and 0.25 inches unless otherwise indicated.
2. Points of Contact: Cushioned with resilient material, minimum 0.25 inch thick; capable of being visually inspected for damage and replaced.

2.5 SEISMIC RESTRAINT SYSTEMS

A. Manufacturers:

1. Seismic Restraint Systems:
    a. Eaton Corporation; None - N/A: www.eaton.com/#sle.
    b. Kinetics Noise Control, Inc; None - N/A: www.kineticsnoise.com/#sle.
    c. Mason Industries; None - N/A: www.mason-ind.com/#sle.

B. Description: System components and accessories specifically designed for field assembly and attachment of seismic restraints.

C. Cable Restraints:
1. Comply with ASCE 19.
2. Cables: Pre-stretched, galvanized steel wire rope with certified break strength.
3. Cable Connections: Use only swaged end fittings. Cable clips and wedge type end fittings are not permitted in accordance with ASCE 19.
4. Use protective thimbles for cable loops where potential for cable damage exists.

D. Rigid Restraints: Use MFMA-4 steel channel (strut), steel angle, or steel pipe for structural element; suitable for both compressive and tensile design loads.

2.6 VIBRATION-ISOLATED AND/OR SEISMICALLY ENGINEERED ROOF CURBS

A. Manufacturers:
1. Vibration-Isolated and/or Seismically Engineered Roof Curbs:
    a. Kinetics Noise Control, Inc; None - N/A: www.kineticsnoise.com/#sle.
    b. Mason Industries; None - N/A: www.mason-ind.com/#sle.
    c. Vibration Eliminator Company, Inc; None - N/A: www.veco-nyc.com/#sle.

B. Vibration Isolation Curbs:
1. Seismic Curb:
    a. Location: Between structure and rooftop equipment.
    b. Construction: Steel.
    c. Integral vibration isolation to comply with requirements of this section.
    d. Snubbers consist of minimum 0.25 inch thick resilient pads to avoid metal-to-metal contact without compromising vibration isolating capabilities.
    e. Weather exposed components consist of corrosion resistant materials.

2.7 INERTIA BASES

A. Structural Bases:
1. Construction: Welded structural steel with gusseted brackets, to support equipment and motor, with motor slide rails.
2. Design: Sufficiently rigid to prevent misalignment or undue stress on machine, and to transmit design loads to isolators and snubbers.

B. Concrete Inertia Bases:
1. Construction: Structural steel channel perimeter frame, with gusseted brackets and anchor bolts, reinforcing; concrete filled.
2. Mass: Minimum of 1.5 times weight of isolated equipment.
3. Connecting Point: Reinforced to connect isolators and snubbers to base.
4. Concrete: Minimum 3000 psi concrete.

2.8 VIBRATION ISOLATORS

A. Restrained Open Spring Isolators:
1. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection. Color code springs for load carrying capacity.
2. Spring Mounts: Provide with leveling devices, minimum 0.25 inch thick neoprene sound pads, and zinc chromate plated hardware.
3. Sound Pads: Size for minimum deflection of 0.05 inch; meet requirements for neoprene pad isolators.
4. Restraint: Provide heavy mounting frame and limit stops.

B. Spring Hanger:
1. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection. Color code springs for load carrying capacity.
2. Housings: Incorporate neoprene isolation pad meeting requirements for neoprene pad isolators.
3. Misalignment: Capable of 20 degree hanger rod misalignment.

C. Neoprene Pad Isolators:
1. Rubber or neoprene waffle pads.
a. Hardness: 30 durometer.
b. Thickness: Minimum 1/2 inch.
c. Maximum Loading: 50 psi.
d. Rib Height: Maximum 0.7 times width.
2. Configuration: Single layer.
3. Configuration: 1/2 inch thick waffle pads bonded each side of 1/4 inch thick steel plate.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.

B. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

C. Secure fasteners according to manufacturer's recommended torque settings.

D. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

E. Seismic Controls:
1. Provide specified snubbing element air gap; remove any factory-installed spacers, debris, or other obstructions.

2. Use only specified components, anchorage, and hardware evaluated by seismic design. Comply with conditions of seismic certification where applicable.
3. Where mounting hole diameter exceeds bolt diameter by more than 0.125 inch, use epoxy grout, elastomeric grommet, or welded washer to reduce clearance to 0.125 inch or less.
4. Equipment with Sheet Metal Housings:
    a. Use Belleville washers to distribute stress over a larger surface area of the sheet metal connection interface as approved by manufacturer.
    b. Attach additional steel as approved by manufacturer where required to transfer loads to structure.
    c. Where mounting surface is irregular, do not shim housing; reinforce housing with additional steel as approved by manufacturer.
5. Concrete Housekeeping Pads:
    a. Size in accordance with seismic design to meet anchor requirements.
    b. Install pad reinforcement and doweling in accordance with seismic design to ensure integrity of pad and associated connection to slab.
6. Seismic Restraint Systems:
    a. Do not attach seismic restraints and gravity supports to dissimilar parts of structure that may move differently during an earthquake.
    b. Install restraints within permissible angles in accordance with seismic design.
    c. Install cable restraints straight between component/run and structural attachment; do not bend around other nonstructural components or structural elements.
    d. Install cable restraints for vibration-isolated components slightly slack to prevent short-circuiting of isolation.
    e. Install hanger rod stiffeners where indicated using only specified clamps; do not weld stiffeners to hanger rod.

3.3 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect vibration isolation and/or seismic control components for damage and defects.

C. Seismic Controls:
    1. Verify snubbing element air gaps.

D. Correct deficiencies and replace damaged or defective vibration isolation and/or seismic control components.

END OF SECTION 22 0548

SECTION 22 0553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Pipe markers.

1.2 SUBMITTALS

A. Schedules:
1. Submit plumbing component identification schedule listing equipment, piping, and valves.
2. Detail proposed component identification data in terms of of wording, symbols, letter size, and color coding to be applied to corresponding product.
3. Valve Data Format: Include id-number, location, function, and model number.

B. Product Data: Provide manufacturers catalog literature for each product required.

C. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

D. Project Record Documents: Record actual locations of tagged valves.

PART 2 PRODUCTS

2.1 PLUMBING COMPONENT IDENTIFICATION GUIDELINE

A. Pipe Markers: 3/4 inch diameter and higher.

2.2 NAMEPLATES

A. Description: Laminated piece with up to three lines of text.
1. Letter Color: White.
2. Letter Height: 1/4 inch.
3. Background Color: Black.

2.3 TAGS

A. Flexible: Vinyl with engraved black letters on light contrasting background color with up to three lines of text. Minimum tag size 1-1/2 inch in diameter.

B. Metal: Brass, 19 gauge 1-1/2 inch in diameter with smooth edges, blank, smooth edges, and corrosion-resistant ball chain. Up to three lines of text.

2.4 PIPE MARKERS

A. Comply with ASME A13.1.

B. Flexible Marker: Factory fabricated, semi-rigid, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid conveyed.

C. Underground Flexible Marker: Bright-colored continuously printed ribbon tape, minimum 6 inches wide by 4 mil, 0.004 inch thick, manufactured for direct burial service.

D. Identification Scheme, ASME A13.1:
1. Primary: External Pipe Diameter, Uninsulated or Insulated.
2. Secondary: Color scheme per fluid service.
a. Water; Potable, Cooling, Boiler Feed, and Other: White text on green background.

PART 3 EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive identification products.

3.2 INSTALLATION

A. Install flexible nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags in clear view and align with axis of piping

C. Install plastic pipe markers in accordance with manufacturer's instructions.

D. Install plastic tape pipe marker around pipe in accordance with manufacturer's instructions.

E. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.

F. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION 22 0553

SECTION 22 0719 - PLUMBING INSULATION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Piping system insulation.
2. Equipment insulation.
3. Pipe insulation jackets.
4. Equipment insulation jackets.
5. Insulation accessories including vapor retarders and accessories.

1.2 **REQUIREMENTS**

A. All insulation shall have a maximum flame spread index of 25.

B. All insulation shall have a maximum smoke developed index of 50.

1.3 SUBMITTALS

A. Product Data: Submit product description, thermal characteristics, flame spread index, smoke developed index and list of materials and thickness for each service, and location.

1.4 CLOSE OUT SUBMITTALS

A. Not Applicable

1.5 QUALITY ASSURANCE

A. Insulation shall be installed to provide an impenetrable vapor barrier around the object insulated. The insulation contractor shall fully adhere insulation to all surfaces so that there are no gaps between the insulation and the surface of the object insulated.

B. Insulation shall not be compressed when installed upon objects. Insulator shall install insulation so that it maintains its original (specified) thickness.

C. Insulation jacketing must maintain a continuous barrier around insulation. Insulation jacketing that has cuts, rips or breaks will not be accepted.

D. Insulation jacketing must be clean and having its original reflectivity.

E. Maintain temperature before, during and after installation for a minimum of 24 hours.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and damage, by storing in original wrapping.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Install insulation only when ambient temperature and humidity conditions are within range recommended by manufacturer.

B. Maintain temperature during and after installation for minimum period of 24 hours.

1.8 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 **INSULATION CODE**

A. MAN MADE MINERAL FIBER: Insulation Code PI-1
1. Insulation: ASTM C457, Type I - pipe and tubing insulation
    a. Temperature ranges 0F to 850F
    b. ‘K’ factor: ASTM C177, 0.24 at 75 degrees F
    c. ASJ Vapor Retarder Jacket
    d. Moisture Vapor Transmission: 0.002 perm

B. MAN MADE MINERAL FIBER: Insulation Code PI-2
1. Insulation: ASTM C1393, Type I - semi rigid fiberous glass board, Class 2
    a. Temperature ranges 0F to 850F
    b. ‘K’ factor: ASTM C177, 0.27 at 75 degrees F
    c. ASJ Vapor Retarder Jacket
        1) Moisture Vapor Transmission: 0.002 perm

C. CELLULAR POLYISOCYANURATE INSULATION: Insulation Code PI-3
1. Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation: ASTM C591, Type III, compressive strength 50 psi
    a. Temperature ranges -297F to 250F
    b. ‘K” factor: 0.19 at 75 degrees F.
    c. Fasteners: Fasten with fiber reinforced masking tape. For sizedover 6” fasten with18 gage stainless steel wires over fiber reinforced masking tape.

D. ELASTOMERIC CELLULAR FOAM: Insulation Code PI-4
1. Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular form: ASTM C534; Type I, Tubular form.
2. Elastomeric Foam Adhesive:

a. Air dried, contact adhesive, compatible with insulation.

2.2 PIPE INSULATION AND EQUIPMENT JACKETS:

A. PVC Plastic Jacket: Insulation Jacket Code PJ-1
1. Product Description: Sheet material, WHITE.
2. Moisture Vapor Transmission: ASTM E96; 0.002 perm-inches.
a. Thickness: 30 mil.
1) Connections: Brush on welding adhesive.
2) Compatible with insulation.

B. VentureClad: Insulation Jacket Code PJ-2
1. VentureClad model 1579CW-E insulation jacketing tape with and aluminum stucco embossed finish.
a. Stainless Steel Pipe Jacket: Insulation Jacket Code PJ-3
1) ASTM A167 Type 304 stainless steel
2) Thickness: 0.18 inch thick
3) Finish: Smooth
4) Metal Jacket Bands: 3/8” wide; 0.010 inch thick stainless steel

2.3 Valve Insulation:

A. All Domestic water valves shall be insulated per systems insulation requirements.

2.4 APPROVED INSULATION MANUFACTURERS:

A. Armstrong

B. Certain-Teed

C. Dow Chemical

D. HiTherm

E. Johns Manville

F. Owens Corning

G. Pittsburg Corning

H. Specialty Products & Insulation

I. Venture Products

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify piping and equipment has been tested before applying insulation materials.

B. Verify surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION

A. Verify field measurements prior to fabrication.

B. Insulation / Jackets in environmental air plenums shall have 25/50 Flame/Smoke rating

C. Insulate entire piping system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints:
   1. Furnish factory-applied or field-applied vapor retarder jackets. Secure factory- applied jackets with pressure sensitive adhesive self-sealing longitudinal laps and butt strips. Secure field-applied jackets with outward clinch expanding staples and seal staple penetrations with vapor retarder mastic.
   2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with fitting covers.

D. Inserts and Shields:
   1. Application: Piping or Equipment
   2. Shields: Minimum 12inches Long Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
   3. Insert location: Between support shield and piping and under finish jacket.
   4. Inserts (Domestic Cold Water and Rain Water Collectors): Armaflex Ultima (Wood Dowels or Wood Blocking are not allowed)
   5. Inserts (Domestic Hot Water): 12” long minimum Calcium Silicate (Wood Dowels or Wood Blocking are not allowed)

E. Continue insulation through penetrations of building assemblies or portions of assemblies having fire resistance rating of one hour or less. Provide intumescent fire stopping when continuing insulation through assembly. Finish at supports, protrusions, and interruptions.

F. All vapor barrier and jacket seams shall be located located at 3 or 9 o’clock position on side of horizontal piping and with overlap facing down to shed water or on bottom side of horizontal duct.

G. Heat Traced Piping: Size insulation large enough to enclose pipe and heat tracer.

H. Factory Insulated Equipment: Do not insulate.

I. Exposed Piping and Equipment: Locate insulation and cover seams in least visible locations. Jacketing required on exposed piping.

J. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.

K. Finish insulation at supports, protrusions, and interruptions.

L. Nameplates and ASME Stamps: Bevel and seal insulation around; do not insulate over.

M. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation for easy removal and replacement without damage.

N. All piping routed interior to the building and in concealed spaces does not require a jacket.

O. Plumbing insulation in environmental air plenums to have 25/50 flame/smoke rating

3.3 SCHEDULES

A. Piping insulation required thickness based on fluid temperature and insulation conductivity:

TABLE C403.12.3 MINIMUM PIPE INSULATION THICKNESS (in inches)[a, c]

FLUID OPERATING TEMPERATURE RANGE AND USAGE (°F)	INSULATION CONDUCTIVITY		NOMINAL PIPE OR TUBE SIZE (inches)				
	Conductivity Btu × in./(h × ft² × °F)[b]	Mean Rating Temperature, °F	< 1	1 to < 1 1/2	1 1/2 to < 4	4 to < 8	> 8
> 350	0.32–0.34	250	4.5	5.0	5.0	5.0	5.0
251–350	0.29–0.32	200	3.0	4.0	4.5	4.5	4.5
201–250	0.27–0.30	150	2.5	2.5	2.5	3.0	3.0
141–200	0.25–0.29	125	1.5	1.5	2.0	2.0	2.0
105–140	0.21–0.28	100	1.0	1.0	1.5	1.5	1.5
40–60	0.21–0.27	75	0.5	0.5	1.0	1.0	1.0
< 40	0.20–0.26	50	0.5	1.0	1.0	1.0	1.5

For SI: 1 inch = 25.4 mm, °C = [(°F) – 32]/1.8.

a. For piping smaller than 1 1/2 inches and located in partitions within conditioned spaces, reduction of these thicknesses by 1 inch shall be permitted (before thickness adjustment required in Note b) but not to a thickness less than 1 inch.

For piping smaller than 1.5 inch and located in partitions within conditioned spaces, reduction of these thicknesses by 1 inch shall be permitted, but not to a thickness less than 1 inch.

B. Pipe Insulation Schedule:
1. Piping System / Insulation Code / Jacket Code
    a. Domestic Hot Water - Interior to Building Exposed / PI-1/ PJ-1 PJ-3*
    b. Domestic Hot Water - Interior to Building Concealed / PI-1 / None Required
    c. Domestic Cold Water - Interior to Building Exposed / PI-4 / PJ-1 PJ-3*
    d. Domestic Cold Water - Interior to Building Concealed / PI-4 / None Required
    e. Domestic Cold Water - Exterior to Building / PI-3 / PJ-2

* Use stainless steel jacket if room temperature exceeds 120F and where volatile or corrosive chemicals are stored.

END OF SECTION 22 0719

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SECTION 22 0719.11 - UNDER-LAVATORY PIPE AND SUPPLY COVERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Under-lavatory pipe and supply covers.

1.2 REFERENCE STANDARDS

A. 28 CFR 36 - Nondiscrimination by Public Accommodations and in Commercial Facilities; Final Rule; Department of Justice; current edition.

B. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

C. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

D. ASTM C1822 - Standard Specification for Insulating Covers on Accessible Lavatory Piping; 2015.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.

F. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.3 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide catalog illustrations of covers, sizes, and finishes.

C. Manufacturer's Instructions: Indicate installation methods and procedures.

D. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.4 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.1 UNDER-LAVATORY PIPE and SUPPLY COVERS

A. Basis of Design: Plumberex Specialty Products, Inc; www.plumberex.com/#sle.
   1. Fusion Molded Under-Lavatory Insulators (Non-Sewn): Plumberex Handy-Shield Maxx.

2. Slim Fit Under-Lavatory Insulators (Non-Sewn): Plumberex Trap Gear.
3. Under-Lavatory Covers with Snap-Lock Fasteners (Molded): Plumberex Pro-Extreme.

B. General:
1. Insulate exposed drainage piping including hot, cold, and tempered water supplies under lavatories or sinks per ADA Standards.
2. Adhesives, sewing threads, and two-ply laminated materials are prohibited.
3. Exterior Surfaces: Smooth nonabsorbent with no finger recessed indentations for easy cleaning.
4. Construction: 1/8 inch PVC with antimicrobial, antifungal, and ultraviolet light (UV) resistant properties.
   a. Comply with ASTM C1822 for covers on accessible lavatory piping.

C. ASTM E84 Compliant, Under-Lavatory Insulators:
1. Construction: Soft, non-laminated, flexible PVC with antimicrobial, antifungal, and UV-resistant properties. Fusion molded one piece universal design for multiple P-trap configurations. Adhesives, sewing threads, and two ply laminated materials shall not be allowed. Exterior surfaces shall be smooth nonabsorbent with no finger recessed indentations for easy cleaning. Supply riser shall be flexible and a minimum of 15 inches inches in length.
2. Provide with weep hole for condensation drainage and ventilation.
3. Fasteners: Reusable, fusion bonded Velcro and tamper resistant snap-locking fasteners with no sharp or abrasive external surfaces. No cable tie fasteners allowed.

D. Under-Lavatory Covers with Snap-Lock Fasteners:
1. Manufacturers:
   a. Plumberex Specialty Products, Inc: Plumberex Pro-Extreme; www.plumberex.com/#sle.
2. Construction: PVC with antimicrobial, antifungal, and UV-resistant properties, one piece injected molded design with internal bridge at top of J-bend to prevent separating.
3. Fasteners: Reusable, snap-locking fasteners with no sharp or abrasive external surfaces. No cable ties allowed.
4. Maintenance: Valve and supply cover shall be accessible for maintenance without removal and with removable, reusable access cap.
5. Provide with weep hole for condensation drainage and ventilation.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install under-lavatory guards according to manufacturer's written instructions..

3.2 CLEANING

A. Clean installed under-lavatory guards.

3.3 PROTECTION

A. Protect installed products from damage due to subsequent construction operations.

B. Repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 22 0719.11

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SECTION 22 1113 - FACILITY WATER DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes water-distribution piping and related components outside the building for water service.

B. Utility-furnished products include water meters that will be furnished to the site, ready for installation.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Detail precast concrete vault assemblies and indicate dimensions, method of field assembly, and components.

C. Field quality-control test reports.

D. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements:
1. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.
2. Comply with standards of authorities having jurisdiction for potable-water-service piping, including materials, installation, testing, and disinfection.

B. Comply with standards of authorities having jurisdiction for fire-suppression water- service piping, including materials, hose threads, installation, and testing.

C. Piping materials shall bear label, stamp, or other markings of specified testing agency.

D. Comply with ASTM F 645 for selection, design, and installation of thermoplastic water piping.

E. Comply with FMG's "Approval Guide" or UL's "Fire Protection Equipment Directory" for fire- service-main products.

F. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-service-main piping for fire suppression.

G. NSF Compliance:
1. Comply with NSF 14 for plastic potable-water-service piping. Include marking "NSF- pw" on piping.
2. Comply with NSF 61 for materials for water-service piping and specialties for domestic water.

1.4 PROJECT CONDITIONS

A. Interruption of Existing Water-Distribution 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 water-distribution service according to requirements indicated:
   1. Notify Construction Manager and Owner no fewer than two days in advance of proposed interruption of service.
   2. Do not proceed with interruption of water-distribution service without Construction Manager's and Owner's written permission.

1.5 COORDINATION

A. Coordinate connection to water main with utility company.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. Soft Copper Tube: ASTM B 88, Type K and ASTM B 88, Type L, water tube, annealed temper.
   1. Copper, Solder-Joint Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.

B. Hard Copper Tube: ASTM B 88, Type K and ASTM B 88, Type L, water tube, drawn temper.
   1. Copper, Solder-Joint Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.

C. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.
   1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
   2. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

D. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell and plain spigot end unless grooved or flanged ends are indicated.
   1. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
   2. Gaskets: AWWA C111, rubber.

E. Grooved-Joint, Ductile-Iron Pipe: AWWA C151, with cut, rounded-grooved ends.
   1. Grooved-End, Ductile-Iron Pipe Appurtenances:
      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) Anvil International, Inc.
         2) Victaulic Company of America.

2.2 JOINING MATERIALS

A. Refer to Division 22 Section "Common Work Results for Plumbing" for commonly used joining materials.

B. Brazing Filler Metals: AWS A5.8, BCuP Series.

C. Bonding Adhesive for Fiberglass Piping: As recommended by fiberglass piping manufacturer.

D. Plastic Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

2.3 PIPING SPECIALTIES

A. Transition Fittings: Manufactured fitting or coupling same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

B. Tubular-Sleeve Pipe Couplings:
1. Description: Metal, bolted, sleeve-type, reducing or transition coupling, with center sleeve, gaskets, end rings, and bolt fasteners and with ends of same sizes as piping to be joined.
   a. Standard: AWWA C219.

2.4 GATE VALVES

A. AWWA, Cast-Iron Gate Valves:
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:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
   a. American AVK Co.; Valves & Fittings Div.
   b. American Cast Iron Pipe Co.; American Flow Control Div.
   c. American Cast Iron Pipe Co.; Waterous Co. Subsidiary.
   d. Crane Co.; Crane Valve Group; Stockham Div.
   e. East Jordan Iron Works, Inc.
   f. McWane, Inc.; Clow Valve Co. Div. (Oskaloosa).
   g. McWane, Inc.; Kennedy Valve Div.
   h. McWane, Inc.; M & H Valve Company Div.
   i. McWane, Inc.; Tyler Pipe Div.; Utilities Div.
   j. Mueller Co.; Water Products Div.
   k. NIBCO INC.
   l. U.S. Pipe and Foundry Company.
4. Nonrising-Stem, Metal-Seated Gate Valves:
   a. Description: Gray- or ductile-iron body and bonnet; with cast-iron or bronze double-disc gate, bronze gate rings, bronze stem, and stem nut.
      1) Standard: AWWA C500.
      2) Minimum Pressure Rating: 200 psig.
      3) End Connections: Mechanical joint.
      4) Interior Coating: Complying with AWWA C550.

5. Nonrising-Stem, Resilient-Seated Gate Valves:
   a. Description: Gray- or ductile-iron body and bonnet; with bronze or gray- or ductile-iron gate, resilient seats, bronze stem, and stem nut.
      1) Standard: AWWA C509.
      2) Minimum Pressure Rating: 200 psig.
      3) End Connections: Mechanical joint.
      4) Interior Coating: Complying with AWWA C550.
6. Nonrising-Stem, High-Pressure, Resilient-Seated Gate Valves:
   a. Description: Ductile-iron body and bonnet; with bronze or ductile-iron gate, resilient seats, bronze stem, and stem nut.
      1) Standard: AWWA C509.
      2) Minimum Pressure Rating: 250 psig.
      3) End Connections: Push on or mechanical joint.
      4) Interior Coating: Complying with AWWA C550.
7. OS&Y, Rising-Stem, Metal-Seated Gate Valves:
   a. Description: Cast- or ductile-iron body and bonnet, with cast-iron double disc, bronze disc and seat rings, and bronze stem.
      1) Standard: AWWA C500.
   b. Minimum Pressure Rating: 200 psig.
      1) End Connections: Flanged.
8. OS&Y, Rising-Stem, Resilient-Seated Gate Valves:
   a. Description: Cast- or ductile-iron body and bonnet, with bronze or gray- or ductile-iron gate, resilient seats, and bronze stem.
      1) Standard: AWWA C509.
      2) Minimum Pressure Rating: 200 psig.
      3) End Connections: Flanged.

B. UL/FMG, Cast-Iron Gate Valves:
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:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
   a. American Cast Iron Pipe Co.; American Flow Control Div.
   b. American Cast Iron Pipe Co.; Waterous Co. Subsidiary.
   c. Crane Co.; Crane Valve Group; Stockham Div.
   d. McWane, Inc.; Clow Valve Co. Div. (Oskaloosa).
   e. McWane, Inc.; Kennedy Valve Div.
   f. McWane, Inc.; M & H Valve Company Div.
   g. Mueller Co.; Water Products Div.
   h. NIBCO INC.
   i. U.S. Pipe and Foundry Company.
4. UL/FMG, Nonrising-Stem Gate Valves:
   a. Description: Iron body and bonnet with flange for indicator post, bronze seating material, and inside screw.
      1) Standards: UL 262 and FMG approved.
      2) Minimum Pressure Rating: 175 psig.

3) End Connections: Flanged.

5. OS&Y, Rising-Stem Gate Valves:
   a. Description: Iron body and bonnet and bronze seating material.
      1) Standards: UL 262 and FMG approved.
      2) Minimum Pressure Rating: 175 psig.
      3) End Connections: Flanged.

C. Bronze Gate Valves:
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:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
   a. Crane Co.; Crane Valve Group; Crane Valves.
   b. Crane Co.; Crane Valve Group; Jenkins Valves.
   c. Crane Co.; Crane Valve Group; Stockham Div.
   d. Hammond Valve.
   e. Milwaukee Valve Company.
   f. NIBCO INC.
   g. Red-White Valve Corporation.
4. OS&Y, Rising-Stem Gate Valves:
   a. Description: Bronze body and bonnet and bronze stem.
      1) Standards: UL 262 and FMG approved.
      2) Minimum Pressure Rating: 175 psig.
      3) End Connections: Threaded.
5. Nonrising-Stem Gate Valves:
   a. Description: Class 125, Type 1, bronze with solid wedge, threaded ends, and malleable-iron handwheel.
      1) Standard: MSS SP-80.

2.5 GATE VALVE ACCESSORIES AND SPECIALTIES

A. Tapping-Sleeve Assemblies:
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:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
   a. American Cast Iron Pipe Co.; Waterous Co. Subsidiary.
   b. East Jordan Iron Works, Inc.
   c. Flowserve.
   d. McWane, Inc.; Clow Valve Co. Div. (Oskaloosa).
   e. McWane, Inc.; Kennedy Valve Div.
   f. McWane, Inc.; M & H Valve Company Div.
   g. Mueller Co.; Water Products Div.
   h. U.S. Pipe and Foundry Company.
4. Description: Sleeve and valve compatible with drilling machine.

a. Standard: MSS SP-60.
b. Tapping Sleeve: Cast- or ductile-iron or stainless-steel, two-piece bolted sleeve with flanged outlet for new branch connection. Include sleeve matching size and type of pipe material being tapped and with recessed flange for branch valve.
c. Valve: AWWA, cast-iron, nonrising-stem, resilient-seated gate valve with one raised face flange mating tapping-sleeve flange.

B. Valve Boxes: Comply with AWWA M44 for cast-iron valve boxes. Include top section, adjustable extension of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over valve and with a barrel approximately 5 inches in diameter.
1. Operating Wrenches: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut.

C. Indicator Posts: UL 789, FMG-approved, vertical-type, cast-iron body with operating wrench, extension rod, and adjustable cast-iron barrel of length required for depth of burial of valve.

2.6 CORPORATION VALVES AND CURB VALVES

A. Manufacturers:
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. Amcast Industrial Corporation; Lee Brass Co.
b. Ford Meter Box Company, Inc. (The); Pipe Products Div.
c. Jones, James Company.
d. Master Meter, Inc.
e. McDonald, A. Y. Mfg. Co.
f. Mueller Co.; Water Products Div.
g. Red Hed Manufacturing & Supply.

B. Service-Saddle Assemblies: Comply with AWWA C800. Include saddle and valve compatible with tapping machine.
1. Service Saddle: Copper alloy with seal and AWWA C800, threaded outlet for corporation valve.
2. Corporation Valve: Bronze body and ground-key plug, with AWWA C800, threaded inlet and outlet matching service piping material.
3. Manifold: Copper fitting with two to four inlets as required, with ends matching corporation valves and outlet matching service piping material.

C. Curb Valves: Comply with AWWA C800. Include bronze body, ground-key plug or ball, and wide tee head, with inlet and outlet matching service piping material.

D. Service Boxes for Curb Valves: Similar to AWWA M44 requirements for cast-iron valve boxes. Include cast-iron telescoping top section of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over curb valve and with a barrel approximately 3 inches in diameter.
1. Shutoff Rods: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and slotted end matching curb valve.

2.7 WATER METERS

A. Water meters will be furnished by utility company.

B. Manufacturers:
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:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
   a. AMCO Water Metering Systems.
   b. Badger Meter, Inc.
   c. Carlon Meter.
   d. Hays Fluid Controls; a division of ROMAC Industries Inc.
   e. McCrometer.
   f. Mueller Co.; Hersey Meters.
   g. Neptune Technology Group Inc.
   h. Sensus Metering Systems.

C. Displacement-Type Water Meters:
1. Description: With bronze main case.
   a. Standard: AWWA C700.
   b. Registration: Flow in cubic meters.

D. Compound-Type Water Meters:
1. Description:
   a. Standard: AWWA C702.
   b. Registration: Flow in cubic meters.

2.8 BACKFLOW PREVENTERS

A. Reduced-Pressure-Principle Backflow Preventers:
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:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
   a. Ames Fire & Waterworks; a division of Watts Regulator Co.
   b. Conbraco Industries, Inc.
   c. FEBCO; SPX Valves & Controls.
   d. Flomatic Corporation.
   e. Watts Water Technologies, Inc.
   f. Zurn Plumbing Products Group; Wilkins Water Control Products Div.
4. Standard: ASSE 1013 or AWWA C511.
5. Operation: Continuous-pressure applications.
6. Pressure Loss: 12 psig maximum, through middle 1/3 of flow range.
7. Size: as per drawings.
8. Design Flow Rate: as per drawings.

9. Selected Unit Flow Range Limits: as per drawings
10. Pressure Loss at Design Flow Rate: as per drawings for NPS 2 and smaller; as per drawings for NPS 2-1/2 and larger.
11. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.
12. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
13. Configuration: Designed for horizontal, straight through flow.
14. Accessories:
    a. Valves: Ball type with threaded ends on inlet and outlet of NPS 2 and smaller; OS&Y gate type with flanged ends on inlet and outlet of NPS 2-1/2 and larger.
    b. Air-Gap Fitting: ASME A112.1.2, matching backflow preventer connection.

B. Double-Check, Backflow-Prevention Assemblies:
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. Ames Fire & Waterworks; a division of Watts Regulator Co.
    b. Conbraco Industries, Inc.
    c. FEBCO; SPX Valves & Controls.
    d. Flomatic Corporation.
    e. Watts Water Technologies, Inc.
    f. Zurn Plumbing Products Group; Wilkins Water Control Products Div.
3. Standard: ASSE 1015 or AWWA C510.
4. Operation: Continuous-pressure applications, unless otherwise indicated.
5. Pressure Loss: 5 psig maximum, through middle 1/3 of flow range.
6. Size: as per drawings
7. Design Flow Rate: as per drawings
8. Selected Unit Flow Range Limits: as per drawings
9. Pressure Loss at Design Flow Rate: as per drawings for NPS 2 and smaller; as per drawings for NPS 2-1/2 and larger.
10. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.
11. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
12. Configuration: Designed for horizontal, straight through flow.
13. Accessories: Ball valves with threaded ends on inlet and outlet of NPS 2 and smaller; OS&Y gate valves with flanged ends on inlet and outlet of NPS 2-1/2 and larger.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Refer to Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications.

B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used, unless otherwise indicated.

C. Do not use flanges or unions for underground piping.

D. Flanges, unions, and special fittings may be used, instead of joints indicated, on aboveground piping and piping in vaults.

E. Underground water-service piping NPS 3/4 to NPS 3 shall be soft copper tube, ASTM B 88, Type K; wrought-copper, solder-joint fittings; and brazed joints.

F. Underground water-service piping NPS 4 and NPS 6 shall be any of the following:
1. Soft copper tube, ASTM B 88, Type K; wrought-copper, solder-joint fittings; and brazed joints.
2. Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed joints.

G. Aboveground and Vault Water-Service Piping NPS 3/4 to NPS 3 shall be hard copper tube, ASTM B 88, Type K; wrought-copper, solder-joint fittings; and brazed joints.

H. Aboveground and vault water-service piping NPS 4 and NPS 6 shall be any of the following:
1. Hard copper tube, ASTM B 88, Type K; wrought-copper, solder-joint fittings; and brazed joints.
2. Ductile-iron, grooved-end pipe; ductile-iron, grooved-end appurtenances; and grooved joints.

I. Aboveground and Vault Fire-Service-Main Piping NPS 4 to NPS 8 shall be ductile-iron, grooved-end pipe; ductile-iron-pipe appurtenances; and grooved joints.

J. Underground Combined Water-Service and Fire-Service-Main Piping NPS 6 to NPS 10 shall be any of the following:
1. Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed grooved-end pipe; ductile-iron-pipe appurtenances; and grooved joints.

K. Aboveground and Vault Combined Water Service and Fire-Service-Main Piping NPS 6 to NPS 10 shall be ductile-iron, grooved-end pipe; ductile-iron-pipe appurtenances; and grooved joints.

3.3 VALVE APPLICATIONS

A. General Application: Use mechanical-joint-end valves for NPS 3 and larger underground installation. Use threaded- or flanged-end valves for installation in vaults. Use UL/FMG, nonrising-stem gate valves for installation with indicator posts. Use corporation valves and curb valves with ends compatible with piping, for NPS 2 and smaller installation.

B. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
1. Underground Valves, NPS 3 and Larger: AWWA, cast-iron, nonrising-stem, high- pressure, resilient-seated gate valves with valve box.
2. Underground Valves, NPS 4 and Larger, for Indicator Posts: UL/FMG, cast-iron, nonrising-stem gate valves with indicator post.
3. Use the following for valves in vaults and aboveground:
   a. Gate Valves, NPS 2 and Smaller: Bronze, nonrising stem.
   b. Gate Valves, NPS 3 and Larger: AWWA, cast iron, OS&Y rising stem, resilient seated.

3.4 PIPING SYSTEMS - COMMON REQUIREMENTS

A. See Division 22 Section "Common Work Results for Plumbing" for piping-system common requirements.

3.5 PIPING INSTALLATION

A. Water-Main Connection: Arrange with utility company for tap of size and in location indicated in water main.

B. Water-Main Connection: Tap water main according to requirements of water utility company and of size and in location indicated.

C. Make connections larger than NPS 2 with tapping machine according to the following:
1. Install tapping sleeve and tapping valve according to MSS SP-60.
2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
3. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water-service piping.

D. Install gate valve onto tapping sleeve. Comply with MSS SP-60. Install valve with stem pointing up and with valve box.
1. Make connections NPS 2 and smaller with drilling machine according to the following:
2. Install service-saddle assemblies and corporation valves in size, quantity, and arrangement required by utility company standards.
3. Install service-saddle assemblies on water-service pipe to be tapped. Position outlets for corporation valves.
4. Use drilling machine compatible with service-saddle assemblies and corporation valves. Drill hole in main. Remove drilling machine and connect water-service piping.
5. Install corporation valves into service-saddle assemblies.
6. Install manifold for multiple taps in water main.
7. Install curb valve in water-service piping with head pointing up and with service box.

E. Comply with NFPA 24 for fire-service-main piping materials and installation.
1. Install copper tube and fittings according to CDA's "Copper Tube Handbook."

F. Install ductile-iron, water-service piping according to AWWA C600 and AWWA M41.

G. Install PE pipe according to ASTM D 2774 and ASTM F 645.

H. Install PVC, AWWA pipe according to ASTM F 645 and AWWA M23.

I. Bury piping with depth of cover over top at least 30 inches.

J. Extend water-service piping and connect to water-supply source and building-water-piping systems at outside face of building wall in locations and pipe sizes indicated.
1. Terminate water-service piping at building wall until building-water-piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building-water-piping systems when those systems are installed.

K. Sleeves are specified in Division 22 Section "Common Work Results for Plumbing."

L. Mechanical sleeve seals are specified in Division 22 Section "Common Work Results for Plumbing."

M. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

3.6 JOINT CONSTRUCTION

A. See Division 22 Section "Common Work Results for Plumbing" for basic piping joint construction.

B. Make pipe joints according to the following:
1. Ductile-Iron Piping, Gasketed Joints for Water-Service Piping: AWWA C600 and AWWA M41.
2. Ductile-Iron Piping, Gasketed Joints for Fire-Service-Main Piping: UL 194.
3. Ductile-Iron Piping, Grooved Joints: Cut-groove pipe. Assemble joints with grooved- end, ductile-iron-piping couplings, gaskets, lubricant, and bolts according to coupling manufacturer's written instructions.
4. PE Piping Insert-Fitting Joints: Use plastic insert fittings and fasteners according to fitting manufacturer's written instructions.
5. PVC Piping Gasketed Joints: Use joining materials according to AWWA C900. Construct joints with elastomeric seals and lubricant according to ASTM D 2774 or ASTM D 3139 and pipe manufacturer's written instructions.
6. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, with OD, and with system working pressure. Refer to Division 22 Section "Common Work Results for Plumbing" for joining piping of dissimilar metals.

3.7 ANCHORAGE INSTALLATION

A. Anchorage, General: Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include the following:
1. Concrete thrust blocks.
2. Locking mechanical joints.
3. Set-screw mechanical retainer glands.
4. Bolted flanged joints.
5. Heat-fused joints.
6. Pipe clamps and tie rods.

B. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:
1. Gasketed-Joint, Ductile-Iron, Water-Service Piping: According to AWWA C600.
2. Gasketed-Joint, PVC Water-Service Piping: According to AWWA M23.
3. Fire-Service-Main Piping: According to NFPA 24.

C. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.8 VALVE INSTALLATION

A. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.

B. UL/FMG, Gate Valves: Comply with NFPA 24. Install each underground valve and valves in vaults with stem pointing up and with vertical cast-iron indicator post.

C. MSS Valves: Install as component of connected piping system.

D. Corporation Valves and Curb Valves: Install each underground curb valve with head pointed up and with service box.

3.9 WATER METER INSTALLATION

A. Install water meters, piping, and specialties according to utility company's written instructions.

B. Water Meters: Install displacement-type water meters, NPS 2 and smaller, with shutoff valves on water meter inlets. Include valves on water meter outlets and valved bypass around meters unless prohibited by authorities having jurisdiction.

C. Water Meters: Install compound-type water meters, NPS 3 and larger. Include shutoff valves on water meter inlets and outlets and valved bypass around meters. Support meters, valves, and piping on brick or concrete piers.

3.10 BACKFLOW PREVENTER INSTALLATION

A. Install backflow preventers of type, size, and capacity indicated. Include valves and test cocks. Install according to requirements of plumbing and health department and authorities having jurisdiction.

B. Do not install backflow preventers that have relief drain in vault or in other spaces subject to flooding.

C. Do not install bypass piping around backflow preventers.

D. Support NPS 2-1/2 and larger backflow preventers, valves, and piping near floor and on brick or concrete piers.

3.11 FIRE DEPARTMENT CONNECTION INSTALLATION

A. Install protective pipe bollards on three sides of each fire department connection. Pipe bollards are specified in Division 05 Section "Metal Fabrications."

3.12 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. See Division 22 Section "Common Work Results for Plumbing" for piping connections to valves and equipment.

C. Connect water-distribution piping to utility water main. Use tapping sleeve and tapping valve or service clamp and corporation valve as required on drawings.

D. Connect water-distribution piping to interior domestic water piping.

E. Connect waste piping from concrete vault drains to sanitary sewerage system. See Division 22 Section "Facility Sanitary Sewers" for connection to sanitary-sewer piping.

3.13 FIELD QUALITY CONTROL

A. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.

B. Hydrostatic Tests: Test at not less than one-and-one-half times working pressure for two hours.
   1. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psig. Slowly increase again to test pressure and hold for 1 more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.

C. Prepare reports of testing activities.

3.14 IDENTIFICATION

A. Install continuous underground detectable warning tape during backfilling of trench for underground water-distribution piping. Locate below finished grade, directly over piping. Underground warning tapes are specified in Division 31 Section "Earth Moving."

B. Permanently attach equipment nameplate or marker indicating plastic water-service piping, on main electrical meter panel. See Division 22 Section "Common Work Results for Plumbing" for identifying devices.

3.15 CLEANING

A. Clean and disinfect water-distribution piping as follows:
   1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
   2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.
   3. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or do as follows:
      a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.
      b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.
      c. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
      d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.

END OF SECTION 22 1113

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SECTION 22 1116 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Under-building slab and aboveground domestic water pipes, tubes, fittings, and specialties inside the building.
2. Specialty valves.
3. Flexible connectors.
4. Water meters furnished by utility company for installation by Contractor.
5. Water meters.
6. Escutcheons.
7. Sleeves and sleeve seals.

1.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Domestic water piping and support and installation shall withstand effects of earthquake motions determined according to ASCE/SEI 7.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14 for plastic, potable domestic water piping and components. Include marking "NSF-pw" on piping.

C. Comply with NSF 61 for potable domestic water piping and components.

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.

2.2 COPPER TUBE AND FITTINGS - DOWNSTREAM OF WATER TREATMENT

A. Hard Copper Tube: ASTM B 88, Type L drawn temper.
1. Cast-Copper Solder-Joint Fittings: ASME B16.18, pressure fittings.

2. Wrought-Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
3. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
4. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and- socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.
5. Copper Pressure-Seal-Joint Fittings:
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) Elkhart Products Corporation; Industrial Division.
      2) NIBCO INC.
      3) Viega; Plumbing and Heating Systems.
   b. NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber O-ring seal in each end.
   c. NPS 2-1/2 to NPS 4: Cast-bronze or wrought-copper fitting with EPDM-rubber O-ring seal in each end.
6. Copper Push-on-Joint Fittings:
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) NVent LLC.
   b. Description: Cast-copper fitting complying with ASME B16.18 or wrought- copper fitting complying with ASME B 16.22; with stainless-steel teeth and EPDM-rubber O-ring seal in each end instead of solder-joint ends.

B. Soft Copper Tube: ASTM B 88, Type K and ASTM B 88, Type L water tube, annealed temper.
1. Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
2. Copper Pressure-Seal-Joint Fittings:
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) Elkhart Products Corporation; Industrial Division.
      2) NIBCO INC.
      3) Viega; Plumbing and Heating Systems.
   b. NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber O-ring seal in each end.
   c. NPS 3 and NPS 4: Cast-bronze or wrought-copper fitting with EPDM-rubber O- ring seal in each end.

2.3 CPVC PIPING - DOWNSTREAM OF WATER TREATMENT

A. CPVC Tubing System: ASTM D 2846/D 2846M, SDR 11, tube and socket fittings.

2.4 PVC PIPE AND FITTINGS - FROM SERVICE ENTRANCE THRU WATER TREAMENT

A. PVC Pipe: ASTM D 1785, Schedule 80.
1. PVC Socket Fittings: ASTM D 2467 for Schedule 80.

2.5 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free, unless otherwise indicated; 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. Include water-flushable flux according to ASTM B 813.

D. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general- duty brazing unless otherwise indicated.

E. Solvent Cements for Joining CPVC Piping and Tubing: ASTM F 493.
1. Use CPVC solvent cement that has a VOC content of 490 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Use adhesive primer that has a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

F. Solvent Cements for Joining PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
1. Use PVC solvent cement that has a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Use adhesive primer that has a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

G. Plastic, Pipe-Flange Gaskets, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

2.6 SPECIALTY VALVES

A. Comply with requirements in Division 22 Section "General-Duty Valves for Plumbing Piping" for general-duty metal valves.

B. Comply with requirements in Division 22 Section "Domestic Water Piping Specialties" for balancing valves, drain valves, backflow preventers, and vacuum breakers.

C. CPVC Union Ball Valves:
1. Description:
a. Standard: MSS SP-122.
b. Pressure Rating: 150 psig at 73 deg F.
c. Body Material: CPVC.
d. Body Design: Union type.
e. End Connections for Valves NPS 2 and Smaller: Detachable, socket.
f. End Connections for Valves NPS 2-1/2 to NPS 4 Flanged.
g. Ball: CPVC; full port.
h. Seals: PTFE or EPDM-rubber O-rings.
i. Handle: Tee shaped.

D. PVC Union Ball Valves:
1. Description:
a. Standard: MSS SP-122.
b. Pressure Rating: 150 psig at 73 deg F.
c. Body Material: PVC.
d. Body Design: Union type.
e. End Connections for Valves NPS 2 and Smaller: Detachable, socket.

f. End Connections for Valves NPS 2-1/2 to NPS 4 Flanged.
g. Ball: PVC; full port.
h. Seals: PTFE or EPDM-rubber O-rings.
i. Handle: Tee shaped.

E. PVC Butterfly Valves:
1. Description:
a. Pressure Rating: 150 psig at 73 deg F.
b. Body Material: PVC.
c. Body Design: Lug or wafer type.
d. Seat: EPDM rubber.
e. Seals: PTFE or EPDM-rubber O-rings.
f. Disc: PVC.
g. Stem: Stainless steel.
h. Handle: Lever.

F. CPVC Ball Check Valves:
1. Description:
a. Pressure Rating: 150 psig at 73 deg F.
b. Body Material: CPVC.
c. Body Design: Union-type ball check.
d. End Connections for Valves NPS 2 and Smaller: Detachable, socket.
e. End Connections for Valves NPS 2-1/2 to NPS 4 Flanged.
f. Ball: CPVC.
g. Seals: EPDM- or FKM-rubber O-rings.

G. PVC Ball Check Valves:
1. Description:
a. Pressure Rating: 150 psig at 73 deg F.
b. Body Material: PVC.
c. Body Design: Union-type ball check.
d. End Connections for Valves NPS 2 and Smaller: Detachable, socket.
e. End Connections for Valves NPS 2-1/2 to NPS 4 Flanged.
f. Ball: PVC.
g. Seals: EPDM- or FKM-rubber O-rings.

H. CPVC Gate Valves:
1. Description:
a. Pressure Rating: 150 psig at 73 deg F.
b. Body Material: CPVC.
c. Body Design: Nonrising stem.
d. End Connections for Valves NPS 2 and Smaller: Socket.
e. End Connections for Valves NPS 2-1/2 to NPS 4 Flanged.
f. Gate and Stem: Plastic.
g. Seals: EPDM rubber.
h. Handle: Wheel.

I. PVC Gate Valves:

1. Description:
    a. Pressure Rating: 150 psig at 73 deg F.
    b. Body Material: PVC.
    c. Body Design: Nonrising stem.
    d. End Connections for Valves NPS 2 and Smaller: Socket.
    e. End Connections for Valves NPS 2-1/2 to NPS 4 Flanged.
    f. Gate and Stem: Plastic.
    g. Seals: EPDM rubber.
    h. Handle: Wheel.

2.7 TRANSITION FITTINGS

A. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

B. Sleeve-Type Transition Coupling: AWWA C219.

C. Plastic-to-Metal Transition Fittings:
1. Description: CPVC or PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert and one solvent-cement-socket or threaded end.

D. Plastic-to-Metal Transition Unions:
1. Description: CPVC or PVC four-part union. Include brass or stainless-steel threaded end, solvent-cement-joint plastic end, rubber O-ring, and union nut.

2.8 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials or ferrous material body with separating nonconductive insulating material suitable for system fluid, pressure, and temperature.

B. Dielectric Unions:
1. Description:
    a. Pressure Rating: 250 psig at 180 deg F.
    b. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:
1. Description:
    a. Factory-fabricated, bolted, companion-flange assembly.
    b. Pressure Rating: 175 psig minimum.
    c. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder- joint copper alloy and threaded ferrous.

D. Dielectric-Flange Kits:
1. Description:
    a. Nonconducting materials for field assembly of companion flanges.
    b. Pressure Rating: 150 psig.
    c. Gasket: Neoprene or phenolic.
    d. Bolt Sleeves: Phenolic or polyethylene.
    e. Washers: Phenolic with steel backing washers.

E. Dielectric Couplings:
1. Description:
a. Galvanized-steel coupling.
b. Pressure Rating: 300 psig at 225 deg F.
c. End Connections: Female threaded.
d. Lining: Inert and noncorrosive, thermoplastic.

F. Dielectric Nipples:
1. Description:
a. Electroplated steel nipple complying with ASTM F 1545.
b. Pressure Rating: 300 psig at 225 deg F.
c. End Connections: Male threaded or grooved.
d. Lining: Inert and noncorrosive, propylene.

2.9 FLEXIBLE CONNECTORS

A. Bronze-Hose Flexible Connectors: Corrugated-bronze tubing with bronze wire-braid covering and ends brazed to inner tubing.
1. Working-Pressure Rating: Minimum 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.

B. 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 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.

2.10 WATER METERS

A. Displacement-Type Water Meters:
1. Description:
a. Standard: AWWA C700.
b. Pressure Rating: 150-psig working pressure.
c. Body Design: Nutating disc; totalization meter.
d. Registration: In gallons or cubic feet as required by utility.
e. Case: Bronze.
f. End Connections: Threaded.

B. Compound-Type Water Meters:
1. Description:
a. Standard: AWWA C702.
b. Pressure Rating: 150-psig working pressure.
c. Body Design: With integral mainline and bypass meters; totalization meter.
d. Registration: In gallons or cubic feet as required by utility company.
e. Case: Bronze.
f. Pipe Connections: Flanged.

C. Remote Registration System: Direct-reading type complying with AWWA C706; modified with signal transmitting assembly, low-voltage connecting wiring, and remote register assembly as required by utility company.

2.11 ESCUTCHEONS

A. General: Manufactured ceiling, floor, and wall escutcheons and floor plates.

B. One Piece, Cast Brass: Polished, chrome-plated or rough-brass finish with setscrews.

C. One Piece, Deep Pattern: Deep-drawn, box-shaped brass with chrome-plated finish.

D. One Piece, Stamped Steel: Chrome-plated finish with setscrew or spring clips.

E. Split Casting, Cast Brass: Polished, chrome-plated or rough-brass finish with concealed hinge and setscrew.

F. Split Plate, Stamped Steel: Chrome-plated finish with concealed hinge, setscrew or spring clips.

G. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

H. Split-Casting Floor Plates: Cast brass with concealed hinge.

2.12 SLEEVES

A. Cast-Iron Wall Pipes: Fabricated of cast iron, and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

D. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc- coated, with plain ends.

E. 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 setscrews.

2.13 SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, used to fill annular space between pipe and sleeve.
1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel.
3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.14 GROUT

A. Standard: ASTM C 1107, 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.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Comply with requirements in Division 31 Section "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 ductile-iron piping under building slab with restrained joints according to AWWA C600 and AWWA M41.

D. PVC/CPVC/ABS PIPING SHALL NOT BE INSTALLED IN ENVIRONMENTAL AIR PLENUMS UNLESS IT HAS A 25/50 FLAME/SMOKE RATING OR IS INSULATED AND THE INSULATION HAS A 25/50 FLAME/SMOKE RATING.

E. 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 in Division 22 Section "Meters and Gages for Plumbing Piping" for pressure gages and Division 22 Section "Domestic Water Piping Specialties" for drain valves and strainers.

F. Install shutoff valve immediately upstream of each dielectric fitting.

G. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements in Division 22 Section "Domestic Water Piping Specialties" for pressure-reducing valves.

H. Install domestic water piping level with 0.25 percent slope downward toward drain and plumb.

I. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

J. Install seismic restraints on piping. Comply with requirements in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment" for seismic-restraint devices.

K. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

L. 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.

M. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

N. Install piping adjacent to equipment and specialties to allow service and maintenance.

O. Install piping to permit valve servicing.

P. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than system pressure rating used in applications below unless otherwise indicated.

Q. Install piping free of sags and bends.

R. Install fittings for changes in direction and branch connections.

S. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

T. Install pressure gages on suction and discharge piping from each plumbing pump and packaged booster pump. Comply with requirements in Division 22 Section "Meters and Gages for Plumbing Piping" for pressure gages.

U. Install thermostats in hot-water circulation piping. Comply with requirements in Division 22 Section "Domestic Water Pumps" for thermostats.

V. Install thermometers on outlet piping from each water heater. Comply with requirements in Division 22 Section "Meters and Gages for Plumbing Piping" for thermometers.

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: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Brazed Joints" Chapter.

E. Soldered Joints: 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: Join copper tube and pressure-seal fittings with tools recommended by fitting manufacturer.

G. Copper-Tubing, Push-on Joints: Clean end of tube. Measure insertion depth with manufacturer's depth gage. Join copper tube and push-on-joint fittings by inserting tube to measured depth.

H. 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.

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. Apply primer.
   2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
   3. PVC Piping: Join according to ASTM D 2855.

J. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.4 VALVE INSTALLATION

A. General-Duty Valves: Comply with requirements in Division 22 Section "General-Duty Valves for Plumbing Piping" for valve installations.

B. Install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have supply stops. Use ball or gate valves for piping NPS 2 and smaller. Use butterfly or gate valves for piping NPS 2-1/2 and larger.

C. Install drain valves for equipment at base of each water riser, at low points in horizontal piping, and where required to drain water piping. Drain valves are specified in Division 22 Section "Domestic Water Piping Specialties."
   1. Hose-End Drain Valves: At low points in water mains, risers, and branches.
   2. Stop-and-Waste Drain Valves: Instead of hose-end drain valves where indicated.

D. Install balancing valve in each hot-water circulation return branch and discharge side of each pump and circulator. Set balancing valves partly open to restrict but not stop flow. Use ball valves for piping NPS 2 and smaller and butterfly valves for piping NPS 2-1/2 and larger. Comply with requirements in Division 22 Section "Domestic Water Piping Specialties" for balancing valves.

3.5 TRANSITION FITTING INSTALLATION

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Underground Domestic Water Piping:
   1. NPS 1-1/2 and Smaller: Fitting-type coupling.
   2. NPS 2 and Larger: Sleeve-type coupling.

C. Transition Fittings in Aboveground Domestic Water PipingNPS 2 and Smaller: Plastic-to-metal transition fittings or unions.

3.6 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 or nipples unions.

C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.

D. Dielectric Fittings for NPS 5 to NPS 6: Use dielectric flange kits.

3.7 FLEXIBLE CONNECTOR INSTALLATION

A. Install flexible connectors in suction and discharge piping connections to each domestic water pump and in suction and discharge manifold connections to each domestic water booster pump.

B. Install bronze-hose flexible connectors in copper domestic water tubing.

C. Install stainless-steel-hose flexible connectors in steel domestic water piping.

3.8 WATER METER INSTALLATION

A. Rough-in domestic water piping for water meter installation, and install water meters according to utility company's requirements.

B. Water meters will be furnished and installed by utility company.

C. Install water meters according to AWWA M6, utility company's requirements, and the following:

D. Install displacement-type water meters with shutoff valve on water-meter inlet. Install valve on water-meter outlet and valved bypass around meter unless prohibited by authorities having jurisdiction.

E. Install compound-type water meters with shutoff valves on water-meter inlet and outlet and on valved bypass around meter. Support meters, valves, and piping on brick or concrete piers.

F. Install remote registration system according to standards of utility company and of authorities having jurisdiction.

3.9 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment" for seismic-restraint devices.

B. Comply with requirements in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment" for pipe hanger and support products and installation.
   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. 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 5: 10 feet with 1/2-inch rod.
6. NPS 6: 10 feet with 5/8-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 and NPS 5: 12 feet with 5/8-inch rod.
7. NPS 6: 12 feet with 3/4-inch rod.

H. Install supports for vertical steel piping every 15 feet.

I. Install vinyl-coated hangers for CPVC piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1 and Smaller: 36 inches with 3/8-inch rod.
2. NPS 1-1/4 to NPS 2: 48 inches with 3/8-inch rod.

J. Install supports for vertical CPVC piping every 60 inches for NPS 1 and smaller, and every 72 inches for NPS 1-1/4 and larger.

K. Install vinyl-coated hangers for PEX piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1 and Smaller: 32 inches with 3/8-inch rod.

L. Install hangers for vertical PEX piping every 48 inches.

M. Install vinyl-coated hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 2 and Smaller: 48 inches with 3/8-inch rod.
2. NPS 2-1/2 to NPS 3-1/2: 48 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
4. NPS 6: 48 inches with 3/4-inch rod.

N. Install supports for vertical PVC piping every 48 inches.

O. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.10 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment and machines to allow 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. Domestic Water Booster Pumps: Cold-water suction and discharge piping.
2. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
3. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code. Comply with requirements in Division 22 plumbing fixture Sections for connection sizes.
4. 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.

3.11 ESCUTCHEON INSTALLATION

A. Install escutcheons for penetrations of walls, ceilings, and floors.

B. Escutcheons for New Piping:
1. Piping with Fitting or Sleeve Protruding from Wall: One piece, deep pattern.
2. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One piece, cast brass with polished chrome-plated finish.
3. Bare Piping at Ceiling Penetrations in Finished Spaces: One piece, cast brass with polished chrome-plated finish.
4. Bare Piping in Unfinished Service Spaces: One piece, cast brass with polished chrome- plated finish cast brass with rough-brass finish.
5. Bare Piping in Equipment Rooms: One piece, cast brass.
6. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece floor plate.

C. Escutcheons for Existing Piping:
1. Chrome-Plated Piping: Split casting, cast brass with chrome-plated finish.
2. Insulated Piping: Split plate, stamped steel with concealed hinge and spring clips.
3. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split casting, cast brass with chrome-plated finish.
4. Bare Piping at Ceiling Penetrations in Finished Spaces: Split casting, cast brass with chrome-plated finish.
5. Bare Piping in Unfinished Service Spaces: Split casting, cast brass with polished chrome-plated finish.
6. Bare Piping in Equipment Rooms: Split casting, cast brass.
7. Bare Piping at Floor Penetrations in Equipment Rooms: Split-casting floor plate.

3.12 SLEEVE INSTALLATION

A. General Requirements: Install sleeves for pipes and tubes passing through penetrations in floors, partitions, roofs, and walls.

B. Sleeves are not required for core-drilled holes.

C. Permanent sleeves are not required for holes formed by removable PE sleeves.

D. Cut sleeves to length for mounting flush with both surfaces unless otherwise indicated.

E. Install sleeves in new partitions, slabs, and walls as they are built.

F. For interior wall penetrations, seal annular space between sleeve and pipe or pipe insulation using joint sealants appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants" for joint sealants.

G. For exterior wall penetrations above grade, seal annular space between sleeve and pipe using joint sealants appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants" for joint sealants.

H. For exterior wall penetrations below grade, seal annular space between sleeve and pipe using

I. Seal space outside of sleeves in concrete slabs and walls with grout.

J. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation unless otherwise indicated.

K. Install sleeve materials according to the following applications:
1. Sleeves for Piping Passing through Concrete Floor Slabs: Steel pipe.
2. Sleeves for Piping Passing through Concrete Floor Slabs of Mechanical Equipment Areas or Other Wet Areas: Steel pipe.
    a. Extend sleeves 2 inches above finished floor level.
    b. For pipes penetrating floors with membrane waterproofing, extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Comply with requirements in Division 07 Section "Sheet Metal Flashing and Trim" for flashing.
3. Sleeves for Piping Passing through Gypsum-Board Partitions:
    a. Steel pipe sleeves for pipes smaller than NPS 6.
    b. Galvanized-steel sheet sleeves for pipes NPS 6 and larger.
    c. Exception: Sleeves are not required for water supply tubes and waste pipes for individual plumbing fixtures if escutcheons will cover openings.
4. Sleeves for Piping Passing through Concrete Roof Slabs: Steel pipe.
5. Sleeves for Piping Passing through Exterior Concrete Walls:
    a. Steel pipe sleeves for pipes smaller than NPS 6.
    b. Cast-iron wall pipe sleeves for pipes NPS 6 and larger.
    c. Install sleeves that are large enough to provide 1-inch annular clear space between sleeve and pipe or pipe insulation when sleeve seals are used.

L. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping" for firestop materials and installations.

3.13 SLEEVE SEAL INSTALLATION

A. Install sleeve seals in sleeves in exterior concrete walls at water-service piping entries into building.

B. Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble sleeve seal components and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.14 IDENTIFICATION

A. Identify system components. Comply with requirements in Division 22 Section "Identification for Plumbing Piping and Equipment" for identification materials and installation.

B. Label pressure piping with system operating pressure.

3.15 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Piping Inspections:
1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
2. 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:
   a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
   b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
3. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

C. Piping Tests:
1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
2. 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.
3. 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.
4. 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 to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
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 for corrective action required.

D. Domestic water piping will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.16 CLEANING

A. Clean and disinfect potable and 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 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. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

B. Prepare and submit reports of purging and disinfecting activities.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.17 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. Under-building-slab, domestic water, building service piping, NPS 3 and smaller, shall be one of the following:
   1. Soft copper tube, ASTM B 88, Type K; wrought-copper solder-joint fittings; and brazed joints.

D. Under-building-slab, domestic water, building-service piping, NPS 4 to NPS 6, shall be one of the following:
   1. Push-on-joint, ductile-iron pipe; standard- or compact- pattern push-on-joint fittings; and gasketed joints.

E. Under-building-slab, domestic water piping, NPS 2 and smaller, shall be one of the following:
   1. Hard copper tube, ASTM B 88, Type L; wrought-copper solder-joint fittings; and brazed joints.

F. 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 soldered joints.
   2. Hard copper tube, ASTM B 88, Type L or ASTM B 88, Type M; copper pressure-seal- joint fittings; and pressure-sealed joints.
   3. Hard copper tube, ASTM B 88, Type L or ASTM B 88, Type M; copper push-on-joint fittings; and push-on joints.
   4. CPVC Tubing System: CPVC tube; CPVC socket fittings; and solvent-cemented joints.

G. 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 ASTM B 88, solder-joint fittings; and soldered joints.
2. Hard copper tube, ASTM B 88, Type L or ASTM B 88, pressure-seal- joint fittings; and pressure-sealed joints.

H. Aboveground domestic water piping, NPS 5 and NPS 6, shall be one of the following:
1. Hard copper tube, ASTM B 88, Type L; cast- or wrought- copper solder-joint fittings; and soldered joints.

3.18 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: Memory-stop balancing valves.
   a. 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.

D. CPVC and PVC valves matching piping materials may be used.

END OF SECTION 22 1116

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SECTION 22 1119 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following domestic water piping specialties:
1. Vacuum breakers.
2. Backflow preventers.
3. Water pressure-reducing valves.
4. Balancing valves.
5. Temperature-actuated water mixing valves.
6. Strainers.
7. Hose bibbs.
8. Wall hydrants.
9. Drain valves.
10. Water hammer arresters.
11. Trap-seal primer valves.

B. See Division 22 Section "Domestic Water Piping" for water meters.

C. See Division 22 Section "Drinking Fountains and Water Coolers" for water filters for water coolers.

D. See Division 22 Section "Domestic Water Filtration Equipment" for water filters in domestic water piping.

1.2 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig, unless otherwise indicated.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control test reports.

C. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. NSF Compliance:
1. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic domestic water piping components.
2. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

PART 2 - PRODUCTS

2.1 VACUUM BREAKERS

A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:
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. Ames Co.
   b. Cash Acme.
   c. Conbraco Industries, Inc.
   d. FEBCO; SPX Valves & Controls.
   e. Rain Bird Corporation.
   f. Toro Company (The); Irrigation Div.
   g. Watts Industries, Inc.; Water Products Div.
   h. Zurn Plumbing Products Group; Wilkins Div.
   i. Standard: ASSE 1001.
   j. Size: NPS 1/4 to NPS 3, as required to match connected piping.
   k. Body: Bronze.
   l. Inlet and Outlet Connections: Threaded.
   m. Finish: Rough bronze.
3. Hose-Connection Vacuum Breakers:
   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) Arrowhead Brass Products, Inc.
      2) Cash Acme.
      3) Conbraco Industries, Inc.
      4) Legend Valve.
      5) MIFAB, Inc.
      6) Prier Products, Inc.
      7) Watts Industries, Inc.; Water Products Div.
      8) Woodford Manufacturing Company.
      9) Zurn Plumbing Products Group; Light Commercial Operation.
      10) Zurn Plumbing Products Group; Wilkins Div.
   c. Standard: ASSE 1001.
   d. Body: Bronze, nonremovable, with manual drain.
   e. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
   f. Finish: Rough bronze.

2.2 BACKFLOW PREVENTERS

A. Intermediate Atmospheric-Vent Backflow Preventers:
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. Cash Acme.
b. Conbraco Industries, Inc.
c. FEBCO; SPX Valves & Controls.
d. Honeywell Water Controls.
e. Legend Valve.
f. Watts Industries, Inc.; Water Products Div.
g. Zurn Plumbing Products Group; Wilkins Div.

3. Standard: ASSE 1012.
4. Operation: Continuous-pressure applications.
5. Size: NPS 3/4.
6. Body: Bronze.
7. End Connections: Solder joint.
8. Finish: Rough bronze.

B. Reduced-Pressure-Principle Backflow Preventers:
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:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
   a. Ames Co.
   b. Conbraco Industries, Inc.
   c. FEBCO; SPX Valves & Controls.
   d. Flomatic Corporation.
   e. Watts Industries, Inc.; Water Products Div.
   f. Zurn Plumbing Products Group; Wilkins Div.
4. Standard: ASSE 1013.
5. Operation: Continuous-pressure applications.
6. Pressure Loss: 12 psig maximum, through middle 1/3 of flow range.
7. Size: as per drawings
8. Design Flow Rate: as per drawings
9. Selected Unit Flow Range Limits: as per drawings
10. Pressure Loss at Design Flow Rate: as per drawings for sizes NPS 2 and smaller; as per drawings for NPS 2-1/2 and larger.
11. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.
12. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
13. Configuration: Designed for horizontal, straight through flow.
14. Accessories:
    a. Valves: Ball type with threaded ends on inlet and outlet ofNPS 2 and smaller; outside screw and yoke gate-type with flanged ends on inlet and outlet of NPS 2- 1/2 and larger.
    b. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

C. Double-Check Backflow-Prevention Assemblies:
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:

3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
   a. Ames Co.
   b. Conbraco Industries, Inc.
   c. FEBCO; SPX Valves & Controls.
   d. Flomatic Corporation.
   e. Watts Industries, Inc.; Water Products Div.
   f. Zurn Plumbing Products Group; Wilkins Div.
4. Standard: ASSE 1015.
5. Operation: Continuous-pressure applications, unless otherwise indicated.
6. Pressure Loss: 5 psig maximum, through middle 1/3 of flow range.
7. Size: as per drawings
8. Design Flow Rate: as per drawings
9. Selected Unit Flow Range Limits: as per drawings
10. Pressure Loss at Design Flow Rate: as per drawings for sizes NPS 2 and smaller; as per drawings for NPS 2-1/2 and larger.
11. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.
12. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
13. Configuration: Designed for horizontal, straight through flow.
14. Accessories:
    a. Valves: Ball type with threaded ends on inlet and outlet of NPS 2 and smaller; outside screw and yoke gate-type with flanged ends on inlet and outlet of NPS 2- 1/2 and larger.

D. Backflow-Preventer Test Kits:
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:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
   a. Conbraco Industries, Inc.
   b. FEBCO; SPX Valves & Controls.
   c. Flomatic Corporation.
   d. Watts Industries, Inc.; Water Products Div.
   e. Zurn Plumbing Products Group; Wilkins Div.
4. Description: Factory calibrated, with gages, fittings, hoses, and carrying case with test- procedure instructions.

2.3 WATER PRESSURE-REDUCING VALVES

A. Water Regulators:
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. Cash Acme.
   b. Conbraco Industries, Inc.
   c. Honeywell Water Controls.

d. Watts Industries, Inc.; Water Products Div.
e. Zurn Plumbing Products Group; Wilkins Div.

3. Standard: ASSE 1003.
4. Pressure Rating: Initial working pressure of 150 psig.
5. Size: as per drawings
6. Design Flow Rate: as per drawings
7. Design Inlet Pressure: as per drawings
8. Design Outlet Pressure Setting: as per drawings
9. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 and NPS 3.
10. Valves for Booster Heater Water Supply: Include integral bypass.
11. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and NPS 3.

2.4 BALANCING VALVES

A. Memory-Stop Balancing Valves:
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. Conbraco Industries, Inc.
   b. Crane Co.; Crane Valve Group; Crane Valves.
   c. Crane Co.; Crane Valve Group; Jenkins Valves.
   d. Crane Co.; Crane Valve Group; Stockham Div.
   e. Hammond Valve.
   f. Milwaukee Valve Company.
   g. NIBCO INC.
   h. Red-White Valve Corp.
3. Standard: MSS SP-110 for two-piece, copper-alloy ball valves.
4. Pressure Rating: 400-psig minimum CWP.
5. Size: NPS 2 or smaller.
6. Body: Copper alloy.
7. Port: Standard or full port.
8. Ball: Chrome-plated brass.
9. Seats and Seals: Replaceable.
10. End Connections: Solder joint or threaded.
11. Handle: Vinyl-covered steel with memory-setting device.

2.5 TEMPERATURE-ACTUATED WATER MIXING VALVES

A. Water-Temperature Limiting Devices:
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:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
   a. Armstrong International, Inc.
   b. Cash Acme.

c. Conbraco Industries, Inc.
d. Honeywell Water Controls.
e. Legend Valve.
f. Leonard Valve Company.
g. Powers; a Watts Industries Co.
h. Symmons Industries, Inc.
i. Taco, Inc.
j. Watts Industries, Inc.; Water Products Div.
k. Zurn Plumbing Products Group; Wilkins Div.

4. Standard: ASSE 1017.
5. Pressure Rating: 125 psig.
6. Type: Thermostatically controlled water mixing valve.
7. Material: Bronze body with corrosion-resistant interior components.
8. Connections: Threaded union inlets and outlet.
9. Accessories: Check stops on hot- and cold-water supplies, and adjustable, temperature- control handle.
10. Tempered-Water Setting: 105°F
11. Tempered-Water Design Flow Rate: as per drawings
12. Valve Finish: Rough bronze.

B. Primary, Thermostatic, Water Mixing Valves:
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:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
   a. Armstrong International, Inc.
   b. Lawler Manufacturing Company, Inc.
   c. Leonard Valve Company.
   d. Powers; a Watts Industries Co.
   e. Symmons Industries, Inc.
4. Standard: ASSE 1017.
5. Pressure Rating: 125 psig.
6. Type: Exposed-mounting, thermostatically controlled water mixing valve.
7. Material: Bronze body with corrosion-resistant interior components.
8. Connections: Threaded union inlets and outlet.
9. Accessories: Manual temperature control, check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
10. Valve Pressure Rating: 125 psig minimum, unless otherwise indicated.
11. Tempered-Water Setting: 105 °F
12. Tempered-Water Design Flow Rate: as per drawings
13. Selected Valve Flow Rate at 45-psig Pressure Drop: as per drawings
14. Pressure Drop at Design Flow Rate: as per drawings
15. Valve Finish: Rough bronze.
16. Piping Finish: Copper.
17. Cabinet: Factory-fabricated, stainless steel, for recessed mounting and with hinged, stainless-steel door.

2.6 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 complying with AWWA C550 or FDA-approved, epoxy coating 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 inch.
   b. Strainers NPS 2-1/2 to NPS 4: 0.045 inch.
   c. Strainers NPS 5 and Larger: 0.10 inch.
6. Drain: Factory-installed, hose-end drain valve.

2.7 HOSE BIBBS

A. Hose Bibbs:

1.	Standard: ASME A112.18.1 for sediment faucets.	
2.	Body Material: Bronze.	
3.	Seat: Bronze, replaceable.	
4.	Supply Connections: NPS 1/2 or NPS 3/4 threaded or solder-joint inlet.	
5.	Outlet Connection: Garden-hose thread complying with ASME B1.20.7.	
6.	Pressure Rating: 125 psig.	
7.	Vacuum Breaker: Integral or field-installation, nonremovable, hose drainable,	
	connection vacuum breaker complying with ASSE 1011.	
8.	Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.	
9.	Finish for Service Areas: Rough bronze.	
10.	Finish for Finished Rooms: Chrome or nickel plated.	
11.	Operation for Equipment Rooms: Wheel handle or operating key.	
12.	Operation for Service Areas: Operating key.	
13.	Operation for Finished Rooms: Operating key.	
14.	Include operating key with each operating-key hose bibb.	
15.	Include integral wall flange with each chrome- or nickel-plated hose bibb.	

2.8 WALL HYDRANTS

A. Nonfreeze Wall Hydrants:
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. Josam Company.
   b. MIFAB, Inc.
   c. Prier Products, Inc.
   d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   e. Tyler Pipe; Wade Div.
   f. Watts Drainage Products Inc.

g. Woodford Manufacturing Company.
h. Zurn Plumbing Products Group; Light Commercial Operation.
i. Zurn Plumbing Products Group; Specification Drainage Operation.

3. Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants.
4. Pressure Rating: 125 psig.
5. Operation: Loose key.
6. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
7. Inlet: NPS 3/4 or NPS 1.
8. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
9. Box: Deep, flush mounting with cover.
10. Box and Cover Finish: Polished nickel bronze.
11. Outlet: Exposed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
12. Nozzle and Wall-Plate Finish: Polished nickel bronze.
13. Operating Keys(s): Two with each wall hydrant.

B. Vacuum Breaker Wall Hydrants:
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. Arrowhead Brass Products, Inc.
b. Mansfield Plumbing Products LLC.
c. McDonald, A. Y. Mfg. Co.
d. Prier Products, Inc.
e. Smith, Jay. R. Mfg. Co.; Division of Smith Industries, Inc.
f. Watts Industries, Inc.; Water Products Div.
g. Woodford Manufacturing Company.
h. Zurn Plumbing Products Group; Light Commercial Operation.
3. Standard: ASSE 1019, Type A or Type B.
4. Type: Freeze-resistant, automatic draining with integral air-inlet valve.
5. Classification: Type A, for automatic draining with hose removed or Type B, for automatic draining with hose removed or with hose attached and nozzle closed.
6. Pressure Rating: 125 psig.
7. Operation: Loose key.
8. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
9. Inlet: NPS 1/2 or NPS 3/4.
10. Outlet: Exposed with garden-hose thread complying with ASME B1.20.7.

2.9 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.

2.10 WATER HAMMER ARRESTERS

A. Water Hammer Arresters:
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. AMTROL, Inc.
   b. Josam Company.
   c. MIFAB, Inc.
   d. PPP Inc.
   e. Sioux Chief Manufacturing Company, Inc.
   f. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   g. Tyler Pipe; Wade Div.
   h. Watts Drainage Products Inc.
   i. Zurn Plumbing Products Group; Specification Drainage Operation.
3. Standard: ASSE 1010 or PDI-WH 201.
4. Type: Metal bellows.
5. Size: ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.

2.11 TRAP-SEAL PRIMER VALVES

A. Supply-Type, Trap-Seal Primer Valves:
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. MIFAB, Inc.
   b. PPP Inc.
   c. Sioux Chief Manufacturing Company, Inc.
   d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   e. Watts Industries, Inc.; Water Products Div.
3. Standard: ASSE 1018.
4. Pressure Rating: 125 psig minimum.
5. Body: Bronze.
6. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
7. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
8. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.

B. 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 not acceptable for this application.
   3. Do not install bypass piping around backflow preventers.

C. Install water regulators with inlet and outlet shutoff valves and bypass with memory-stop balancing valve. Install pressure gages on inlet and outlet.

D. Install balancing valves in locations where they can easily be adjusted.

E. Install temperature-actuated water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.
   1. Install thermometers and water regulators if specified.
   2. Install cabinet-type units recessed in or surface mounted on wall as specified.

F. Install Y-pattern strainers for water on supply side of each control valve, water pressure- reducing valve, solenoid valve, and pump.

G. Install water hammer arresters in water piping according to PDI-WH 201.

H. Install supply-type, trap-seal primer valves 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.

I. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping and specialties.

J. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:
   1. Intermediate atmospheric-vent backflow preventers.
   2. Reduced-pressure-principle backflow preventers.
   3. Double-check backflow-prevention assemblies.
   4. Water pressure-reducing valves.
   5. Primary, thermostatic, water mixing valves.
   6. Supply-type, trap-seal primer valves.

K. 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 Division 22 Section "Identification for Plumbing Piping and Equipment."

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and prepare test reports:
   1. Test each reduced-pressure-principle backflow preventer and double-check backflow- prevention assembly according to authorities having jurisdiction and the device's reference standard.

B. Remove and replace malfunctioning domestic water piping specialties and retest as specified above.

3.3 ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing valves.

B. Set field-adjustable flow of balancing valves.

C. Set field-adjustable temperature set points of temperature-actuated water mixing valves.

END OF SECTION 22 1119

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SECTION 22 1122 - FACILITY NATURAL-GAS 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. Pipes, tubes, and fittings.
2. Piping specialties.
3. Piping and tubing joining materials.
4. Valves.
5. Pressure regulators.
6. Service meters.
7. Concrete bases.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, 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 mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

1.4 PERFORMANCE REQUIREMENTS

A. Minimum Operating-Pressure Ratings:
1. Piping and Valves: 150 psig (1035 kPa) minimum unless otherwise indicated.
2. Service Regulators: 100 psig (690 kPa) minimum unless otherwise indicated.

B. Natural-Gas System Pressure within Buildings: 0.5 psig (3.45 kPa) or less

C. Delegated Design: Design restraints and anchors for natural-gas piping and equipment, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of the following:
1. Piping specialties.
2. Corrugated, stainless-steel tubing with associated components.
3. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
4. Pressure regulators. Indicate pressure ratings and capacities.
5. Service meters. Indicate[pressure ratings and] capacities. Include [bypass fittings] [bypass fittings and meter bars] [meter bars] [supports].
6. Dielectric fittings.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified professional engineer.

B. Welding certificates.

C. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For motorized gas valves, pressure regulators to include in emergency, operation, and maintenance manuals.

1.8 QUALITY ASSURANCE

A. Steel Support 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 ASME Boiler and Pressure Vessel Code.

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 DELIVERY, STORAGE, AND HANDLING

A. Handling Flammable Liquids: Remove and dispose of liquids from existing natural-gas piping according to requirements of authorities having jurisdiction.

B. 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.

C. Store and handle pipes and tubes having factory-applied protective coatings to avoid damaging coating, and protect from direct sunlight.

D. Protect stored PE pipes and valves from direct sunlight.

1.10 PROJECT CONDITIONS

A. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.

B. Interruption of Existing Natural-Gas Service: Do not interrupt natural-gas service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide purging and startup of natural-gas supply according to requirements indicated:
   1. Notify the Owner no fewer than seven days in advance of proposed interruption of natural-gas service.
   2. Do not proceed with interruption of natural-gas service without the Owner's written permission.

1.11 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

B. Coordinate requirements for access panels and doors for valves installed concealed behind finished surfaces. Comply with requirements in Section 083113 "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
   1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
   2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
   3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
   4. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, minimum Class 150, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
      a. Material Group: 1.1.
      b. End Connections: Threaded or butt welding to match pipe.
      c. Lapped Face: Not permitted underground.
      d. Gasket Materials: ASME B16.20, metallic, flat, asbestos free, aluminum o-rings, and spiral-wound metal gaskets.
      e. Bolts and Nuts:ASME B18.2.1, carbon steel aboveground and stainless steel underground.
         1) Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and PE.
            a) Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.
         2) Mechanical Couplings:
            a) Manufacturers: Subject to compliance with requirements, provide products by one of the following:
               (1) Dresser Piping Specialties; Division of Dresser, Inc.
               (2) Smith-Blair, Inc.
            b) [Stainless-steel] [Steel] flanges and tube with epoxy finish.
            c) Buna-nitrile seals.
            d) [Stainless-steel] [Steel] bolts, washers, and nuts.

e) Coupling shall be capable of joining PE pipe to PE pipe, steel pipe to PE pipe, or steel pipe to steel pipe.
f) Steel body couplings installed underground on plastic pipe shall be factory equipped with anode.

f. Corrugated, Stainless-Steel Tubing: Comply with ANSI/IAS LC 1.
1) Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a) Parker Hannifin Corporation; Parflex Division.
b) Titeflex.
c) Gastite.
2) Tubing: ASTM A 240/A 240M, corrugated, Series 300 stainless steel.
3) Coating: PE with flame retardant.
a) Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 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: 50 or less.
4) Fittings: Copper-alloy mechanical fittings with ends made to fit and listed for use with corrugated stainless-steel tubing and capable of metal-to-metal seal without gaskets. Include brazing socket or threaded ends complying with ASME B1.20.1.
5) Striker Plates: Steel, designed to protect tubing from penetrations.
6) Manifolds: Malleable iron or steel with factory-applied protective coating. Threaded connections shall comply with ASME B1.20.1 for pipe inlet and corrugated tubing outlets.
7) Operating-Pressure Rating: 5 psig (34.5 kPa).

2.2 PIPING SPECIALTIES

A. Appliance Flexible Connectors:
1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
2. Indoor, Movable-Appliance Flexible Connectors: Comply with ANSI Z21.69.
3. Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.
4. Corrugated stainless-steel tubing with polymer coating.
5. Operating-Pressure Rating: 0.5 psig (3.45 kPa).
6. End Fittings: Zinc-coated steel.
7. Threaded Ends: Comply with ASME B1.20.1.
8. Maximum Length: 72 inches (1830 mm.)

B. Quick-Disconnect Devices: Comply with ANSI Z21.41.
1. Copper-alloy convenience outlet and matching plug connector.
2. Nitrile seals.
3. Hand operated with automatic shutoff when disconnected.
4. For indoor or outdoor applications.
5. Adjustable, retractable restraining cable.

C. Y-Pattern Strainers:
1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 (DN 50) and smaller; flanged ends for NPS 2-1/2 (DN 65) and larger.

3. Strainer Screen: 40-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig (862 kPa).

D. Basket Strainers:
1. Body: ASTM A 126, Class B, high-tensile cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 (DN 50) and smaller; flanged ends for NPS 2-1/2 (DN 65) and larger.
3. Strainer Screen: 40-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig (862 kPa).

E. T-Pattern Strainers:
1. Body: Ductile or malleable iron with removable access coupling and end cap for strainer maintenance.
2. End Connections: Grooved ends.
3. Strainer Screen: 40-mesh startup strainer, and perforated stainless-steel basket with 57 percent free area.
4. CWP Rating: 750 psig (5170 kPa).

F. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

2.3 JOINING MATERIALS

A. Joint Compound and Tape: Suitable for natural gas.

B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

C. Brazing Filler Metals: Alloy with melting point greater than 1000 deg F (540 deg C) complying with AWS A5.8/A5.8M. Brazing alloys containing more than 0.05 percent phosphorus are prohibited.

2.4 MANUAL GAS SHUTOFF VALVES

A. See "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles for where each valve type is applied in various services.

B. General Requirements for Metallic Valves, NPS 2 (DN 50) and Smaller: Comply with ASME B16.33.
1. CWP Rating: 150 psig (1035 kPa).
2. Threaded Ends: Comply with ASME B1.20.1.
3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
4. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch (25 mm) and smaller.
6. Service Mark: Valves 1-1/4 inches (32 mm) to NPS 2 (DN 50) shall have initials "WOG" permanently marked on valve body.

C. General Requirements for Metallic Valves, NPS 2-1/2 (DN 65) and Larger: Comply with ASME B16.38.
   1. CWP Rating: 150 psig (1035 kPa).
   2. Flanged Ends: Comply with ASME B16.5 for steel flanges.
   3. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
   4. Service Mark: Initials "WOG" shall be permanently marked on valve body.

D. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. BrassCraft Manufacturing Company; a Masco company.
      b. Conbraco Industries, Inc.; Apollo Div.
      c. Lyall, R. W. & Company, Inc.
      d. McDonald, A. Y. Mfg. Co.
      e. Perfection Corporation; a subsidiary of American Meter Company.
   2. Body: Bronze, complying with ASTM B 584.
   3. Ball: Chrome-plated bronze.
   4. Stem: Bronze; blowout proof.
   5. Seats: Reinforced TFE; blowout proof.
   6. Packing: Threaded-body packnut design with adjustable-stem packing.
   7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
   8. CWP Rating: 600 psig (4140 kPa).
   9. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
   10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

E. Three-Piece, Full-Port Bronze Ball Valves with Bronze Trim: MSS SP-110.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. BrassCraft Manufacturing Company; a Masco company.
      b. Conbraco Industries, Inc.; Apollo Div.
      c. Lyall, R. W. & Company, Inc.
      d. McDonald, A. Y. Mfg. Co.
      e. Perfection Corporation; a subsidiary of American Meter Company.
   2. Body: Bronze, complying with ASTM B 584.
   3. Ball: Chrome-plated bronze.
   4. Stem: Bronze; blowout proof.
   5. Seats: Reinforced TFE; blowout proof.
   6. Packing: Threaded-body packnut design with adjustable-stem packing.
   7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
   8. CWP Rating: 600 psig (4140 kPa).
   9. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
   10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

F. Bronze Plug Valves: MSS SP-78.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Lee Brass Company.
b. McDonald, A. Y. Mfg. Co.
c. Perfection Corporation; a subsidiary of American Meter Company.
d. Conbraco Industries, Inc.; Apollo Div.

2. Body: Bronze, complying with ASTM B 584.
3. Plug: Bronze.
4. Ends: Threaded, socket, or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Operator: Square head or lug type with tamperproof feature where indicated.
6. Pressure Class: 125 psig (862 kPa).
7. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
8. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

G. Cast-Iron, Nonlubricated Plug Valves: MSS SP-78.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. McDonald, A. Y. Mfg. Co.
b. Mueller Co.; Gas Products Div.
c. Xomox Corporation; a Crane company.
2. Body: Cast iron, complying with ASTM A 126, Class B.
3. Plug: Bronze or nickel-plated cast iron.
4. Seat: Coated with thermoplastic.
5. Stem Seal: Compatible with natural gas.
6. Ends: Threaded or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
7. Operator: Square head or lug type with tamperproof feature where indicated.
8. Pressure Class: 125 psig (862 kPa).
9. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

H. Cast-Iron, Lubricated Plug Valves: MSS SP-78.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Flowserve.
b. Homestead Valve; a division of Olson Technologies, Inc.
c. McDonald, A. Y. Mfg. Co.
d. Milliken Valve Company.
e. Mueller Co.; Gas Products Div.
f. R&M Energy Systems, A Unit of Robbins & Myers, Inc.
2. Body: Cast iron, complying with ASTM A 126, Class B.
3. Plug: Bronze or nickel-plated cast iron.
4. Seat: Coated with thermoplastic.
5. Stem Seal: Compatible with natural gas.
6. Ends: Threaded or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
7. Operator: Square head or lug type with tamperproof feature where indicated.
8. Pressure Class: 125 psig (862 kPa).

9. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

I. PE Ball Valves: Comply with ASME B16.40.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Kerotest Manufacturing Corp.
   b. Lyall, R. W. & Company, Inc.
   c. Perfection Corporation; a subsidiary of American Meter Company.
2. Body: PE.
3. Ball: PE.
4. Stem: Acetal.
5. Seats and Seals: Nitrile.
6. Ends: Plain or fusible to match piping.
7. CWP Rating: 80 psig (552 kPa).
8. Operating Temperature: Minus 20 to plus 140 deg F (Minus 29 to plus 60 deg C).
9. Operator: Nut or flat head for key operation.
10. Include plastic valve extension.
11. Include tamperproof locking feature for valves where indicated on Drawings.

J. Valve Boxes:
1. Cast-iron, two-section box.
2. Top section with cover with "GAS" lettering.
3. Bottom section with base to fit over valve and barrel a minimum of 5 inches (125 mm) in diameter.
4. Adjustable cast-iron extensions of length required for depth of bury.
5. Include tee-handle, steel operating wrench with socket end fitting valve nut or flat head, and with stem of length required to operate valve.

2.5 MOTORIZED GAS VALVES

A. Automatic Gas Valves: Comply with ANSI Z21.21.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. ASCO Power Technologies, LP; Division of Emerson.
   b. Dungs, Karl, Inc.
   c. Eaton Corporation; Controls Div.
   d. Eclipse Combustion, Inc.
   e. Honeywell International Inc.
   f. Johnson Controls.
2. Body: Brass or aluminum.
3. Seats and Disc: Nitrile rubber.
4. Springs and Valve Trim: Stainless steel.
5. Normally closed.
6. Visual position indicator.
7. Electrical operator for actuation by appliance automatic shutoff device.

B. Electrically Operated Valves: Comply with UL 429.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. ASCO Power Technologies, LP; Division of Emerson.

b. Dungs, Karl, Inc.
c. Eclipse Combustion, Inc.
d. Goyen Valve Corp.; Tyco Environmental Systems.
e. Magnatrol Valve Corporation.
f. Parker Hannifin Corporation; Climate & Industrial Controls Group; Skinner Valve Div.
g. Watts Regulator Co.; Division of Watts Water Technologies, Inc.

2. Pilot operated.
3. Body: Brass or aluminum.
4. Seats and Disc: Nitrile rubber.
5. Springs and Valve Trim: Stainless steel.
6. 120-V ac, 60 Hz, Class B, continuous-duty molded coil, and replaceable.
7. NEMA ICS 6, Type 4, coil enclosure.
8. Normally closed.
9. Visual position indicator.

2.6 PRESSURE REGULATORS

A. General Requirements:
1. Single stage and suitable for natural gas.
2. Steel jacket and corrosion-resistant components.
3. Elevation compensator.
4. End Connections: Threaded for regulators NPS 2 (DN 50) and smaller; flanged for regulators NPS 2-1/2 (DN 65) and larger.

B. Service Pressure Regulators: Comply with ANSI Z21.80.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Actaris.
b. American Meter Company.
c. Fisher Control Valves and Regulators; Division of Emerson Process Management.
d. Invensys.
e. Richards Industries; Jordan Valve Div.
2. Body and Diaphragm Case: Cast iron or die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
6. Orifice: Aluminum; interchangeable.
7. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
8. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
9. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.
10. Overpressure Protection Device: Factory mounted on pressure regulator.
11. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
12. Maximum Inlet Pressure: 100 psig (690 kPa).

C. Line Pressure Regulators: Comply with ANSI Z21.80.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Actaris.
   b. American Meter Company.
   c. Eclipse Combustion, Inc.
   d. Fisher Control Valves and Regulators; Division of Emerson Process Management.
   e. Invensys.
   f. Maxitrol Company.
   g. Richards Industries; Jordan Valve Div.
2. Body and Diaphragm Case: Cast iron or die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
6. Orifice: Aluminum; interchangeable.
7. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
8. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
9. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.
10. Overpressure Protection Device: Factory mounted on pressure regulator.
11. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
12. Maximum Inlet Pressure: 2 psig (13.8 kPa)

D. Appliance Pressure Regulators: Comply with ANSI Z21.18.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Canadian Meter Company Inc.
   b. Eaton Corporation; Controls Div.
   c. Harper Wyman Co.
   d. Maxitrol Company.
   e. SCP, Inc.
2. Body and Diaphragm Case: Die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber.
6. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
7. Factory-Applied Finish: Minimum three-layer polyester and polyurethane paint finish.
8. Regulator may include vent limiting device, instead of vent connection, if approved by authorities having jurisdiction.
9. Maximum Inlet Pressure: 1 psig (6.9 kPa)

2.7 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, provide products by one of the following:

a. Capitol Manufacturing Company.
b. Central Plastics Company.
c. Hart Industries International, Inc.
d. Jomar International Ltd.
e. Matco-Norca, Inc.
f. McDonald, A. Y. Mfg. Co.
g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
h. Wilkins; a Zurn company.

2. Description:
   a. Standard: ASSE 1079.
   b. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Capitol Manufacturing Company.
   b. Central Plastics Company.
   c. Matco-Norca, Inc.
   d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
   e. Wilkins; a Zurn company.
2. Description:
   a. Standard: ASSE 1079.
   b. Factory-fabricated, bolted, companion-flange assembly.
   c. 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, provide products by one of the following:
   a. Advance Products & Systems, Inc.
   b. Calpico, Inc.
   c. Central Plastics Company.
   d. Pipeline Seal and Insulator, Inc.
2. Description:
   a. Nonconducting materials for field assembly of companion flanges.
   b. Pressure Rating: 150 psig (1035 kPa).
   c. Gasket: Neoprene or phenolic.
   d. Bolt Sleeves: Phenolic or polyethylene.
   e. Washers: Phenolic with steel backing washers.

2.8 LABELING AND IDENTIFYING

A. Detectable Warning Tape: Acid- and alkali-resistant, PE film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep; colored yellow.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for natural-gas piping system to verify actual locations of piping connections before equipment installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Close equipment shutoff valves before turning off natural gas to premises or piping section.

B. Inspect natural-gas piping according to NFPA 54 and the International Fuel Gas Code to determine that natural-gas utilization devices are turned off in piping section affected.

C. Comply with NFPA 54 and the International Fuel Gas Code requirements for prevention of accidental ignition.

3.3 OUTDOOR PIPING INSTALLATION

A. Comply with NFPA 54 for installation and purging of natural-gas piping.

B. Steel Piping with Protective Coating:
1. Apply joint cover kits to pipe after joining to cover, seal, and protect joints.
2. Replace pipe having damaged PE coating with new pipe.

C. Install fittings for changes in direction and branch connections.

D. Install pressure gage upstream and downstream from each service regulator. Pressure gages are specified in Section 230519 "Meters and Gages for HVAC Piping."

3.4 INDOOR PIPING INSTALLATION

A. Comply with [NFPA 54] for installation and purging of natural-gas piping.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. 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.

C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.

D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

E. 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.

F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

G. Locate valves for easy access.

H. Install natural-gas piping at uniform grade of 2 percent down toward drip and sediment traps.

I. Install piping free of sags and bends.

J. Install fittings for changes in direction and branch connections.

K. Verify final equipment locations for roughing-in.

L. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.

M. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.
   1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches (75 mm) long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.

N. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.

O. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.

P. Concealed Location Installations: Except as specified below, install concealed natural-gas piping and piping installed under the building in containment conduit constructed of steel pipe with welded joints as described in Part 2. Install a vent pipe from containment conduit to outdoors and terminate with weatherproof vent cap.
   1. Above Accessible Ceilings: Natural-gas piping, fittings, valves, and regulators may be installed in accessible spaces without containment conduit.
   2. In Floors: Install natural-gas piping with welded or brazed joints and protective coating in cast-in-place concrete floors. Cover piping to be cast in concrete slabs with minimum of 1-1/2 inches (38 mm) of concrete. Piping may not be in physical contact with other metallic structures such as reinforcing rods or electrically neutral conductors. Do not embed piping in concrete slabs containing quick-set additives or cinder aggregate.
   3. In Floor Channels: Install natural-gas piping in floor channels. Channels must have cover and be open to space above cover for ventilation.
   4. In Walls or Partitions: Protect tubing installed inside partitions or hollow walls from physical damage using steel striker barriers at rigid supports.
      a. Exception: Tubing passing through partitions or walls does not require striker barriers.
   5. Prohibited Locations:
      a. Do not install natural-gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
      b. Do not install natural-gas piping in solid walls or partitions.

Q. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

R. Connect branch piping from top or side of horizontal piping.

S. Install unions in pipes NPS 2 (DN 50) and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.

T. Do not use natural-gas piping as grounding electrode.

U. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.

V. Install pressure gage upstream and downstream from each line regulator. Pressure gages are specified in Section 230519 "Meters and Gages for HVAC Piping."

W. 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."

X. 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."

Y. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC Piping."

3.5 VALVE INSTALLATION

A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.

B. Install underground valves with valve boxes.

C. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.

D. Install earthquake valves aboveground outside buildings according to listing.

E. Install anode for metallic valves in underground PE piping.

3.6 PIPING JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints:
1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
2. Cut threads full and clean using sharp dies.
3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
5. 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.

D. Welded Joints:
1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
2. Bevel plain ends of steel pipe.

3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.

F. Flanged Joints: Install gasket material, size, type, and thickness appropriate for natural-gas service. Install gasket concentrically positioned.

G. Flared Joints: Cut tubing with roll cutting tool. Flare tube end with tool to result in flare dimensions complying with SAE J513. Tighten finger tight, then use wrench. Do not overtighten.

H. 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.

3.7 HANGER AND SUPPORT INSTALLATION

A. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 230548 "Vibration and Seismic Controls for HVAC Piping and Equipment."

B. Comply with requirements for pipe hangers and supports specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

C. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:
1. NPS 1 (DN 25) and Smaller: Maximum span, 96 inches (2438 mm); minimum rod size, 3/8 inch (10 mm).
2. NPS 1-1/4 (DN 32): Maximum span, 108 inches (2743 mm); minimum rod size, 3/8 inch (10 mm).
3. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): Maximum span, 108 inches (2743 mm); minimum rod size, 3/8 inch (10 mm).
4. NPS 2-1/2 to NPS 3-1/2 (DN 65 to DN 90): Maximum span, 10 feet (3 m); minimum rod size, 1/2 inch (13 mm).
5. NPS 4 (DN 100) and Larger: Maximum span, 10 feet (3 m); minimum rod size, 5/8 inch (15.8 mm).

D. Install hangers for horizontal, corrugated stainless-steel tubing with the following maximum spacing and minimum rod sizes:
1. NPS 3/8 (DN 10): Maximum span, 48 inches (1220 mm); minimum rod size, 3/8 inch (10 mm).
2. NPS 1/2 (DN 15): Maximum span, 72 inches (1830 mm); minimum rod size, 3/8 inch (10 mm).
3. NPS 3/4 (DN 20) and Larger: Maximum span, 96 inches (2440 mm); minimum rod size, 3/8 inch (10 mm).

3.8 CONNECTIONS

A. Connect to utility's gas main according to utility's procedures and requirements.

B. Install natural-gas piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.

C. Install piping adjacent to appliances to allow service and maintenance of appliances.

D. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches (1800 mm) of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.

E. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.9 LABELING AND IDENTIFYING

A. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for piping and valve identification.

B. Install detectable warning tape directly above gas piping, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.

3.10 PAINTING

A. Comply with requirements in Section 09 9600 High Performance Coatings

B. Paint exposed, exterior metal piping, valves, service regulators, service meters and meter bars, earthquake valves, and piping specialties, except components, with factory-applied paint or protective coating.

C. Paint exposed, interior metal piping, valves, service regulators, service meters and meter bars, earthquake valves, and piping specialties, except components, with factory-applied paint or protective coating.

D. Damage and Touchup: Repair marred and damaged factory-applied finishes with materials and by procedures to match original factory finish.

3.11 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:
1. Test, inspect, and purge natural gas according to [NFPA 54] [the International Fuel Gas Code] and authorities having jurisdiction.

C. Natural-gas piping will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.12 DEMONSTRATION

A. Engage a factory-authorized service representative to train Cleveland Clinic maintenance personnel to adjust, operate, and maintain earthquake valves.

3.13 OUTDOOR PIPING SCHEDULE

A. Aboveground natural-gas piping shall be one of the following:
1. Steel pipe with malleable-iron fittings and threaded joints. Paint with corrosion prevention paint.

2. Steel pipe with wrought-steel fittings and welded joints. Paint with corrosion prevention paint.

B. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.

3.14 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES LESS THAN 0.5 PSIG (3.45 kPa)

A. Aboveground, branch piping NPS 1 (DN 25) and smaller limited to specialty equipment shall be one of the following:
1. Corrugated stainless-steel tubing with mechanical fittings having socket or threaded ends to match adjacent piping.
2. Annealed-temper, copper tube with wrought-copper fittings and [brazed] [flared] joints.
3. Steel pipe with malleable-iron fittings and threaded joints.

B. Aboveground, distribution piping shall be one of the following:
1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with wrought-steel fittings and welded joints.

C. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.

D. Containment Conduit Vent Piping: Steel pipe with malleable-iron fittings and threaded or wrought-steel fittings with welded joints. Coat underground pipe and fittings with protective coating for steel piping.

3.15 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

A. Valves for pipe sizes NPS 2 (DN 50) and smaller at service meter shall be one of the following:
1. One-piece, bronze ball valve with bronze trim.
2. Two-piece, full-port, bronze ball valves with bronze trim.
3. Bronze plug valve.

B. Valves for pipe sizes NPS 2-1/2 (DN 65) and larger at service meter shall be one of the following:
1. Two-piece, full-port, bronze ball valves with bronze trim.
2. Bronze plug valve.
3. Cast-iron, nonlubricated plug valve.

C. Distribution piping valves for pipe sizes NPS 2 (DN 50) and smaller shall be one of the following:
1. One-piece, bronze ball valve with bronze trim.
2. Two-piece, full-port, bronze ball valves with bronze trim.
3. Bronze plug valve.

D. Distribution piping valves for pipe sizes NPS 2-1/2 (DN 65) and larger shall be one of the following:
1. Two-piece, full-port, bronze ball valves with bronze trim.
2. Bronze plug valve.
3. Cast-iron, [nonlubricated] [lubricated] plug valve.

E. Valves in branch piping for single appliance shall be one of the following:
1. One-piece, bronze ball valve with bronze trim.
2. Two-piece, full-port, bronze ball valves with bronze trim.
3. Bronze plug valve.

END OF SECTION 231123 22 1122

SECTION 22 1316 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following soil and waste, sanitary drainage and vent piping inside the building:
   1. Pipe, tube, and fittings.
   2. Special pipe fittings.

B. See Division 22 Section "Chemical-Waste Systems for Laboratory and Healthcare Facilities" for chemical-waste and vent piping systems.

1.2 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.

1.3 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. 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-drain" for plastic drain piping.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Hub-and-Spigot, Cast-Iron Pipe and Fittings: ASTM A 74, Service class.
   1. Gaskets: ASTM C 564, rubber.

B. Hubless Cast-Iron Pipe and Fittings: ASTM A 888 or CISPI 301.
   1. Sovent Stack Fittings: ASME B16.45 or ASSE 1043, hubless, cast-iron aerator and deaerator drainage fittings.
   2. Shielded Couplings: ASTM C 1277 assembly of metal shield or housing, corrosion- resistant fasteners, and rubber sleeve with integral, center pipe stop.
      a. Standard, Shielded, Stainless-Steel Couplings: CISPI 310, with stainless-steel corrugated shield; stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve.
      b. Heavy-Duty, Shielded, Stainless-Steel Couplings: With stainless-steel shield, stainless-steel bands and tightening devices, and ASTM C 564, rubber sleeve.

C. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade A or B, Schedule 40, galvanized. Include ends matching joining method.

1. Drainage Fittings: ASME B16.12, galvanized, threaded, cast-iron drainage pattern.
2. Pressure Fittings:
   a. Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106, Schedule 40, galvanized, seamless steel pipe. Include ends matching joining method.
   b. Malleable-Iron Unions: ASME B16.39; Class 150; hexagonal-stock body with ball-and-socket, metal-to-metal, bronze seating surface; and female threaded ends.
   c. Gray-Iron, Threaded Fittings: ASME B16.4, Class 125, galvanized, standard pattern.
   d. Cast-Iron Flanges: ASME B16.1, Class 125.
   e. Cast-Iron, Flanged Fittings: ASME B16.1, Class 125, galvanized.

D. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.
1. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought- copper, solder-joint fittings.

E. Solid-Wall ABS Pipe: ASTM D 2661, Schedule 40, solid wall.
1. ABS Socket Fittings: ASTM D 2661, made to ASTM D 3311, drain, waste, and vent patterns.
2. Solvent Cement and Adhesive Primer:
   a. Use ABS solvent cement that has a VOC content of 325 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   b. Use adhesive primer that has a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

F. Solid-Wall PVC Pipe: ASTM D 2665, solid-wall drain, waste, and vent.
1. PVC Socket Fittings: ASTM D 2665, socket type, made to ASTM D 3311, drain, waste, and vent patterns.
2. Solvent Cement and Adhesive Primer:
   a. Use PVC solvent cement that has a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   b. Use adhesive primer that has a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Special pipe fittings with pressure ratings at least equal to piping pressure ratings may be used in applications below, unless otherwise indicated.

B. Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.

C. PVC/CPVC/ABS PIPING SHALL NOT BE INSTALLED IN ENVIRONMENTAL AIR PLENUMS UNLESS IT HAS A 25/50 FLAME/SMOKE RATING OR IS INSULATED AND THE INSULATION HAS A 25/50 FLAME/SMOKE RATING.

D. Aboveground, soil, waste, and vent piping NPS 4 and smaller shall beany of the following:
1. Service class, hub-and-spigot, cast-iron soil pipe and fittings; gaskets; and compression joints.
2. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and hubless-coupling joints.
3. Steel pipe, drainage fittings, and threaded joints.

4. Copper DWV tube, copper drainage fittings, and soldered joints.
5. Solid-wall ABS pipe, ABS socket fittings, and solvent-cemented joints.
6. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

E. Aboveground, soil, waste, and vent piping NPS 5 and larger shall beany of the following:
1. Service class, cast-iron soil pipe and fittings; gaskets; and compression joints.
2. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and hubless-coupling joints.
3. Steel pipe, drainage fittings, and threaded joints.
4. Copper DWV tube, copper drainage fittings, and soldered joints.
5. Solid-wall ABS pipe, ABS socket fittings, and solvent-cemented joints.
6. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

F. Underground, soil, waste, and vent piping NPS 4 and smaller shall be any of the following:
1. Service class, hub-and-spigot, cast-iron soil pipe and fittings; gaskets; and compression joints.
2. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and hubless-coupling joints.
3. Solid-wall ABS pipe, ABS socket fittings, and solvent-cemented joints.
4. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

G. Underground, 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 compression joints.
2. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and hubless-coupling joints.
3. ABS pipe, ABS socket fittings, and solvent-cemented joints.
4. Solid-wall ABS pipe, ABS socket fittings, and solvent-cemented joints.
5. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

3.2 PIPING INSTALLATION

A. Sanitary sewer piping outside the building is specified in Division 22 Section "Facility Sanitary Sewers."

B. Basic piping installation requirements are specified in Division 22 Section "Common Work Results for Plumbing."

C. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.

D. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Division 22 Section "Common Work Results for Plumbing."

E. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight. Wall penetration systems are specified in Division 22 Section "Common Work Results for Plumbing."

F. 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."

G. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. 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. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

H. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

I. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:
1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

J. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

K. Install ABS soil and waste drainage and vent piping according to ASTM D 2661.

L. Install PVC soil and waste drainage and vent piping according to ASTM D 2665.

M. Install underground ABS and PVC soil and waste drainage piping according to ASTM D 2321.

N. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.3 JOINT CONSTRUCTION

A. Basic piping joint construction requirements are specified in Division 22 Section "Common Work Results for Plumbing."

B. Cast-Iron, Soil-Piping Joints: Make joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
1. Gasketed Joints: Make with rubber gasket matching class of pipe and fittings.
2. Hubless Joints: Make with rubber gasket and sleeve or clamp.

C. Soldered Joints:Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free- alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

D. PVC Nonpressure Piping Joints: Join piping according to ASTM D 2665.

3.4 VALVE INSTALLATION

A. General-duty valves are specified in Division 22 Section "General-Duty Valves for Plumbing Piping."

B. Shutoff Valves: Install shutoff valve on each sewage pump discharge.
   1. Use gate or full-port ball valve for piping NPS 2 and smaller.
   2. Use gate valve for piping NPS 2-1/2 and larger.

C. Check Valves: Install swing check valve, downstream from shutoff valve, on each sewage pump discharge.

D. Backwater Valves: Install backwater valves in piping subject to sewage 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. Backwater valves are specified in Division 22 Section "Sanitary Waste Piping Specialties."

3.5 HANGER AND SUPPORT INSTALLATION

A. Seismic-restraint devices are specified in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Pipe hangers and supports are specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment." Install the following:
   1. Vertical Piping: MSS Type 8 or Type 42, clamps.
   2. Individual, Straight, Horizontal Piping Runs: According to the following:
      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. Install supports according to Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

D. Support vertical piping and tubing at base and at each floor.

E. Rod diameter may be reduced 1 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: 60 inches with 3/4-inch rod.
   5. 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 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: 12 feet with 3/4-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.

K. Install supports for vertical copper tubing every 10 feet.

L. Install hangers for ABS and 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: 48 inches with 3/4-inch rod.

M. Install supports for vertical ABS and PVC piping every 48 inches.

N. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.6 CONNECTIONS

A. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

B. Connect drainage and vent piping to the following:
1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 22 Section "Sanitary Waste Piping Specialties."
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 drainage and vent piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 22 Section "Sanitary Waste Piping Specialties."
4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.

3.7 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 drainage and vent piping according to procedures of authorities having jurisdiction.
1. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
2. Prepare reports for tests and required corrective action.

3.8 CLEANING

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.

3.9 PROTECTION

A. Exposed ABS and PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

END OF SECTION 22 1316

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SECTION 22 1319 - SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following sanitary drainage piping specialties:
1. Backwater valves.
2. Cleanouts.
3. Floor drains.
4. Roof flashing assemblies.
5. Miscellaneous sanitary drainage piping specialties.
6. Flashing materials.
7. Grease interceptors.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for grease interceptors.

1.3 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 BACKWATER VALVES

A. Horizontal, Cast-Iron Backwater Valves:
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:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
    a. Josam Company; Josam Div.
    b. MIFAB, Inc.
    c. Smith, Jay R. Mfr. Co.; Division of Smith Industries, Inc.
    d. Tyler Pipe; Wade Div.
    e. Watts Drainage Products Inc.
    f. Zurn Plumbing Products Group; Specification Drainage Operation.
4. Standard: ASME A112.14.1.
5. Size: Same as connected piping.
6. Body: Cast iron.
7. Cover: Cast iron with bolted or threaded access check valve.

8. End Connections: Hub and spigot.
9. Type Check Valve: Removable, bronze, swing check, factory assembled or field modified to hang open for airflow unless subject to backflow condition.
10. Extension: ASTM A 74, 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. 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. Josam Company; Josam Div.
   b. Smith, Jay R. Mfr. Co.; Division of Smith Industries, Inc.
   c. Watts Drainage Products Inc.
   d. Zurn Plumbing Products Group; Specification Drainage Operation.
3. Size: Same as floor drain outlet.
4. Body: Cast iron or bronze made for vertical installation in bottom outlet of floor drain.
5. Check Valve: Removable ball float.
6. Inlet: Threaded.
7. Outlet: Threaded or spigot.

2.2 CLEANOUTS

A. Exposed Cast-Iron Cleanouts:
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:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
   a. Josam Company; Josam Div.
   b. MIFAB, Inc.
   c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   d. Tyler Pipe; Wade Div.
   e. Watts Drainage Products Inc.
   f. Zurn Plumbing Products Group; Specification Drainage Operation.
4. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
5. Size: Same as connected drainage piping
6. Body Material: Hub-and-spigot, cast-iron soil pipe T-branch as required to match connected piping.
7. Closure: Countersunk or raised-head, brass plug.
8. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

B. Cast-Iron Floor Cleanouts:
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:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

a. Josam Company; Josam Div.
b. Oatey.
c. Sioux Chief Manufacturing Company, Inc.
d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
e. Tyler Pipe; Wade Div.
f. Watts Drainage Products Inc.
g. Zurn Plumbing Products Group; Light Commercial Operation.
h. Zurn Plumbing Products Group; Specification Drainage Operation.

4. Standard: ASME A112.36.2M for threaded, adjustable housing cleanout.
5. Size: Same as connected branch.
6. Type: Threaded, adjustable housing.
7. Body or Ferrule: Cast iron.
8. Clamping Device: Required.
9. Outlet Connection: Spigot.
10. Closure: Brass plug with straight threads and gasket.
11. Adjustable Housing Material: Cast iron with threads.
12. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
13. Frame and Cover Shape: Round or Square as per drawings.
14. Top Loading Classification: Extra Heavy Duty.
15. Riser: ASTM A 74, Extra-Heavy class, cast-iron drainage pipe fitting and riser to cleanout.

C. Cast-Iron Wall Cleanouts:
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:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
a. Josam Company; Josam Div.
b. MIFAB, Inc.
c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
d. Tyler Pipe; Wade Div.
e. Watts Drainage Products Inc.
f. Zurn Plumbing Products Group; Specification Drainage Operation.
4. Standard: ASME A112.36.2M. Include wall access.
5. Size: Same as connected drainage piping.
6. Body: Hub-and-spigot, cast-iron soil pipe T-branch as required to match connected piping.
7. Closure: Countersunk or raised-head, drilled-and-threaded brass plug.
8. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
9. Wall Access: Round, flat, chrome-plated brass or stainless-steel cover plate with screw.
10. Wall Access: Round or Square as per drawings, nickel-bronze, copper-alloy, or stainless- steel wall-installation frame and cover.

2.3 FLOOR DRAINS

A. Cast-Iron Floor Drains:
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:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
    a. Commercial Enameling Co.
    b. Josam Company; Josam Div.
    c. MIFAB, Inc.
    d. Prier Products, Inc.
    e. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    f. Tyler Pipe; Wade Div.
    g. Watts Drainage Products Inc.
    h. Zurn Plumbing Products Group; Light Commercial Operation.
    i. Zurn Plumbing Products Group; Specification Drainage Operation.
4. Standard: ASME A112.6.3 with backwater valve.
5. Pattern: Area drain.
6. Body Material: Gray iron.
7. Seepage Flange: Not required.
8. Anchor Flange: Required.
9. Clamping Device: Required.
10. Outlet: Bottom or side.
11. Backwater Valve: Integral, ASME A112.14.1, swing-check type.
12. Coating on Interior and Exposed Exterior Surfaces: Not required.
13. Sediment Bucket: Insert description.
14. Top or Strainer Material: Bronze.
15. Top of Body and Strainer Finish: Rough bronze.
16. Top Shape: Round or Square as per drawings.
17. Top Loading Classification: Extra Heavy-Duty.
18. Funnel: Not required.
19. Inlet Fitting: Gray iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
20. Trap Material: Bronze.
21. Trap Pattern: Standard P-trap.
22. Trap Features: Cleanout and trap-seal primer valve drain connection.

2.4 ROOF FLASHING ASSEMBLIES

A. Roof Flashing Assemblies:
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:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
    a. Acorn Engineering Company; Elmdor/Stoneman Div.
    b. Thaler Metal Industries Ltd.

B. Description: Manufactured assembly made of 6.0-lb/sq. ft., 0.0938-inch- thick, lead flashing collar and skirt extending at least 6 inches from pipe, with galvanized-steel boot reinforcement and counterflashing fitting.
1. Open-Top Vent Cap: Without cap.

2. Low-Silhouette Vent Cap: With vandal-proof vent cap.
3. Extended Vent Cap: With field-installed, vandal-proof vent cap.

2.5 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Open Drains:
1. Description: Shop or field fabricate from ASTM A 74, 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 C 564, rubber gaskets.
2. Size: Same as connected waste piping with increaser fitting of size indicated.

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 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.

2.6 FLASHING MATERIALS

A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:
   1. General Use: 4.0-lb/sq. ft., 0.0625-inch thickness.
   2. Vent Pipe Flashing: 3.0-lb/sq. ft., 0.0469-inch thickness.
   3. Burning: 6-lb/sq. ft., 0.0938-inch thickness.

B. Fasteners: Metal compatible with material and substrate being fastened.

C. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

D. Solder: ASTM B 32, lead-free alloy.

E. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

2.7 GREASE INTERCEPTORS

A. Grease Interceptors:
   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:
   3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
      a. Applied Chemical Technology, Incorporated.
      b. Josam Company; Josam Div.
      c. MIFAB, Inc.
      d. Rockford Sanitary Systems, Inc.
      e. Schier Products Company.
      f. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
      g. Tyler Pipe; Wade Div.
      h. Watts Drainage Products Inc.
      i. Zurn Plumbing Products Group; Light Commercial Operation.
      j. Zurn Plumbing Products Group; Specification Drainage Operation.
      k. Ashland Trap Distribution Co.
      l. Bio-Microbics, Inc.
      m. Canplas LLC.
      n. Schier Products Company.
      o. Zurn Plumbing Products Group; Light Commercial Operation.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.

B. Install backwater valves in building drain piping. 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 aboveground piping and 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 45 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.

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 floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
   1. Position floor drains for easy access and maintenance.
   2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:
      a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
      b. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
      c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1- inch total depression.
   3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
   4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

G. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.

H. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.

I. Assemble open drain fittings and install with top of hub 1 inch above floor.

J. Install deep-seal traps on floor drains and other waste outlets, if indicated.

K. 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.

L. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

M. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.

N. Install vent caps on each vent pipe passing through roof.

O. Install grease interceptors, including trapping, venting, and flow-control fitting, according to authorities having jurisdiction and with clear space for servicing.
   1. Above-Floor Installation: Set unit with bottom resting on floor, unless otherwise indicated.
   2. Flush with Floor Installation: Set unit and extension, if required, with cover flush with finished floor.
   3. Recessed Floor Installation: Set unit in receiver housing having bottom or cradle supports, with receiver housing cover flush with finished floor.
   4. Install cleanout immediately downstream from interceptors not having integral cleanout on outlet.

P. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

Q. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Grease Interceptors: Connect inlet and outlet to unit, and connect flow-control fitting and vent to unit inlet piping. Install valve on outlet of automatic drawoff-type unit.

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:
   1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft., 0.0938-inch thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft., 0.0625-inch thickness or thinner.

B. 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.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Division 07 Section "Sheet Metal Flashing and Trim."

F. 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 grease interceptor.

3.5 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 22 1319

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SECTION 22 1500 - GENERAL-SERVICE COMPRESSED-AIR SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pressure reducing stations.

1.2 REFERENCE STANDARDS

A. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2016.

B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2012.

C. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2018.

D. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes; 2018.

E. ASME B31.1 - Power Piping; 2018.

F. ASME B31.9 - Building Services Piping; 2014.

G. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2018.

H. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2018a.

I. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).

J. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2016.

K. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2016.

L. ASTM D2513 - Standard Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings; 2018a.

M. ASTM D2683 - Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing; 2014.

N. ASTM F1281 - Standard Specification for Crosslinked Polyethylene/Aluminum/Crosslinked Polyethylene (PEX-AL-PEX) Pressure Pipe; 2017.

O. ASTM F1282 - Standard Specification for Polyethylene/Aluminum/Polyethylene (PE-AL-PE) Composite Pressure Pipe; 2017.

1.3 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturers catalog literature with capacity, weight, and electrical characteristics and connection requirements.

C. Shop Drawings: Indicate piping system schematic with electrical characteristics and connection requirements.

D. Project Record Documents: Record actual locations of equipment and components. Modify shop drawings to indicate final locations.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

PART 2 PRODUCTS

2.1 PRESSURE REDUCING STATIONS

A. Pressure Reducing Station: Consisting of automatic reducing valve and bypass, and low pressure side relief valve and gauge. Provide oil separator where indicated.

B. Valve Capacity: Reduce pressure from 200 psi to 30 psi, adjustable upwards from reduced pressure.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install equipment in accordance with manufacturer's instructions.

B. Connect condensate drains to nearest floor drain.

C. Install takeoffs to outlets from top of main, with shut off valve after takeoff. Slope takeoff piping to outlets.

D. Install compressed air couplings, female quick connectors, and pressure gauges where outlets are indicated.

E. Identify piping system and components. See Section 22 0553.

3.2 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Compressed Air Piping Leak Test: Prior to initial operation, clean and test compressed air piping in accordance with ASME B31.1.

C. Repair or replace compressed air piping as required to eliminate leaks, and retest to demonstrate compliance.

D. Cap and seal ends of piping when not connected to mechanical equipment.

SECTION 22 3000 - PLUMBING EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Commercial gas-fired water heaters.

B. In-line circulator pumps.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

B. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.3 SUBMITTALS

A. Product Data:
1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
2. Indicate pump type, capacity, power requirements.
3. Provide certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.
4. Provide electrical characteristics and connection requirements.

B. Shop Drawings:
1. Indicate heat exchanger dimensions, size of tappings, and performance data.
2. Indicate dimensions of tanks, tank lining methods, anchors, attachments, lifting points, tappings, and drains.

C. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

D. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1.4 QUALITY ASSURANCE

A. Identification: Provide pumps with manufacturer's name, model number, and rating/capacity identified by permanently attached label.

B. Performance: Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, operate within 25 percent of midpoint of published maximum efficiency curve.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.6 WARRANTY

A. Provide five year manufacturer warranty for domestic water heaters.

PART 2 PRODUCTS

2.1 WATER HEATERS

A. Manufacturers:
1. Rheem
2. A.O. Smith Water Products Co
3. Bradford White.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Commercial Gas-Fired Water Heaters:
1. Water heater(s) shall be Triton Model GHE80SS / GHE100SS manufactured by Rheem
2. Maximum hydrostatic working pressure of 150 psi
3. Minimum Inlet Gas Pressure 3.5" in WC. Water heater(s) shall 1.) Include a modulating gas burner that automatically adjusts the input based on demand.
4. Power anodes that are non-sacrificial and maintenance free.
5. Factory installed CSA/ASME rated temperature and pressure relief valve, meet SCAQMD rule 1146.2 and include the CSA seal of certification
6. Wet-base design and furnished with a heat exchange system with both sides coated in high temperature porcelain enamel.
7. 2" NPT front and rear, (1) 1-½" NPT Top water connection.
8. 5-year (SS) standard warranty.
9. Controls
10. The control shall be an integrated 4.3" Color touch screen with the ability to:
    a. Provide user advanced notice of any issues with health alerts on tank and combustion system.
    b. Give users advanced notice of catastrophic failure with Integrated LeakSense™ leak detection.
    c. Automatically turn off water in the event of a failure with Integrated LeakGuard™ Auto Shut-Off Valve (SS model only).
    d. Report water & energy usage reports via app or control. (SS model only)
    e. Connect to a cloud, and control & remote monitor the system via the EcoNet® app through integrated Wi-Fi.
    f. Connect to a Building Management System without the need of any accessories using an integrated BacNet MS/TP connection. (SS model only).
11. Venting
    a. Water heater(s) shall be able to vent with the following materials:

b. Polypropylene, PVC, CPVC, ABS, & InnoFlue® flex venting.
c. Standard power vent, water heater shall be suited 2", 3", 4" or 6" pipe for a total maximum venting of 185 ft.
d. Power Direct Vent water heater shall be suited for 2", 3", 4" or 6"pipe for a total maximum vent length, intake 120 ft, exhaust 135 ft.

2.2 IN-LINE CIRCULATOR PUMPS

A. Manufacturers:
1. Grundfos
2. Taco : www.taco-hvac.com.
3. Substitutions: See Section 01 6000 - Product Requirements.

B. Casing: Bronze, rated for 125 psig working pressure, with stainless steel rotor assembly.

C. Impeller: Bronze.

D. Shaft: Alloy steel with integral thrust collar and two oil lubricated bronze sleeve bearings.

E. Seal: Carbon rotating against a stationary ceramic seat.

F. Drive: Flexible coupling.

G. Performance: See Drawings for Model information / required accesories

PART 3 EXECUTION

3.1 INSTALLATION

A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions of certification, if any.

B. Coordinate with plumbing piping and related fuel piping work to achieve operating system.

C. Pumps:
1. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

END OF SECTION 22 3000

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SECTION 22 3030 - WATER TREATMENT, STORAGE, AND BOOSTER PUMP SYSTEM

PART 1 GENERAL

1.1 REFERENCE STANDARDS

A. ASSE 1013 - Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Principle Fire Protection Backflow Preventers; 2011.

B. AWWA C700 - Cold-Water Meters -- Displacement Type, Metal Alloy Main Case; 2015.

1.2 SUMMARY

A. Section Includes: A complete, engineered domestic water treatment, storage, and pressure boosting system serving a building supplied by a municipal (city) water supply, consisting of the following tagged equipment, furnished and installed as a coordinated system:
1. Backflow preventers (BFP-1, BFP-2, BFP-3).
2. Raw water, truck fill, and treated water sample taps (SP-1, SP-2, SP-3).
3. Dechlorination activated carbon filtration systems (DC-1, DC-2).
4. Water softener, twin alternating tank, with brine tank (WS-1, BT-1).
5. Reverse osmosis treatment system (RO-1).
6. Atmospheric storage tanks (ST-1, ST-2) with float switch level controls (FS-1, FS-2).
7. Booster pump system (BP-1, BP-2).
8. Cartridge polishing filters, triplex parallel arrangement (F-1, F-2, F-3).
9. Ultraviolet disinfection system (UV-1) and fail-safe solenoid valve (SV-2).
10. Discharge pressure tank (PT-1).
11. Pulse-output water meter (WM-1).
12. Chemical feed pH/alkalinity correction system, including flow-paced metering pump and solution tank (CP-1, CT-1).
13. Chemical contact/retention tank (RT-1).
14. Fire apparatus truck fill and truck wash branch connections.

B. This Section consolidates equipment that is conventionally distributed across several separate Division 22 Sections, including Domestic Water Pumps, Domestic Water Softeners, and Domestic Water Filtration Equipment, into a single Section for the purpose of bid simplification on this project. Where the Contract Documents or authorities having jurisdiction require separate submittal breakdown by equipment category, the Contractor shall provide submittals organized accordingly; the consolidation of this Section does not relieve the Contractor of any requirement applicable to an individual piece of equipment.

C. Related Requirements:
1. Division 22 Section “Domestic Water Piping” for pipe, fittings, and joining methods not otherwise specified in Part 2 of this Section.
2. Division 22 Section “Domestic Water Piping Specialties” for valves, unions, and specialties not otherwise specified in Part 2 of this Section.
3. Division 22 Section “Domestic Water Heaters” for domestic hot water generation, storage, and thermostatic mixing valve downstream of the point of connection with this system.

4. Division 22 sanitary waste Sections for the indirect waste connection receiving the reverse osmosis concentrate (reject) discharge and equipment drains.
5. Division 23 Section “Building Automation System” for monitoring and control points, if the Contract Documents require BAS integration of this system.
6. Division 26 for electrical power wiring, disconnect switches, and motor branch circuit protection to equipment furnished under this Section.

1.3 SYSTEM DESCRIPTION

A. Design Basis: The building is served by a municipal (city) water supply. The system operates in two hydraulic zones. Zone 1 (treatment and production): from the city water service through dechlorination, softening, and reverse osmosis treatment to atmospheric storage, operating at a continuous reverse osmosis feed flow of approximately 9.5 gpm. Zone 2 (distribution): from atmospheric storage through the booster pump system, polishing filtration, ultraviolet disinfection, and pH/alkalinity correction to the building distribution system, sized for a design flow of 50 gpm. The reverse osmosis system treats all domestic water for the building; nominal production capacity is 6,600 gallons per day with approximately 1,500 gallons of treated water storage.

B. Water Quality Basis: No site-specific water analysis was available at the time of design. Equipment selections and sizing in this Section are based on the water treatment equipment Supplier’s knowledge of local municipal water quality. The Supplier shall confirm all media, resin, membrane, ultraviolet dose, and chemical dosing selections against a current water analysis of the actual supply prior to submittal, per Article 1.3.

C. Combined Demand: The 50 gpm design flow is the combined total of simultaneous truck wash branch and building demand. Booster pump, polishing filter, and ultraviolet equipment sizing is based on this combined value.

D. Sequence of Treatment (informational; refer to Drawings for the complete flow schematic and diagram keynotes, which govern in case of conflict with this description):
1. City water service entrance: backflow preventer (BFP-1) and raw water sample tap (SP-1).
2. Truck fill branch: connects upstream of all treatment equipment and delivers untreated city water to the apparatus fill connection; backflow preventer (BFP-2) and sample tap (SP-2).
3. Dechlorination activated carbon filters (DC-1, DC-2).
4. Water softener (WS-1) with brine tank (BT-1).
5. Reverse osmosis system (RO-1); permeate to storage, concentrate (reject) to sanitary drain via indirect waste connection.
6. Atmospheric storage tanks (ST-1, ST-2), cross-connected, with float switch level controls (FS-1, FS-2) interlocked with the RO-1 feed solenoid valve.
7. Booster pump system (BP-1, BP-2), duplex variable speed.
8. Cartridge polishing filters (F-1, F-2, F-3), triplex parallel arrangement, 5 micron.
9. Ultraviolet disinfection (UV-1) with fail-safe solenoid valve (SV-2).
10. Discharge pressure tank (PT-1).
11. Truck wash branch: 2 inch; connects downstream of UV-1 and PT-1 and upstream of the water meter and chemical injection point; backflow preventer (BFP-3); delivers filtered, disinfected reverse osmosis permeate without pH/alkalinity correction to the apparatus wash connection for spot-free rinsing.
12. Pulse-output water meter (WM-1), building supply branch.

13. Chemical feed injection point: soda ash (sodium carbonate) pH/alkalinity correction, flow-paced metering pump (CP-1) drawing from solution tank (CT-1).
14. Chemical contact/retention tank (RT-1).
15. Treated water sample tap (SP-3).
16. Building domestic water distribution.

E. The sequence in this Article is a design requirement, not merely a suggested layout. Do not relocate the chemical feed injection point relative to the truck wash branch or the contact tank without written authorization from the Engineer. The truck wash branch intentionally connects upstream of the chemical injection point so that wash water remains reverse osmosis permeate without added dissolved solids; relocating the injection point upstream of the truck wash branch defeats the spot-free rinse function. Dechlorination and hardness removal must precede the reverse osmosis membranes to prevent oxidative damage and scaling of the membrane elements. The reverse osmosis system shall not operate while the dechlorination filters or the water softener are bypassed.

1.4 SUBMITTALS

A. Product Data: For each piece of tagged equipment specified in Part 2, submit manufacturer's data including performance curves or ratings, dimensions, weights, materials of construction, electrical characteristics, and connection sizes.

B. Shop Drawings: Dimensioned equipment layout and piping connection diagram showing the equipment listed in this Section in the sequence specified, including required clearances for cartridge, media, membrane, and lamp servicing, valve and union locations for equipment removal, and coordination with structural housekeeping pads.

C. Water Quality Verification: Supplier's written confirmation, based on a current water analysis of the municipal supply obtained by the Supplier, that the activated carbon media, softener resin, reverse osmosis membranes and projected recovery rate, ultraviolet dose, and soda ash dosing range selected are suitable for the actual supply, including confirmation of the disinfectant residual type (free chlorine or chloramine) reported by the water purveyor. Include projected permeate quality (total dissolved solids and pH) and projected daily production at design recovery.

D. Delegated Design Submittal: Chemical feed dosing calculation substantiating soda ash solution strength and flow-paced metering pump output range required to raise reverse osmosis permeate pH and alkalinity to a non-corrosive range suitable for the downstream distribution system, across the full 0 to 50 gpm building flow range.

E. Or-Equal Substitution Requests: Submitted in accordance with Division 01 Section "Product Requirements," substantiated with performance data demonstrating compliance with the performance criteria scheduled for the corresponding tag in Part 2.

F. Operation and Maintenance Data: Include startup and shutdown procedures; cartridge, carbon media, and membrane replacement intervals and part numbers; softener regeneration settings; chemical feed solution mixing instructions; ultraviolet lamp and sleeve replacement intervals; membrane cleaning and preservation procedures; and manufacturer's service contact information for each piece of equipment.

G. Warranty documentation for each piece of equipment listed in Article 1.6.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer regularly engaged in production of the applicable equipment type, with not less than 5 years documented experience in that product line.

B. Installer Qualifications: Firm licensed as required by the state and municipality having jurisdiction to perform plumbing work of the type required, with documented experience installing commercial water treatment and reverse osmosis systems.

C. Regulatory Requirements: Comply with the following, as applicable to each component:
1. International Plumbing Code (IPC), including Section 608 cross connection control requirements.
2. Cross-connection control and containment requirements of the water purveyor and the authority having jurisdiction at the service entrance and at the truck fill and truck wash connections.
3. State and local health department and environmental regulations applicable to point-of-entry treatment of a public water supply and to discharge of reverse osmosis concentrate to the sanitary sewer.
4. NSF/ANSI 61 for all system components in contact with potable water, and NSF/ANSI 372 for lead content.
5. NSF/ANSI 44 for the water softener.
6. NSF/ANSI 42 and 53 for filtration equipment, as applicable to the contaminant reduction claimed.
7. NSF/ANSI 55 Class A, or third-party validation per USEPA UVDGM, for the ultraviolet disinfection unit.
8. ASSE 1013, or the backflow preventer standard applicable in the jurisdiction, for reduced pressure zone backflow prevention assemblies.

D. Pre-installation Conference: Convene a conference at the project site, attended by the Contractor, equipment Supplier, and Engineer, prior to ordering equipment, to review the current water analysis and purveyor disinfectant residual type, the sequence specified in Article 1.2, the reverse osmosis concentrate drain routing, coordination with structural, electrical, and BAS trades, and the schedule for the pre-installation and startup submittals.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver equipment in manufacturer’s original, undamaged packaging, labeled with the equipment tag designation shown in Part 2.

B. Store filter media, softener resin, and chemical feed components in a dry, temperature controlled space until installation; do not store below freezing.

C. Store reverse osmosis membrane elements per manufacturer’s written requirements; do not allow preserved membrane elements to freeze or dry out, and do not remove elements from preservative packaging until installation.

D. Protect factory finished surfaces and threaded, flanged, and grooved connections from damage until installation.

1.7 WARRANTY

A. Provide manufacturer’s standard warranty for each piece of equipment, and not less than the following minimum periods from date of Substantial Completion:

1. Dechlorination Systems (DC-1, DC-2): 5 years control components, 10 years tanks.
2. Water Softener Control Valve and Tanks (WS-1): 5 years control valve, 10 years mineral tanks.
3. Reverse Osmosis System (RO-1): 1 year system, parts and labor; membrane elements per manufacturer's standard prorated membrane warranty.
4. Atmospheric Storage Tanks (ST-1, ST-2): 3 years against material defect, per manufacturer's standard warranty; NSF/ANSI 61 potable water rating maintained for tank service life.
5. Booster Pump System (BP-1, BP-2): 2 years, parts and labor, minimum; substituted products must meet or exceed this term regardless of manufacturer's standard offering.
6. Ultraviolet Disinfection Chamber (UV-1): 3 years chamber and electronics; lamp and quartz sleeve per manufacturer's standard, not less than 1 year.
7. Discharge Pressure Tank (PT-1) and Contact Tank (RT-1): 5 years, per manufacturer's standard warranty.
8. Chemical Metering Pump (CP-1) and Water Meter (WM-1): Per manufacturer's standard warranty, not less than 1 year.

PART 2 PRODUCTS

2.1 MANUFACTURERS AND OR-EQUAL PROVISION

A. Products named as "Basis of Design" in this Part establish the standard of quality, performance, and function required for the corresponding equipment tag and are the basis on which the system was engineered and coordinated.

B. Products by the manufacturers listed as "Or Equal" for the corresponding tag will be considered, provided the submitted product equals or exceeds the performance criteria scheduled for that tag, and is compatible in connection size, control voltage, and physical dimension with the balance of the system specified in this Section. Submit or-equal requests in accordance with Division 01 Section "Product Requirements."

C. Products by manufacturers not listed as Basis of Design or Or Equal for a given tag may be submitted for substitution review in accordance with Division 01 Section "Product Requirements"; approval is at the discretion of the Engineer.

D. Approval of an or-equal or substitution request for an individual tag does not relieve the Contractor of responsibility for the compatibility, sequencing, and performance of the system as a whole. The Contractor and equipment Supplier remain responsible for coordinating the combined performance of all or-equal or substituted equipment with the remaining equipment specified in this Section.

E. Equipment Tag Summary: The following list summarizes the equipment tags, basis of design products, and acceptable or-equal manufacturers for the system. Detailed requirements for each tag follow in the remaining Articles of this Part.
   1. BFP-1: Service entrance reduced pressure zone backflow preventer. Basis of Design: Watts Series 909 RPZ. Or Equal: Zurn Wilkins Model 375; Febco Model 860; Ames Model 4000B.
   2. BFP-2: Truck fill line reduced pressure zone backflow preventer. Basis of Design: Watts Series 909 RPZ. Or Equal: Zurn Wilkins Model 375; Febco Model 860; Ames Model 4000B.
   3. BFP-3: Truck wash line backflow preventer, type per hazard assessment. Basis of Design: Watts Series 909 RPZ. Or Equal: Zurn Wilkins; Febco; Ames.
   4. SP-1, SP-2, SP-3: Smooth nose sample taps, bronze or stainless steel.

5. DC-1, DC-2: Upflow activated carbon dechlorination filters, non-electric. Basis of Design: Kinetico Model 1175 Dechlorinator. Or Equal: Clack WS1-based activated carbon filtration system; Fleck (Pentair) 5600/2510-based activated carbon filtration system; Culligan.
6. WS-1: Water softener, twin alternating tank, non-electric, metered. Basis of Design: Kinetico Model CP213s. Or Equal: Fleck/Pentair 9100 SXT twin tank; Clack WS1 twin tank; Marlo MGT Series.
7. BT-1: Brine tank, 24 inch x 40 inch HDPE, 500 lb salt capacity, with safety brine valve.
8. RO-1: Commercial reverse osmosis system, 6,600 GPD nominal. Basis of Design: MagniPure (Martin Water Conditioning) Model MRO4. Or Equal: Axeon R1-Series; Watts PWR Series; Evoqua Vantage MICRO FLEX (MFX) Series.
9. ST-1, ST-2: Atmospheric storage tanks, (2) 750 gallon vertical polyethylene, NSF/ANSI 61. Basis of Design: Norwesco Model 40606. Or Equal: Snyder Industries; Ace Roto-Mold/Den Hartog; Bushman.
10. FS-1, FS-2: Storage tank float switch level controls. Basis of Design: SJE-Rhombus Sentry float switch. Or Equal: Zoeller Model 10-0748.
11. BP-1, BP-2: Booster pump system, duplex, variable speed, integrated drive. Basis of Design: DAB Esybox Max (verify model designation with final pressure selection). Or Equal: Grundfos Hydro MPC-E or CME Series; Bell & Gossett (Xylem) MiniBoost; Armstrong Design Envelope 4300.
12. F-1, F-2, F-3: Cartridge polishing filter housings, 20 inch, triplex parallel. Basis of Design: Martin Water Conditioning Model CAHBB20-1½. Or Equal: Pentair/Pentek 3G Big Blue; Harmsco Calypso Blue; 3M Aqua-Pure AP Series.
13. UV-1: Ultraviolet disinfection system, single validated chamber, 50 gpm. Basis of Design: Viqua Model PRO50. Or Equal: Any manufacturer's UV disinfection system meeting the performance criteria in the UV-1 Article of this Part; submit for Engineer review.
14. SV-2: Ultraviolet fail-safe solenoid valve, normally closed, 2 inch.
15. PT-1: Discharge pressure tank, composite. Basis of Design: Pentair WellMate Model WM-9 (WM0120 QC). Or Equal: Amtrol Well-X-Trol; Flexcon.
16. WM-1: Pulse-output water meter, building supply branch, 1-1/2 inch. Basis of Design: Badger Meter Recordall Disc Series Model 120 with pulse-output register. Or Equal: Neptune T-10 (1-1/2 inch) with pulse-output register; Zenner PMN Series; Master Meter multi-jet with pulse output.
17. CP-1: Chemical metering pump, flow-paced. Basis of Design: LMI (Liquid Metronics) Series P+ with external pulse pacing input. Or Equal: Stenner Classic Series with Stenner PCM pump control (pacing) module; Blue-White Flex-Pro A2 with pulse input; Pulsafeeder Pulsatron Series E Plus with pulse input.
18. CT-1: Chemical solution tank, approximately 100 gallon, 26 inch diameter x 43 inch height, polyethylene, with mixer; capacity not less than 30 days of solution at the design dosing rate.
19. RT-1: Chemical contact/retention tank. Basis of Design: Pentair WellMate Model UT-40. Or Equal: Flexcon; Amtrol retention tank of equivalent volume and pressure rating.

2.2 BACKFLOW PREVENTERS (BFP-1, BFP-2, BFP-3)

A. BFP-1 (Service Entrance): Reduced pressure zone assembly at the building point of entry, first device ahead of the raw water sample tap and all treatment equipment. Size for the combined demand of the truck fill connection plus concurrent reverse osmosis feed flow; verify pressure drop at truck fill flow leaves adequate residual pressure for the reverse osmosis feed. Provide air gap drain per manufacturer's requirements.

B. BFP-2 (Truck Fill): Reduced pressure zone assembly on the truck fill branch. Filling of fire apparatus booster tanks is a high hazard connection; a reduced pressure zone assembly or air gap arrangement is required. Provide air gap drain per manufacturer's requirements.

C. BFP-3 (Truck Wash): Backflow preventer on the 2 inch truck wash branch, type per hazard assessment of the downstream wash equipment; provide a reduced pressure zone assembly if soap, foam, or other chemical injection equipment is connected downstream.

D. Comply with IPC Section 608, ASSE 1013 as applicable, and the containment requirements of the water purveyor.

2.3 SAMPLE TAPS (SP-1, SP-2, SP-3)

A. Provide smooth nose sample cocks, corrosion resistant bronze or stainless steel construction, at the following locations:
1. SP-1, raw water sample tap: city water service entrance, downstream of BFP-1 and upstream of all treatment equipment.
2. SP-2, truck fill sample tap: truck fill branch, downstream of BFP-2.
3. SP-3, treated water sample tap: building supply, downstream of the contact tank (RT-1) and upstream of the building distribution tie-in.

2.4 DECHLORINATION SYSTEMS (DC-1, DC-2)

A. Basis of Design: Kinetico Model 1175 upflow dechlorinator, (2) units. Or Equal: per the Equipment Tag Summary.

B. Type: Upflow activated carbon filtration, non-electric, no timers or electrical controls; corrosion resistant tank and valve construction; nominal tank size 13 inch diameter x 56 inch height, each.

C. Function: Removal of chlorine and chloramine disinfectant residual from the municipal supply ahead of the water softener and reverse osmosis membranes. Free chlorine and chloramine destroy thin film composite membrane elements; the dechlorination filters shall remain in service whenever the reverse osmosis system operates.

D. Media: Activated carbon selected for the disinfectant residual type confirmed with the water purveyor; where the purveyor uses chloramine, provide catalytic carbon and contact time per manufacturer's recommendation for chloramine reduction. Media replacement interval approximately 3 to 5 years for typical municipal chlorination; confirm per the water quality verification submittal.

E. Configuration: Two units arranged as shown on the Drawings. Provide isolation valves and unions at each unit and a normally closed, locked bypass around the dechlorination assembly; the reverse osmosis system shall be disabled whenever the dechlorination filters are bypassed.

2.5 WATER SOFTENER (WS-1)

A. Basis of Design: Kinetico Model CP213s twin alternating tank water softener. Or Equal: per the Equipment Tag Summary.

B. Type: Twin alternating mineral tank configuration with a single non-electric, metered, demand-initiated control valve; 2.5 cubic feet of resin per tank; (2) 13 inch x 54 inch mineral tanks. Only one tank is in service at a time; on exhaustion the control valve transfers service to the fresh tank and regenerates the exhausted tank with softened water, providing continuous soft water during regeneration. Continuous soft water supply is required because the reverse osmosis system operates around the clock.

C. Piping: Single inlet and single outlet connection at the control valve; tank-to-valve connections are internal to the equipment. Provide a 3-valve bypass around the complete softener assembly (both tanks and control valve as a unit), with isolation valves at inlet and outlet and a normally closed, locked bypass valve. Do not pipe the mineral tanks in series or provide individual tank bypasses. The reverse osmosis system shall be disabled whenever the softener is bypassed.

D. Function: Hardness removal ahead of the reverse osmosis membranes to prevent membrane scaling.

E. Brine System (BT-1): 24 inch x 40 inch HDPE brine tank, 500 lb salt capacity, with safety brine valve; refill access without disturbing adjacent piping.

2.6 REVERSE OSMOSIS SYSTEM (RO-1)

A. Basis of Design: MagniPure (Martin Water Conditioning) Model MRO4 commercial reverse osmosis system. Or Equal: per the Equipment Tag Summary.

B. Performance: Nominal production 6,600 gallons per day (approximately 4.6 gpm permeate) at approximately 48 percent recovery; feed flow approximately 9.5 gpm; concentrate (reject) flow approximately 5 gpm to sanitary drain during operation. The reverse osmosis system treats all domestic water for the building.

C. Construction: Skid-mounted, frame assembly approximately 26 inches x 26 inches x 57 inches (verify against manufacturer's dimensioned equipment drawing); thin film composite FDA approved membrane elements, (4) 4 inch elements; fiberglass pressure vessels; high pressure pump, 1.5 HP; corrosion resistant tubing and piping; powder coated frame.

D. Standard Features: Automatic low feed pressure shut-off; automatic feed water shut-off valve; concentrate recycling; permeate, concentrate, and recycle flow meters; prefilter with pressure gauges.

E. Controls: Feed solenoid valve interlocked with the storage tank level controls (FS-1, FS-2); system starts on falling storage tank level and stops on high level. Provide dry-run and low feed pressure protection.

F. Concentrate Disposal: Route concentrate to an approved indirect waste receptor with air gap per IPC Chapter 8; coordinate drain size and routing for a continuous discharge of approximately 5 gpm during operation.

G. Service Access: Provide clearances per the manufacturer's dimensioned equipment drawing for membrane element removal and replacement; coordinate element removal direction and required clear space with the equipment layout shown on the Drawings.

2.7 ATMOSPHERIC STORAGE TANKS (ST-1, ST-2)

A. Basis of Design: Norwesco Model 40606, (2) 750 gallon vertical polyethylene tanks. Or Equal: per the Equipment Tag Summary.

B. Construction: Rotationally molded polyethylene resin, seamless, corrosion resistant, translucent, UV stabilized; resin complying with FDA requirements for potable water contact. Submit manufacturer's written certification of NSF/ANSI 61 potable water listing for the specific tank model furnished.

C. Fittings: 16 inch threaded vented manway; factory 2 inch female NPT polypropylene bulkhead outlet fitting. Provide additional factory-drilled or field-installed bulkhead fittings as required for inlet connection, tank-to-

tank cross-connection, overflow, and level switches; each tank as furnished includes only the single standard outlet fitting.

D. Arrangement: (2) tanks cross-connected at the base with isolation valves to permit either tank to be taken out of service for inspection or cleaning while the other remains in service; combined nominal storage 1,500 gallons.

E. Dimensions and Weight: Each tank nominally 48 inch diameter x 103 inch height, freestanding; approximately 154 lbs empty and approximately 6,400 lbs filled, per tank (approximately 12,800 lbs combined, both tanks filled). Verify current dimensions against manufacturer's published data; polyethylene tank dimensions may vary plus or minus 3 percent per standard rotational molding tolerance. Verify ceiling clearance for the 103 inch tank height plus manway access and vent piping prior to rough-in.

F. Structural Coordination: Provide a housekeeping pad under each tank and verify supporting floor/slab capacity per Division 03 for the combined filled tank weight indicated above.

2.8 STORAGE TANK LEVEL CONTROLS (FS-1, FS-2)

A. Basis of Design: SJE-Rhombus Sentry float switches. Or Equal: per the Equipment Tag Summary.

B. Function: Float switches sensing storage tank level control the RO-1 feed solenoid valve: the reverse osmosis system starts on falling level and stops on high level to prevent overflow. Provide a low-low level switch interlocked to disable the booster pump system (BP-1, BP-2) on low storage level, in addition to the booster pumps' integral dry-run protection. Provide high level and low-low level alarm contacts for local alarm and BAS monitoring where required.

2.9 BOOSTER PUMP SYSTEM (BP-1, BP-2)

A. Basis of Design: DAB Esybox Max, (2) units, duplex arrangement; verify model designation against the final discharge pressure selection. Or Equal: per the Equipment Tag Summary.

B. Type: Self-contained variable speed booster units, each consisting of an electronic vertical multistage pump with integrated variable frequency drive, pressure sensors on suction and discharge, integral check valve on discharge, and integral expansion tank. The two units shall operate as an electronically synchronized duplex set with automatic lead/lag alternation. Each pump shall be independently capable of delivering 100 percent of the design flow and pressure specified below; arrangements where the loss of one pump reduces system capacity below the design point are not acceptable.

C. Performance: Not less than 50 gpm combined at the station discharge pressure setpoint, atmospheric (flooded, non-pressurized) suction from the storage tanks. Discharge pressure setpoint shall not exceed 70 psi; the downstream contact tank (RT-1) is rated 75 psi maximum operating pressure.

D. Construction: Technopolymer pump body and impellers with stainless steel jacket; water-cooled permanent magnet motor, stainless steel motor jacket; NSF/ANSI 61 and 372 listed for drinking water. Electrical: 208-240V single phase or 380-480V three phase, per final selection; coordinate with Division 26.

E. Protection: Integral dry-run protection, low suction protection suitable for atmospheric suction, anti-cycling, anti-blocking, overheat, and abnormal voltage protection. Interlock with the storage tank low-low level switch per the Storage Tank Level Controls Article.

F. Electrical Coordination: Each pump is individually powered; provide a separate lockable, within-sight disconnect for each pump under Division 26. A single common disconnect serving both pumps is not acceptable; individual disconnects are required so either pump may be serviced while the other remains in operation.

G. Location: Downstream of the atmospheric storage tanks (ST-1, ST-2); discharge to the cartridge polishing filters (F-1, F-2, F-3).

2.10 CARTRIDGE POLISHING FILTERS (F-1, F-2, F-3)

A. Basis of Design: Martin Water Conditioning Model CAHBB20-1½, 20 inch filter housings, 1-1/2 inch NPT connections, (3) units. Or Equal: per the Equipment Tag Summary.

B. Arrangement: Triplex parallel arrangement with isolation valves at each housing, so any housing may be taken out of service for cartridge replacement while the remaining housings carry system flow. Provide pressure gauges upstream and downstream of the filter bank for differential pressure monitoring.

C. Cartridges: 5 micron nominal for initial installation; provide manufacturer's recommended spare cartridges per the Operation and Maintenance Data requirements of Article 1.3.

D. Function: Final particulate polish protecting the ultraviolet disinfection unit from particulate shadowing; the parallel arrangement limits pressure drop at design flow.

E. Rating: Housings rated not less than 90 psi maximum working pressure at 100 degrees Fahrenheit; confirm compatibility with the booster discharge pressure setpoint.

F. Location: Downstream of the booster pump system and upstream of the ultraviolet disinfection unit (UV-1).

2.11 ULTRAVIOLET DISINFECTION SYSTEM (UV-1)

A. Basis of Design: Viqua Model PRO50. Or Equal: Any manufacturer's UV disinfection system meeting all criteria in the Or-Equal Performance Criteria Paragraph of this Article; submit for Engineer review per Division 01 Section "Product Requirements."

B. Performance: Rated not less than 50 gpm at a manufacturer-published or validated dose of not less than 40 mJ/cm², at 95 percent UVT, end of lamp life; NSF/ANSI 55 Class A or third-party validation per USEPA UVDGM.

C. Configuration: Single chamber sized for the full design flow. Do not provide multiple smaller chambers in a parallel, flow-split arrangement in lieu of the single validated chamber specified, due to flow-split uncertainty and the absence of capacity margin at design demand.

D. Construction: Stainless steel chamber, 316L preferred; integral UV intensity sensor at the germicidal wavelength with continuous local digital readout; audible/visual lamp-life and lamp-failure alarms; 4-20mA output for remote monitoring; controller output signal for the fail-safe solenoid valve (SV-2), activating on low UV intensity or lamp failure.

E. Electrical: Per manufacturer; dedicated GFCI-protected branch circuit; coordinate with Division 26.

F. Fail-Safe Solenoid Valve (SV-2): Provide a 2 inch, normally closed, fail-closed solenoid valve in the discharge piping downstream of UV-1, wired to the UV-1 controller's solenoid output per the

manufacturer's interconnection requirements. Valve shall fail closed on loss of power in addition to responding to the low UV intensity signal.

G. Temperature Management: UV lamps operate continuously regardless of water flow; provide the manufacturer's recommended temperature management provision (timed purge/dump valve or equivalent) to prevent stagnant water within the chamber from reaching an unsafe temperature during extended no-flow periods. Route any purge discharge to an approved indirect waste receptor with air gap per IPC Chapter 8.

H. Service: Provide isolation valves and clearances for lamp and sleeve replacement per manufacturer's requirements without draining the balance of the system.

I. Or-Equal Performance Criteria: A substituted product must equal or exceed all of the following to be considered:
1. Minimum flow rate: 50 gpm at a manufacturer-published or validated dose of not less than 40 mJ/cm^2, at 95 percent UVT, end of lamp life.
2. Chamber material: stainless steel, 316L preferred.
3. Connections: manufacturer's standard connections of nominal size matching adjacent piping; reducing fittings not permitted.
4. Maximum operating pressure rating: not less than 125 psi.
5. Integral UV sensor continuously monitoring intensity at the germicidal wavelength, with local digital readout and low-UV alarm.
6. Solenoid fail-safe valve output, factory or field mounted valve, closing on low UV intensity or lamp failure.
7. Validation/dose basis: NSF/ANSI 55 Class A or third-party validation per USEPA UVDGM, at the stated flow and dose.
8. Lamp type: high-output germicidal UV lamp(s), minimum rated service life 9,000 hours.
9. Single chamber only; parallel/flow-split multi-chamber arrangements not permitted.

J. Location: Downstream of the cartridge polishing filters (F-1, F-2, F-3) and upstream of the discharge pressure tank (PT-1) and truck wash branch.

2.12 DISCHARGE PRESSURE TANK (PT-1)

A. Basis of Design: Pentair WellMate Model WM-9 (WM0120 QC), fiberglass composite captive air tank, 29.5 gallon capacity, 9.1 gallon drawdown, nominally 16 inch diameter x 44 inch height, 125 psi maximum operating pressure, 1 inch male NPT connection. Or Equal: per the Equipment Tag Summary.

B. Function: Buffers booster pump cycling and serves small draws on both the building and truck wash branches without pump starts. Composite construction is required; steel tanks are not acceptable in reverse osmosis permeate service.

C. Precharge: Set air precharge per the booster pump manufacturer's written requirements relative to the pump restart pressure, coordinated with the pumps' integral expansion tanks; verify precharge with the tank isolated and drained of water prior to system startup.

D. Location: Downstream of the ultraviolet disinfection system (UV-1) and upstream of the truck wash branch connection.

2.13 WATER METER (WM-1)

A. Basis of Design: Badger Meter Recordall Disc Series Model 120, 1-1/2 inch, with pulse-output register. Or Equal: per the Equipment Tag Summary.

B. Type: Lead-free, NSF/ANSI 61 and 372 listed water meter, 1-1/2 inch, nutating disc or multi-jet type, AWWA C700 series compliant as applicable to the meter type furnished, with pulse-output register; pulse resolution compatible with the pacing input of the metering pump (CP-1), nominally 1 pulse per gallon or finer. Sized for the building supply branch design flow with low head loss at 50 gpm.

C. Function: Meters building branch flow downstream of the truck wash tee and provides the pulse pacing signal to the chemical metering pump (CP-1). Truck wash branch flow intentionally bypasses the meter and the chemical injection point.

D. Location: Building supply branch, downstream of the truck wash branch connection and upstream of the chemical injection point.

2.14 CHEMICAL FEED SYSTEM (CP-1, CT-1)

A. Metering Pump (CP-1) Basis of Design: LMI (Liquid Metronics) Series P+ electronic metering pump with external pulse pacing input. Or Equal: per the Equipment Tag Summary. A pump without a native pulse pacing input is acceptable only when furnished with the same manufacturer's external pacing/control module (e.g., Stenner Classic Series with Stenner PCM pump control module).

B. Metering Pump Type: Electronic, positive displacement (diaphragm or peristaltic), chemical resistant wetted parts suitable for sodium carbonate (soda ash) solution, adjustable output, accepting an external pulse pacing signal from WM-1 with field-adjustable pulse-to-stroke ratio. The pump shall be flow-paced from the pulse-output water meter (WM-1); fixed-rate dosing is not acceptable, as the injection point serves a variable flow of 0 to 50 gpm and fixed-rate dosing would produce unacceptable pH swings between low-flow and peak conditions. The Supplier may furnish the meter and metering pump as the pump manufacturer's matched flow-pacing package in lieu of separately furnished components, provided both the meter requirements of the Water Meter Article and the pump requirements of this Article are met.

C. Injection Pressure: Pump shall be rated to inject against the booster discharge pressure (approximately 60 to 70 psi at the required dosing rate.

D. Injection Assembly: Centerline-mounted injection quill extending to approximately the pipe centerline, with integral or adjacent check valve rated for the discharge pressure of CP-1 to prevent backflow of process water into the solution tank. Wall-tap injection without a quill is not acceptable. Quill and all wetted parts shall be PVC or PVDF (Kynar); provide a connection type compatible with CPVC piping, using thread sealant approved for CPVC.

E. Chemical: Sodium carbonate (soda ash) solution, concentration and dosing rate as required to raise reverse osmosis permeate pH and alkalinity to a non-corrosive range suitable for the downstream distribution system; substantiate with the delegated design submittal required in Article 1.3.

F. Solution Tank (CT-1): Polyethylene solution tank, nominally 26 inch diameter x 43 inch height (approximately 100 gallon), with mixer mount and mixer, 6 inch threaded lid, graduated volume indication, and secondary containment sized per manufacturer recommendation and local code. Tank capacity shall be not less than 30 days of soda ash solution storage at the design dosing rate established in the delegated design submittal; a larger tank is not required and is discouraged, as soda ash solution stored

for extended periods absorbs carbon dioxide and promotes carbonate scaling of the tank and metering pump suction. Provide clear height above the tank lid for the mixer motor and for solution charging.

G. Location and Sequence: Injection point located on the building supply branch, downstream of the truck wash branch connection and the water meter (WM-1), and upstream of the contact tank (RT-1). Do not relocate the injection point upstream of the truck wash branch; refer to Article 1.2.

2.15 CONTACT TANK (RT-1)

A. Basis of Design: Pentair WellMate Model UT-40 retention tank, 40 gallon, fiberglass composite, nominally 16 inch diameter x 56-1/2 inch height, 75 psi maximum operating pressure, 1-1/4 inch quick-connect connections. Or Equal: per the Equipment Tag Summary.

B. Function: Provides blending volume downstream of the chemical injection point so the building distribution system receives water of uniform pH; this is a flow-through retention tank, not a captive air pressure tank.

C. Pressure Coordination: Tank maximum operating pressure is 75 psi. The booster pump discharge pressure setpoint shall not exceed 70 psi; if a higher system pressure is required, furnish a contact tank with a correspondingly higher pressure rating, subject to Engineer review.

D. Location: Building supply branch, downstream of the chemical injection point and upstream of the treated water sample tap (SP-3) and the building distribution tie-in.

2.16 TRUCK FILL AND TRUCK WASH CONNECTIONS

A. Truck Fill Branch: Connects upstream of all treatment equipment and delivers untreated city water to the apparatus fill connection. Provide BFP-2 and sample tap SP-2 on the branch. Size the branch and coordinate the fill connection type with the apparatus bay requirements shown on the Drawings.

B. Truck Wash Branch: 2 inch branch connecting downstream of UV-1 and PT-1 and upstream of the water meter and chemical injection point, delivering filtered, disinfected reverse osmosis permeate without pH/alkalinity correction for spot-free apparatus rinsing. Provide BFP-3 on the branch. Label the branch piping “RO PERMEATE – NO pH CORRECTION” at intervals per the identification requirements of Division 22.

C. Piping for the truck wash branch shall be CPVC or other non-metallic material per Part 3; copper and copper alloy piping and components are not permitted on this branch.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify the municipal water service size, available static and residual pressure, and meter/backflow arrangement are adequate for the combined truck fill demand plus concurrent reverse osmosis feed flow assumed in Part 2; notify the Engineer in writing of any discrepancy before proceeding.

B. Verify a sanitary drain connection of adequate capacity is available for the continuous reverse osmosis concentrate discharge and equipment drains, with air gap per IPC Chapter 8.

C. Verify structural housekeeping pads and mechanical room clearances shown on the Drawings are adequate for the equipment furnished, including manufacturer's required service clearances for cartridge, media, membrane, and lamp servicing, and ceiling clearance for the storage tank height, manway access, and vent piping.

D. Verify the current water analysis and purveyor disinfectant residual type have been obtained and the water quality verification submittal per Article 1.3 has been approved, prior to ordering equipment.

3.2 INSTALLATION, GENERAL

A. Install equipment in accordance with manufacturer's written instructions, the IPC, and the sequence specified in Article 1.2 and shown on the Drawings.

B. Install treatment train components in the sequence specified in Article 1.2; do not deviate from the specified sequence without written authorization from the Engineer. Do not relocate the chemical feed injection point relative to the truck wash branch.

C. Provide unions, flanges, or grooved couplings and isolation valves at each piece of equipment listed in Part 2 to permit removal and replacement of that equipment without draining the balance of the system.

D. Provide a full pipe size bypass, with valves normally locked in the closed (in-service) position, around each piece of treatment equipment where indicated on the Drawings. Interlock or administratively control bypass operation so the reverse osmosis system does not operate while the dechlorination filters or the water softener are bypassed.

3.3 PIPING

A. Piping from the city water service entrance through the contact tank (RT-1), including the truck wash branch, shall be CPVC unless otherwise indicated on the Drawings; solvent cement and thread sealants shall be approved for CPVC potable water service.

B. Copper and copper alloy piping and components are not permitted between the reverse osmosis system and the chemical injection point, including the storage tanks, booster pump connections, polishing filters, ultraviolet piping, pressure tank connection, and the truck wash branch; water in this portion of the system is aggressive reverse osmosis permeate prior to pH/alkalinity correction.

C. Piping downstream of the contact tank shall match the material specified in Division 22 Section "Domestic Water Piping" for the balance of the domestic water distribution system, unless otherwise indicated.

D. Provide dielectric isolation at transitions between dissimilar metallic piping materials.

3.4 ELECTRICAL COORDINATION

A. Coordinate voltage, phase, and load requirements for each piece of powered equipment specified in this Section with Division 26; provide a disconnect switch at each motorized or powered device unless factory furnished with an integral disconnect. Provide a separate lockable, within-sight disconnect for each booster pump (BP-1 and BP-2); refer to the Booster Pump System Article.

B. Provide low voltage control wiring between the storage tank level controls (FS-1, FS-2) and the RO-1 feed solenoid and booster pump interlock, between the water meter (WM-1) pulse output and the chemical

metering pump (CP-1), and between the UV-1 controller and the fail-safe solenoid valve (SV-2), unless otherwise assigned to Division 26 or Division 23 by the Contract Documents.

3.5 CONTROLS AND MONITORING

A. If the Contract Documents require BAS integration of this system, coordinate monitoring points with Division 23, including at minimum: reverse osmosis system run and fault status, storage tank high and low-low level alarms, UV intensity/lamp failure alarm, booster pump run and fault status, and booster pump low suction/low level lockout status.

3.6 FIELD QUALITY CONTROL

A. Startup: Provide manufacturer's certified startup services, or startup by a factory trained representative, for the dechlorination filters, water softener, reverse osmosis system, ultraviolet disinfection system, chemical feed system, and booster pump system.

B. Testing: Hydrostatically test piping installed under this Section per Division 22 Section "Domestic Water Piping." Verify booster pump discharge pressure setpoint does not exceed 70 psi, confirm duplex staging and alternation, and verify UV dose/intensity reading at startup. Verify storage tank level control setpoints, RO start/stop operation, and low-low level booster lockout.

C. Reverse Osmosis Performance Verification: Record feed, permeate, and concentrate flows and feed and permeate conductivity/TDS at startup; confirm production rate and permeate quality against the projections in the water quality verification submittal.

D. Chemical Feed Verification: With the metering pump flow-paced from WM-1, verify pH at the treated water sample tap (SP-3) is within the range established in the delegated design submittal at both a low building flow and at or near design flow; adjust the dosing ratio accordingly.

E. Water Quality Verification: Obtain a bacteriological (total coliform/E. coli) sample downstream of treatment and submit to the authority having jurisdiction where clearance is required prior to occupancy; the ultraviolet disinfection system does not eliminate any bacteriological sampling requirement of the AHJ.

3.7 ADJUSTING

A. Set water softener regeneration frequency, chemical feed dosing ratio, storage tank level setpoints, and booster pump discharge pressure setpoint based on startup water quality results and actual building demand; document final settings in the Operation and Maintenance Data.

3.8 CLEANING

A. Flush all piping and equipment furnished under this Section prior to placing the system in service, per manufacturer's instructions. Clean and sanitize the atmospheric storage tanks and downstream piping prior to placing the system in service.

3.9 DEMONSTRATION AND TRAINING

A. Provide not less than 4 hours of on-site instruction to the Owner's operating personnel, covering normal operation; water softener regeneration and salt refill; soda ash solution mixing and refill; cartridge, carbon media, and membrane replacement; reverse osmosis operation and permeate quality monitoring; UV lamp and sleeve replacement; truck fill and truck wash branch operation; and alarm response for each piece of equipment specified in this Section.

END OF SECTION 22 3030

SECTION 22 3800 - RADON MITIGATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Radon and soil gas control system for new construction, consisting of an active soil depressurization (ASD) system installed beneath all ground-contact slabs of the building, including apparatus bays, in compliance with ANSI/AARST CC-1000.

B. Delegated design of the complete radon mitigation system by a certified radon mitigation professional retained by the Contractor, based on the performance requirements and design criteria specified in this Section and the diagrammatic layout indicated on the Drawings.

C. Soil gas collection plenums and sub-slab perforated collection piping network, including trenching and stone bedding and backfill in pipe trenches.

D. Coordination and inspection of the gas permeable layer, soil gas retarder, and slab joint sealing provided under the General Construction contract.

E. Sealing of slab penetrations created by work of this Section and by plumbing work, and sealing of floor drains, trench drains, and sumps.

F. Solid-wall riser and exhaust vent piping from below slab to the roof discharge point, PVC below the slab and plenum-rated CPVC above the slab, including supports, insulation, and firestopping.

G. Furnishing, mounting, and commissioning of in-line radon fans, flexible couplings, roof penetrations, and exhaust terminations.

H. Furnishing and mounting of electronic system monitors with failure alarms, and riser pressure test taps.

I. Pressure field extension (PFE) test ports.

J. System identification and labeling.

K. Inspections, PFE testing, system activation, and commissioning of the radon mitigation system.

L. Coordination with post-construction radon testing performed by the Owner’s radon testing agency, and corrective work where test results exceed the specified limits.

M. Operation, maintenance, and monitoring (OM&M) manual.

1.2 DEFINITIONS

A. Active Soil Depressurization (ASD): A radon control method in which a fan continuously draws soil gas from beneath the slab and exhausts it outdoors above the roof, creating a negative pressure field under the slab relative to the occupied space above.

B. Certified Mitigation Professional: An individual holding current certification as a radon mitigation professional from the National Radon Proficiency Program (NRPP) or the National Radon Safety Board

(NRSB), and holding current Pennsylvania Department of Environmental Protection (DEP) radon mitigation certification under 25 Pa. Code Chapter 240.

C. Delegated Designer: The Certified Mitigation Professional retained by the Contractor to design, inspect, commission, and certify the radon mitigation system under this Section.

D. Gas Permeable Layer: The layer of clean aggregate, or other approved material, beneath the slab and soil gas retarder that allows soil gas to move freely to the collection piping network.

E. Soil Gas Collection Plenum: The gas permeable layer area served by a single vent system, bounded by grade beams, thickened slabs, footings, or other features that interrupt air movement.

F. Collection Piping Network: Interconnected perforated pipe installed within the gas permeable layer, connected to one or more solid-wall risers, through which soil gas is drawn from the gas permeable layer.

G. Pressure Field Extension (PFE): The distance that a pressure change, created by drawing soil gas through the collection piping network, extends outward within the sub-slab gas permeable layer.

H. Test Port: A small capped opening through the slab, or a capped tube terminating in the gas permeable layer, used to measure sub-slab pressure during PFE testing and future diagnostics.

I. Soil Gas Retarder: The continuous, sealed membrane between the gas permeable layer and the concrete slab that forms the air barrier between soil gas and indoor air.

J. pCi/L: Picocuries per liter of air; the unit of measure for radon concentration.

1.3 RELATED REQUIREMENTS

A. Section 01 9113 - General Commissioning Requirements: Commissioning Authority and commissioning procedures.

B. Section 07 2600 - Vapor Retarders: Under-slab vapor retarder, which also serves as the soil gas retarder for this Section.

C. Section 07 9200 - Joint Sealants: Sealing of slab perimeter, isolation, and control joints.

1.4 WORK BY OTHER CONTRACTS

A. Contract Assignment: The work of this Section is part of the Plumbing contract. In this Section, “Contractor” means the Plumbing Contractor.

B. General Construction Contract: The following work is provided under the General Construction contract. The Contractor’s Delegated Designer shall coordinate and inspect this work as specified in Part 3.
1. Granular base course serving as the gas permeable layer, ASTM C33/C33M No. 57 stone, not less than 4 inches deep, or as indicated on the Structural Drawings.
2. Soil gas retarder (under-slab vapor retarder), ASTM E1745 Class A, not less than 15 mils, covering the entire slab area including apparatus bays, lapped not less than 12 inches and taped, sealed to foundations, and sealed at all penetrations, in compliance with ANSI/AARST CC-1000 Section 6.
3. Concrete slabs, and sealing of slab perimeter, isolation, and control joints and of penetrations by other trades, with ASTM C920 sealant, in compliance with ANSI/AARST CC-1000 Section 6.2.
4. Sleeves through foundations and grade beams, where indicated on the Structural Drawings.

5. Flashing of radon vent piping roof penetrations by the roofing installer.

C. Electrical Contract: Dedicated 120 volt branch circuit for each radon fan, disconnect switch within sight of each fan, GFCI receptacle within 25 feet of each fan, non-switched power to each system monitor, power wiring from disconnect to fan, and electrical labels reading “RADON FAN” at each circuit breaker, disconnect, and junction box, as indicated on the Electrical Drawings.

D. HVAC Contract (Controls): Building automation system (BAS) alarm point for each radon system monitor, and wiring from each monitor dry contact to the BAS.

E. Owner (Commissioning Authority): Post-construction radon testing by an independent Pennsylvania DEP-certified radon testing agency, and commissioning verification of the radon mitigation system.

F. This Contract: All other work of this Section, including the delegated design, collection piping, trenching and stone bedding and backfill in pipe trenches, risers, riser connectors, test ports, piping above the slab, fans, monitors, labels, PFE testing, system activation, DEP filings, and corrective work.

1.5 REFERENCE STANDARDS

A. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2016.

B. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2016, with Editorial Revision (2016).

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

D. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2012 (Reapproved 2018).

E. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2014.

F. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2011.

G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.

H. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2011 (Reapproved 2017).

I. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2017.

J. ASTM F438 - Standard Specification for Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40; 2017.

K. ASTM F439 - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80; 2013.

L. ASTM F441/F441M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80; 2015.

M. ASTM F493 - Standard Specification for Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings; 2014.

N. ASTM F656 - Standard Specification for Primers for Use in Solvent Cement Joints of Poly(Vinyl Chloride) (PVC) and Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe and Fittings; 2025.

O. ASTM F2618 - Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Fittings for Chemical Waste Drainage Systems; 2024.

P. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2011 (Revised 2012).

Q. EPA/625/R-92/016 - Radon Prevention in the Design and Construction of Schools and Other Large Buildings; 1994, with Addendum.

R. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

S. ICC (IMC) - International Mechanical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

T. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2009.

U. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

V. UL 507 - Electric Fans; Current Edition, Including All Revisions.

W. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

X. UL 1479 - Standard for Fire Tests of Penetration Firestops; Current Edition, Including All Revisions.

Y. 25 Pa. Code Chapter 240 - Radon Certification; Pennsylvania Department of Environmental Protection; current edition.

Z. 34 Pa. Code Chapters 401-405 - Pennsylvania Uniform Construction Code (UCC); current edition, which adopts the 2021 International Codes as amended.

AA. ANSI/AARST CC-1000 - Soil Gas Control Systems in New Construction of Multifamily, School, Commercial and Mixed-Use Buildings; 2018, Rev. 5/23.

BB. ANSI/AARST MA-MFLB - Protocol for Conducting Measurements of Radon and Radon Decay Products in Multifamily, School, Commercial and Mixed-Use Buildings; Current Edition.

CC. ANSI/AARST SGM-MFLB - Soil Gas Mitigation Standards for Existing Multifamily, School, Commercial and Mixed-Use Buildings; 2023.

DD. ASTM A888 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; Current Edition.

EE. ASTM C1173 - Standard Specification for Flexible Transition Couplings for Underground Piping Systems; Current Edition.

FF. ASTM F758 - Standard Specification for Smooth-Wall Poly(Vinyl Chloride) (PVC) Plastic Underdrain Systems for Highway, Airport, and Similar Drainage; Current Edition.

GG. ASTM D5926 - Standard Specification for Poly(Vinyl Chloride) (PVC) Gaskets for Drain, Waste, and Vent (DWV), Sewer, Sanitary, and Storm Plumbing Systems; Current Edition.

HH. EPA 402-R-92-014 - Radon Measurement in Schools; U.S. Environmental Protection Agency; 1993.

1.6 ADMINISTRATIVE REQUIREMENTS

A. Code Basis: The 2021 International Codes adopted by the Pennsylvania UCC do not contain radon control requirements for this occupancy. Radon control for this project is a contract requirement of the Owner, and ANSI/AARST CC-1000 is the governing design and installation standard. Pennsylvania radon certification, testing, and reporting requirements of 25 Pa. Code Chapter 240 apply.

B. Coordination:
1. Basis of Design: The perforated collection piping network is indicated on the Architectural slab plans as “gas piping, typical, spaced 25 feet on center maximum.” The indicated network is the minimum basis of design. The Delegated Designer shall verify, extend, and complete the network as required to comply with this Section.
2. Basis of Design Risers and Fans: Four independent vent systems, each with one riser and one fan, at the approximate riser locations indicated on the Drawings:
    a. System R1, North Strip (north of Grid AA): 4-inch riser, approximately 3,550 sq feet.
    b. System R2, Main Support Wing (Grids 1 to 6, A to H): 6-inch riser, approximately 10,900 sq feet.
    c. System R3, Apparatus Bays (Grids 7 to 14), riser at the Grid 7 bay wall: 6-inch riser, approximately 12,300 sq feet.
    d. System R4, East Wing (Grids 14 to 15, B to J): 4-inch riser, approximately 3,000 sq feet.
    e. Areas are approximate gross areas. The Delegated Designer shall confirm net plenum areas and riser sizes, and shall not join systems unless the combined area complies with ANSI/AARST CC-1000 Table 4.3 for the header and exhaust size used.
3. Coordinate the layout of soil gas collection plenums, collection piping, and riser locations with foundations, grade beams, thickened slabs, and footings indicated on the Structural Drawings. Do not penetrate footings, grade beams, or structural elements without written approval of the Structural Engineer.
4. Coordinate the gas permeable layer with the granular base course indicated on the Structural Drawings. Where that base course meets the requirements of this Section, it may serve as the gas permeable layer.
5. The under-slab vapor retarder provided under the General Construction contract shall serve as the soil gas retarder. Coordinate the installation sequence so that collection piping, riser stubs, and test port tubing are installed and inspected before the retarder is placed.
6. Coordinate riser routing with architectural chases, walls, and ceiling spaces so that all piping in finished occupied spaces is concealed. Do not route riser piping through sleeping rooms, day rooms, kitchens, or offices unless concealed within a chase indicated on the Drawings.
7. Coordinate fan locations, roof penetrations, and exhaust terminations with the roofing installer, rooftop HVAC equipment, outdoor air intakes, exhaust fans, plumbing vents, and other openings indicated on the Mechanical and Plumbing Drawings.
8. Coordinate fan power, disconnects, and monitor power with the Electrical Contractor, and alarm wiring and BAS points with the HVAC Contractor (controls).
9. Coordinate collection piping crossings with under-slab sanitary, storm, and trench drain piping. Pass collection piping over or under other piping without cutting or offsetting the other piping. Coordinate

apparatus bay collection piping with trench drains, oil-water separator piping, vehicle exhaust system supports, and overhead doors.

10. Notify DEDC, LLC of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with the affected work.

C. Preinstallation Meeting: Convene a meeting at the site before installation of the gas permeable layer. Attendees shall include the Contractor, the Delegated Designer, the General, Electrical, and HVAC Contractors (including their concrete, earthwork, and roofing installers), the Commissioning Authority, the Architect, and DEDC, LLC. Review the delegated design, plenum layout, inspection hold points, protection of piping and the soil gas retarder during concrete placement, and the testing schedule.

D. Sequencing:

1. Install collection piping, riser stubs, and any preinstalled test port tubing before installation of the soil gas retarder. Obtain inspection and acceptance by the Delegated Designer before covering.
2. The General Construction contract installs and seals the soil gas retarder. The Delegated Designer shall inspect and accept the retarder before concrete is placed.
3. The General Construction contract seals slab joints after the concrete has cured, before installation of floor finishes. Seal penetrations created by work of this Section at the same time.
4. Install above-slab piping, roof penetrations, and exhaust terminations, and obtain inspection by the Delegated Designer before concealment by walls, ceilings, or finishes.
5. Energize radon fans within three days of mounting the fan on the system piping. Do not leave a fan installed and de-energized.
6. Activate the system and perform PFE testing after the building envelope is substantially closed and the HVAC systems are operating in their normal occupied mode.
7. Notify the Commissioning Authority not less than 7 days before system activation, so that the Owner's post-construction radon testing can be performed within the time window specified in Part 3.

1.7 PERFORMANCE REQUIREMENTS

A. Radon Concentration: The completed radon mitigation system shall reduce and maintain radon concentrations in all ground-contact spaces tested below 4.0 pCi/L, as measured by post-construction testing performed in accordance with ANSI/AARST MA-MFLB and this Section.

1. Design Goal: Design the system to achieve radon concentrations below 2.0 pCi/L in all regularly occupied spaces, including sleeping quarters, day room, kitchen, and offices.

B. Sub-Slab Pressure Field: With the system operating and the building HVAC systems in their normal occupied mode, the system shall produce a sub-slab pressure differential of not less than 0.004 inch water column (1 Pa) negative, relative to the space above, at every test port.

C. Coverage: Provide soil gas vent systems for every ground-contact slab of the building, including apparatus bays. The ventilated garage exemption of ANSI/AARST CC-1000 Section 4.8 shall not be applied to this project.

D. System Capacity: Size each vent system with capacity sufficient for an ASD fan to establish a vacuum under the entire area of each soil gas collection plenum served, in accordance with ANSI/AARST CC-1000 Sections 3 and 4. Plenum area served by each vent pipe shall not exceed the limits of ANSI/AARST CC-1000 Table 4.3 for the pipe size used.

E. System Type: Active soil depressurization system, with fans installed, energized, and operating at Substantial Completion. A passive system without fans is not acceptable.

F. Building Pressure: The HVAC systems are designed by DEDC, LLC to maintain ground-contact occupied spaces at neutral or slightly positive pressure relative to outdoors, in accordance with ANSI/AARST CC-1000 Section 11. The radon mitigation system shall not depend on building pressurization to meet the performance requirements. Report to DEDC, LLC any observed negative pressure conditions in ground-contact spaces during PFE testing.

G. Prohibited Methods: Do not use air cleaners or devices that solely increase ventilation as the radon reduction method.

H. Combustion Appliances: The system shall not cause backdrafting of any fuel-fired appliance or vent.

I. Fan Locations: Radon fans shall be located inside the building at the locations indicated on the Drawings, in mechanical rooms, a storage room, and the apparatus bays, mounted in-line on vertical piping approximately 4 feet above finished floor for service access. This is an engineered deviation from the fan location requirements of ANSI/AARST CC-1000 Section 8.9.1, authorized by DEDC, LLC, subject to the following conditions:
   1. Rooms containing radon fans or pressurized (discharge-side) piping shall not be regularly occupied, shall not serve as return air plenums, shall not contain open-return air handling units, outdoor air intakes, or combustion air openings, and shall not be negatively pressurized relative to adjacent occupied spaces.
   2. Discharge-side piping, from the fan outlet coupling to the roof termination, shall be continuous solvent-welded pipe with no cleanouts, test ports, unions, or mechanical joints other than the fan outlet coupling.
   3. Pressurized discharge-side piping shall be as short as practical, routed directly from the fan to the roof.
   4. Fans in the apparatus bays shall be located out of vehicle paths and protected from vehicle impact, as coordinated with the Architect.
   5. Leak testing and radon testing of fan rooms shall be performed as specified in Part 3.
   6. The Delegated Designer shall acknowledge this deviation in the delegated design submittal and shall certify the system on that basis.

1.8 DELEGATED DESIGN

A. Design Responsibility: Engage the Delegated Designer to design the complete radon mitigation system to comply with the performance requirements of this Section and ANSI/AARST CC-1000. Use EPA/625/R-92/016 as supplemental design guidance. The Drawings indicate design intent, approximate riser and fan locations, and coordination constraints only. The Delegated Designer is responsible for final quantities, locations, and sizes of system components.

B. Delegated Designer Qualifications:
   1. Current NRPP or NRSB certification as a radon mitigation professional.
   2. Current Pennsylvania DEP radon mitigation certification under 25 Pa. Code Chapter 240, for the individual and, where required, the firm.
   3. Minimum five years of experience in the design and installation of radon mitigation systems, including at least three completed ASD systems in new or existing commercial, institutional, school, or multifamily buildings of not less than 10,000 sq feet.

C. Scope of Delegated Design: The delegated design shall include, at a minimum, the following:

1. Division of the ground-contact slab area, including apparatus bays, into soil gas collection plenums, with the area of each plenum and the vent pipe size serving it, demonstrating compliance with ANSI/AARST CC-1000 Table 4.3.
2. Final layout of the collection piping network based on the network indicated on the Drawings, including extensions to areas not covered by the indicated network, riser connection points, and identification of footings, grade beams, and thickened slabs that divide the network into separate plenums. Each separate plenum shall have its own riser unless sleeved crossings are indicated on the Structural Drawings.
3. Gas permeable layer material and depth, and verification that the base course indicated on the Structural Drawings meets ANSI/AARST CC-1000 Section 5.5.
4. Riser locations and routing, pipe sizes, slopes, supports, and equivalent length calculations demonstrating compliance with ANSI/AARST CC-1000 Section 8.6.
5. Fan locations, fan selections with performance curves, and calculated system operating points for each vent system.
6. Exhaust termination locations, with dimensioned separation from roof surfaces, parapets, operable openings, outdoor air intakes, exhaust outlets, and areas where people congregate or traverse, demonstrating compliance with ANSI/AARST CC-1000 Section 9.
7. Test port type and locations, in accordance with ANSI/AARST CC-1000 Section 7 and Part 2 of this Section.
8. Locations of system monitors and alarms, electrical power requirements for each fan, and alarm wiring to the BAS.
9. Slab joint, penetration, block-out, sump, trench drain, and floor drain sealing details, for incorporation into the work of the General Construction contract and this Contract.
10. Label schedule, including label text and locations.
11. Extension of the collection piping network into areas not served by the indicated network, including the enclosed room at approximately Grids 4 to 6 and C.2 to E.5, the toilet and shower rooms near Grids 5 to 6 at AA, and the room at Grids 14 to 15 between B and C.
12. Riser connectors and connection fittings as specified in Part 2.
13. A capped 4-inch contingency riser stub, connected to the apparatus bay collection piping at the Grid 14 bay wall and extended not less than 24 inches above the slab, labeled “RADON VENT - FUTURE - DO NOT REMOVE CAP,” for use if PFE testing at the east side of the apparatus bays does not meet the specified sub-slab pressure differential.
14. Inspection and test schedule with hold points as specified in Part 3.

D. Contract Document Basis: The delegated design shall be based on the Contract Documents. Changes to structural, architectural, or MEP work required by the delegated design shall be submitted for approval and shall not be made without written acceptance by the Architect and DEDC, LLC.

E. Acceptance of Delegated Design: Review of the delegated design submittal by the Architect and DEDC, LLC is for general conformance with the design intent and coordination with the Contract Documents only, and does not relieve the Contractor or Delegated Designer of responsibility for the system meeting the specified performance requirements.

1.9 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittals procedures.

B. Qualification Data: For the Delegated Designer, including NRPP or NRSB certificate, Pennsylvania DEP certification numbers for the individual and firm, and project experience list demonstrating the specified

experience, with Owner contact information. For the independent testing firm, Pennsylvania DEP testing certification numbers and laboratory certification.

C. Delegated Design Submittal: Submit before installation of the gas permeable layer.
1. Drawings: Floor plans at a scale not smaller than the Contract Drawings, roof plan, and details, indicating all items listed under “Scope of Delegated Design” above.
2. Calculations: Plenum area per riser, equivalent length of each vent system, and fan selections.
3. Narrative: Description of system operation, sequence of installation, and inspection schedule.
4. Signature: Bear the name, signature, NRPP or NRSB certification number, and Pennsylvania DEP certification number of the Delegated Designer.

D. Product Data: Manufacturer’s data sheets for each product, including radon fans with performance curves and UL listing, piping and fittings, flexible couplings, perforated piping and fittings, system monitors and alarms, test port assemblies, sealants, firestop systems, hangers, and labels.

E. Field Inspection Reports: Signed reports by the Delegated Designer for each inspection hold point specified in Part 3, with photographs documenting the work before concealment.

F. PFE and Commissioning Report: Static pressure at each riser test tap, sub-slab pressure at each test port, building operating conditions at the time of testing, final fan speed settings, and alarm setpoints. Submit to the Architect, DEDC, LLC, and the Commissioning Authority.

G. Pennsylvania DEP Reporting: Copies of mitigation reports and active system fee forms filed by the Delegated Designer with Pennsylvania DEP as required by 25 Pa. Code Chapter 240.

H. As-Built Submittals: Updated delegated design drawings indicating as-built locations of risers, collection piping, test ports, fans, monitors, exhaust terminations, and concealed sub-slab piping, dimensioned from building column lines or fixed walls.

I. Operation, Maintenance, and Monitoring (OM&M) Manual: Prepare in accordance with ANSI/AARST CC-1000 Section 12. Submit in electronic (PDF) format and two printed copies in three-ring binders. Include the following:
1. System description and floor plan diagram identifying all components.
2. Statement of the party responsible for maintaining and monitoring the system.
3. Start-up riser static pressures and alarm setpoints for each vent system, and actions to take upon system degradation or failure.
4. Advisory to check each system monitor at least quarterly, and to retest for radon at least every two years and after any building modifications affecting ground-contact areas or HVAC systems.
5. Fan and monitor manufacturer’s installation, operation, and maintenance instructions, and replacement part numbers.
6. Copies of inspection reports, PFE records, test reports, product data, and warranties.
7. Service contact information for the Delegated Designer, with certification numbers.

J. Warranty Documentation: Submit executed warranties as specified in this Section.

1.10 QUALITY ASSURANCE

A. Comply with ANSI/AARST CC-1000, 25 Pa. Code Chapter 240, and the requirements of this Section. Where requirements conflict, the more stringent requirement governs.

B. Installer Qualifications: Installation shall be performed by, or under the direct on-site supervision of, the Delegated Designer or a Pennsylvania DEP-certified mitigation individual employed by the Delegated Designer's firm.
   1. Workers installing collection piping, riser stubs, and penetration seals shall receive instruction from the Delegated Designer on radon control requirements before starting work.
   2. Do not perform radon system installation work at the site without the Delegated Designer or the Delegated Designer's certified supervising individual present or immediately available.

C. Owner's Radon Testing Agency: Post-construction radon testing will be performed by an independent radon testing agency and individual holding current Pennsylvania DEP radon testing certification under 25 Pa. Code Chapter 240, retained by the Commissioning Authority on behalf of the Owner, with test devices analyzed by a Pennsylvania DEP-certified radon laboratory. The testing agency will have no financial affiliation with the Contractor or the Delegated Designer.

D. Diagnostic Equipment: Digital micromanometers used for PFE testing shall be capable of reading to 0.001 inch water column (0.25 Pa) and shall have current calibration traceable to national standards. Submit proof of calibration with the PFE report.

E. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this Section with minimum three years of documented experience.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

B. Deliver materials to the site in manufacturer's original, unopened containers with labels intact.

C. Store piping off the ground, protected from weather, ultraviolet exposure, dirt, and physical damage. Store fans and monitors in a clean, dry location.

D. Keep pipe ends and riser openings capped at all times to prevent entry of debris, concrete, and water.

1.12 FIELD CONDITIONS

A. Project Description: The Exeter Township Emergency Services Facility is a new slab-on-grade building located in Berks County, Pennsylvania, within EPA Radon Zone 1 (highest radon potential). The building includes apparatus bays and ground-floor occupied spaces such as sleeping quarters, day room, kitchen, offices, and support spaces. Refer to the Architectural and Structural Drawings for floor plans, foundation layout, slab thicknesses, and base course requirements.

B. Do not install collection piping over standing water, frozen subgrade, or mud.

1.13 WARRANTY

A. Installer Warranty: Provide a written warranty, signed by the Delegated Designer and the Contractor, covering materials and workmanship of the complete radon mitigation system for two years from the date of Substantial Completion. The warranty shall include correction of the system, at no cost to the Owner, if radon testing performed during the warranty period in accordance with ANSI/AARST MA-MFLB indicates radon concentrations of 4.0 pCi/L or greater in any ground-contact space tested.

B. Fan Warranty: Manufacturer's warranty of not less than five years from the date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Radon Fans:
1. Basis of Design: Fantech, a Systemair company; Rn4EC; www.fantech.net.
2. RadonAway, a Spruce Environmental Technologies company; www.radonaway.com.
3. Festa Radon Technologies Co.; www.festaradontech.com.

B. System Monitors:
1. RadonAway, a Spruce Environmental Technologies company; www.radonaway.com.
2. Fantech, a Systemair company; www.fantech.net.
3. Festa Radon Technologies Co.; www.festaradontech.com.

C. Plenum-Rated CPVC Piping, subject to compliance with the specified dry-pipe fire performance in the sizes required:
1. Basis of Design: Spears Manufacturing Company; EverTUFF Industrial CPVC or LabWaste CPVC; www.spearsmfg.com.
2. Pipe extruded from Lubrizol Corzan CPVC compound, by any manufacturer, only where the manufacturer's listing documents dry-pipe 25/50 performance in the sizes provided.

D. Substitutions: See Section 01 6000 - Product Requirements.

2.2 TRENCH BEDDING AND BACKFILL

A. Stone: Clean gravel or crushed stone complying with ASTM C33/C33M size No. 57, matching the gas permeable layer, for bedding and backfill in pipe trenches.

2.3 SUB-SLAB COLLECTION PIPING

A. General: Soil gas shall be collected through a network of perforated pipe within the gas permeable layer. Suction pits are not permitted.

B. Perforated Pipe: 4-inch nominal diameter PVC, factory-perforated, complying with ASTM D2729, or ASTM F758 Type PS 46 where additional crush resistance is required by the delegated design.
1. Perforations: Two rows of 1/2-inch diameter holes, 120 degrees apart, as standard for perforated drainage pipe.
2. Size: All sub-slab collection piping shall be 4-inch nominal diameter, one size throughout.
3. Corrugated pipe, flexible pipe, and pipe with filter socks or geotextile wraps are not permitted.

C. Fittings: PVC fittings of the same material and size as the pipe, solvent-welded or mechanically secured so that joints cannot separate during placement of aggregate, retarder, and concrete. Provide tees or crosses at every intersection of the network. Cap all dead ends.

D. Riser Connections: Solid-wall tee or cross at each riser location, transitioning to the riser piping specified below.

E. Inlet Capacity: The perforated piping connected to each riser shall provide not less than 10 feet of perforated pipe extending from the riser, and combined unobstructed inlet area not less than twice the cross-sectional area of the riser, in accordance with ANSI/AARST CC-1000 Section 5.7.

2.4 RISER AND EXHAUST VENT PIPING

A. Riser and Exhaust Piping Materials:
1. Below Slab: PVC, ASTM D2665, Schedule 40, solid wall, for riser connectors and riser piping below the top of the slab. Cellular-core pipe is not permitted. Solvent-weld joints using primer complying with ASTM F656 and solvent cement complying with ASTM D2564.
2. Above Slab: CPVC, Schedule 40 or Schedule 80, ASTM F441 pipe with ASTM F438 or ASTM F439 fittings, or ASTM F2618 CPVC drainage pipe and fittings, for all riser and exhaust piping above the top of the slab, including exterior and rooftop piping.
    a. Fire Performance: Flame spread index not greater than 25 and smoke-developed index not greater than 50 when tested dry (empty) in accordance with ASTM E84 or UL 723, listed and labeled for installation in air-handling plenums, in every pipe and fitting size used. Submit the listing or evaluation report (such as ICC-ES PMG-1278) confirming dry-pipe performance in the sizes provided. Ratings based on water-filled pipe are not acceptable.
    b. Joints: Solvent-welded using primer and solvent cement complying with ASTM F493 and as required by the CPVC manufacturer to maintain the plenum listing.
    c. Transition: Transition from PVC to CPVC at or immediately above the top of the slab, using a solvent cement listed by the CPVC manufacturer for PVC-to-CPVC joints, or a flexible coupling as specified below.
    d. Exterior Exposure: Protect CPVC exposed to sunlight with an ultraviolet-resistant coating as recommended by the CPVC manufacturer, color as selected by the Architect.

B. Riser and Exhaust Piping Requirements:
1. Size: As indicated in the Basis of Design Risers and Fans paragraph in Part 1, and as confirmed in the delegated design. Exhaust piping shall be the same size as the riser it serves.
2. Plenum Area per Riser: In accordance with ANSI/AARST CC-1000 Table 4.3, not more than the following:
    a. 4-Inch Riser: 4,500 sq feet, increased to 6,200 sq feet where the pre-concrete inspections specified in Part 3 are performed and documented.
    b. 6-Inch Riser: 10,000 sq feet, increased to 14,000 sq feet where the pre-concrete inspections specified in Part 3 are performed and documented.
3. Riser Connectors: Where a riser is located away from the collection piping network, connect the riser to the network with solid-wall pipe of the same size as the riser, installed in the gas permeable layer with the specified bedding and cover.
4. Connection Fittings: The combined cross-sectional area of the 4-inch collection piping legs connected to each riser or riser connector shall be not less than the cross-sectional area of the riser. Connect 4-inch risers to not fewer than two legs, and 6-inch risers to not fewer than three legs, using a solid-wall tee or reducing cross. Where the connection point has fewer legs, extend perforated piping not less than 10 feet from the connection to provide the additional leg.
5. Crossings: Where a riser connector or collection piping of one system crosses collection piping of another system, cross over or under without fittings so that the systems remain separate.

C. Cast Iron Pipe and Fittings: ASTM A888 hubless cast iron soil pipe, with CISPI 310 couplings. Use for exposed piping in apparatus bays below 8 feet above finished floor, where subject to physical damage. Cast iron may be used in lieu of CPVC elsewhere above the slab at the Contractor's option.

D. Flexible Couplings: Elastomeric couplings complying with ASTM D5926 or ASTM C1173, unshielded, with stainless steel clamps, for connection of fans to system piping and for service disconnects.

E. Hangers and Supports: MSS SP-58, galvanized steel or factory-coated steel.
1. Horizontal Piping: Adjustable clevis or band hangers sized for the pipe outside diameter, with threaded steel rods.
2. Vertical Piping: Riser clamps at each floor and at the roof, with intermediate wall brackets or clamps as required for the specified spacing.
3. Fan Supports: Vibration-isolating clamps or brackets, so that fan weight is not carried by the flexible couplings.

F. Pipe Insulation: Where vent piping passes through unconditioned spaces and condensation could freeze or damage adjacent materials, provide flexible elastomeric or glass fiber pipe insulation with an external vapor barrier jacket and a thermal resistance of not less than R-4, with insulation and jacket having a flame spread index not greater than 25 and smoke-developed index not greater than 50 when tested in accordance with ASTM E84, in accordance with ANSI/AARST CC-1000 Section 8.

G. Firestop Systems: Through-penetration firestop systems tested to UL 1479 and listed for the pipe material and size, with an F rating not less than the rating of the assembly penetrated.

H. Exhaust Termination Screen: Stainless steel or galvanized wire mesh, not smaller than 1/2 inch openings. Rain caps and other devices that obstruct or redirect the upward discharge are not permitted.

I. Riser Pressure Test Tap: 1/4-inch capped test fitting on each riser, located below the fan and accessible from the floor or from an accessible ceiling, for measuring system static pressure with a digital manometer.

2.5 RADON FANS

A. Description: In-line centrifugal fan designed for radon and soil gas applications, with sealed housing to prevent soil gas leakage and thermally protected motor rated for continuous duty.

B. Listing: UL 507.

C. Performance: Rated in accordance with AMCA 210. Select each fan to provide the airflow and static pressure required by the delegated design at the calculated system operating point, with capacity to maintain the specified sub-slab pressure differential at every test port.

D. Capacity:
1. Systems R2 and R3 (6-Inch): Not less than 450 cfm at 0.5 inch water column, and capable of not less than 4.0 inches water column static pressure at low flow.
2. Systems R1 and R4 (4-Inch): The fan model specified for Systems R2 and R3, with speed adjusted to limit velocity in 4-inch piping, or a smaller radon fan selected by the Delegated Designer to suit the system operating point.

E. Motor: Electronically commutated (EC) motor with integral speed adjustment, for setting fan speed during commissioning to achieve the specified sub-slab pressure differential.

F. Connections: Fan collars connected to riser and exhaust piping with flexible couplings sized for the pipe served. Use 6-inch by 6-inch couplings on 6-inch systems, and 6-inch by 4-inch reducing couplings on 4-inch systems where fan collars are 6 inches.

G. Electrical Characteristics: 120 volt, single phase, 60 Hz, not more than 175 watts per fan, unless otherwise indicated on the Electrical Drawings.

H. Mounting: In-line on vertical piping at the locations specified in Part 1, connected with flexible couplings secured with stainless steel clamps.

2.6 SYSTEM MONITORS AND ALARMS

A. Description: Electronic pressure-sensing system monitor for each vent system, connected to the riser by sensing tube, providing local audible and visual alarm upon loss of system vacuum, in compliance with ANSI/AARST CC-1000 Section 10.3.
1. Automatic reset upon restoration of power and system vacuum.
2. Adjustable alarm setpoint.
3. Powered from a non-switched 120 volt circuit. Battery-powered monitors are not acceptable.
4. Normally closed dry contact for remote alarm monitoring by the BAS.

B. Location: Install monitors in a location visible to building occupants or staff, as indicated in the delegated design and coordinated with the Architect. In finished spaces, mount in a recessed or surface box with cover plate.

2.7 TEST PORTS

A. Quantity and Location: Provide test ports for each soil gas collection plenum at locations distant from the risers and between runs of collection piping, including the outer quadrants of each plenum and not less than one port per 8,000 sq feet of plenum area, in accordance with ANSI/AARST CC-1000 Section 7.

B. Type: At the option of the Delegated Designer, provide either of the following:
1. Drilled Ports: Holes 1/4 inch to 1 inch in diameter drilled through the slab after concrete placement, cleared of debris, and closed with a removable, gasketed, flush-mounted plug.
2. Preinstalled Ports: Rigid, non-corroding tubing, 1/4 inch to 1 inch inside diameter, terminating in the gas permeable layer in a constructed void of not less than 1 pint or in perforated pipe not less than 12 inches long, and extending to an accessible location above the slab, with a threaded or gasketed cap.

C. Ports in Finished Spaces: Do not locate drilled ports in finished floors of sleeping rooms, day room, kitchen, or offices. Where test locations are required in these areas, use preinstalled ports terminated in a wall box or within casework, closets, or utility spaces.

D. Ports shall be accessible for future measurement without demolition, and shall be dimensioned on the as-built drawings.

2.8 SEALANTS

A. Slab Penetrations: Polyurethane elastomeric sealant complying with ASTM C920, Type S or M, Grade P for horizontal joints and Grade NS for vertical joints, Class 25 minimum, Use T for traffic areas, for sealing risers, test ports, and plumbing penetrations through the slab.

B. Backer Rod: Closed-cell polyethylene foam, compatible with sealant, for joints and openings wider than 1/2 inch.

C. Expanding foam is not an acceptable permanent sealant for radon control.

D. Sump and Pit Lids: Rigid lids sealed with gasket material or silicone sealant.

E. Non-Shrink Grout: Premixed, non-metallic, non-shrink cementitious grout, for closure of slab block-outs.

2.9 LABELS

A. Materials: Durable, permanent, weather-resistant labels with contrasting colors, suitable for the surface and environment. Title lettering not less than 1/4 inch high; other text not less than 1/8 inch high.

B. Pipe Labels: "RADON REDUCTION SYSTEM - DO NOT ALTER."

C. System Description Label: At each system monitor location, including the following information:
1. "Radon Reduction System."
2. Explanation of the monitor indication and alarm.
3. Instructions to follow if the alarm sounds.
4. Advisory to inspect the monitor at least quarterly and to test the building for radon at least every two years.
5. Delegated Designer's firm name, telephone number, Pennsylvania DEP certification number, and date of installation.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that subgrade has been prepared and compacted as indicated on the Structural Drawings, and that grading below the gas permeable layer will not allow water to collect and obstruct inlet piping.

B. Verify that foundation walls and grade beams surrounding each plenum are complete and that openings below grade have been closed.

C. Verify that underground plumbing, electrical, and other utilities beneath the slab are installed and tested before installation of the soil gas retarder.

D. Prepare written report, endorsed by the Delegated Designer, listing conditions detrimental to performance of the Work.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION - BELOW SLAB

A. Install the radon mitigation system in accordance with the accepted delegated design, ANSI/AARST CC-1000, and the manufacturer's instructions.

B. Gas Permeable Layer: Provided under the General Construction contract. Verify depth and cleanliness of the base course before installing collection piping, and coordinate placement so that the base course is not disturbed after piping is installed.

C. Collection Piping: Install the network at the locations indicated in the accepted delegated design, at not more than 25 feet on center, and not less than 12 inches from footings, grade beams, and foundation walls.
   1. Bedding and Cover: Embed the pipe completely in the gas permeable layer, with not less than 1 inch of aggregate below the pipe and not less than 2 inches of aggregate between the top of the pipe and the soil gas retarder.
   2. Trenching: Where the gas permeable layer is not deep enough to provide the specified bedding and cover, excavate a trench in the subgrade beneath each pipe run, not less than 4 inches wider than the pipe, and bed and backfill the pipe with the specified stone to the top of the pipe.
   3. Orientation: Install pipe with perforations facing down, at the 4 o'clock and 8 o'clock positions, so that water drains out of the pipe and aggregate is kept out.
   4. Grade: Install pipe level or sloped to drain. Grade the subgrade beneath pipe runs so that water cannot collect in or obstruct the pipe.
   5. Joints and Intersections: Connect every intersection with a tee or cross fitting; do not overlap or cross pipes without a fitting. Secure all joints and fittings against displacement.
   6. Footings and Grade Beams: Do not pass collection piping through footings, grade beams, or thickened slabs unless sleeves are indicated on the Structural Drawings. Where the network is divided by footings or grade beams, provide a separate riser for each divided area.
   7. Protection: Do not operate compaction equipment or vehicles directly on installed pipe. Repair or replace crushed or displaced pipe before covering.

D. Risers: Extend riser piping not less than 24 inches above the top of the slab, cap and seal the open end immediately, and label "RADON VENT - DO NOT REMOVE CAP" until connected to the above-slab system.

E. Preinstalled Test Ports: Where used, install test port tubing and voids at locations indicated in the delegated design. Cap and protect tubing during concrete placement.

F. Soil Gas Retarder: Provided under the General Construction contract. Before the retarder is placed, verify that collection piping, riser stubs, and test port tubing are complete and inspected. After the retarder is placed, verify that it is sealed at each riser and test port penetration.

3.3 INSTALLATION - SLAB SEALING

A. Comply with ANSI/AARST CC-1000 Section 6.2 for work of this Contract. Slab perimeter, isolation, and control joints, and penetrations by other trades, are sealed under the General Construction contract.

B. Penetrations: Seal openings around risers, test ports, and plumbing penetrations through the slab with ASTM C920 sealant. Install backer rod in openings wider than 1/2 inch.

C. Floor Drains and Trench Drains: Provide trap seals and trap primers at floor drains, trench drains, and oil-water separator connections in ground-contact slabs as indicated on the Plumbing Drawings, so that drains do not allow soil gas entry. Seal around drain bodies and trench drain frames at the slab.

D. Sumps and Pits: Install sealed rigid lids on sumps and other pits open to the soil.

3.4 INSTALLATION - ABOVE SLAB PIPING AND FANS

A. Install riser and exhaust piping plumb and parallel to building lines, concealed in chases, walls, or above ceilings in finished occupied spaces. Exposed piping is acceptable only in mechanical rooms, apparatus bays, and other unfinished spaces.

B. Slope horizontal piping not less than 1/8 inch per foot back toward the riser so condensate drains to the sub-slab area. Do not create traps or low points.

C. Support horizontal plastic piping at intervals not exceeding 4 feet and vertical piping at intervals not exceeding 10 feet, and at each change in direction. Support cast iron piping at each coupling and at intervals not exceeding 5 feet.

D. Where piping is routed through conditioned or occupied spaces, maintain airtight joints throughout. Do not route pressurized (discharge-side) piping through occupied rooms; route it directly from the fan room to the roof.

E. Firestopping: Where piping penetrates fire-resistance-rated assemblies, install the specified firestop system in accordance with its listing.

F. Fans: Install fans at the locations specified in Part 1, approximately 4 feet above finished floor, on vertical piping. Connect fans to piping with flexible couplings and stainless steel clamps, tightened to the coupling manufacturer's torque. Support fans independently of the piping with vibration-isolating supports, and provide clear service access.

G. Fan Labels: Label each fan and its discharge piping "RADON FAN - PRESSURIZED DISCHARGE - DO NOT OPEN OR DISCONNECT. SEE SYSTEM LABEL FOR SERVICE CONTACT."

H. Roof Penetrations: Roof penetrations shall be flashed by the roofing installer, using pipe boots or flashing compatible with the roof system, to maintain the roof warranty.

I. Exhaust Terminations: Comply with ANSI/AARST CC-1000 Section 9 and the following:
   1. Discharge vertically upward, within 45 degrees of vertical, outdoors above the roof.
   2. Not less than 18 inches above a flat roof surface or 12 inches above a pitched roof surface, and above the top of any adjacent parapet within 10 feet.
   3. Not less than 10 feet above grade.
   4. Not less than 4 feet above, or not less than 10 feet horizontally from, any operable opening, door, window, or outdoor air intake, and not less than 10 feet from any rooftop equipment outdoor air intake or economizer.
   5. Not less than 10 feet above or 10 feet horizontally from roof walkways, decks, and other areas where people congregate or traverse.
   6. Increase separation distances as required by ANSI/AARST CC-1000 for exhaust pipes larger than 4 inches.
   7. Provide termination screen as specified.

3.5 INSTALLATION - MONITORS AND ELECTRICAL COORDINATION

A. Monitors: Install each monitor at the location indicated in the delegated design, with sensing tube connected to the riser below the fan.

B. Electrical Coordination: Furnish fan and monitor electrical data to the Electrical Contractor. Verify that power to each fan is a dedicated circuit, is not interlocked with or switched by other mechanical systems, and that monitor power is non-switched. Do not route wiring inside radon vent piping.

C. BAS Coordination: Coordinate the monitor dry contact terminations and alarm points with the HVAC Contractor (controls).

3.6 IDENTIFICATION

A. Label all exposed and accessible vent piping, including piping above accessible ceilings, at intervals not exceeding 10 feet and at each penetration of a wall, floor, or ceiling.

B. Label sealed slab components, test ports, and sealed sump lids as components of the radon mitigation system.

C. Install the system description label at each system monitor location.

D. Label each roof exhaust termination “RADON EXHAUST - DO NOT BLOCK.”

3.7 FIELD QUALITY CONTROL

A. Inspection Hold Points: The Delegated Designer shall inspect and approve in writing each of the following before the work is covered or concealed. Notify the Architect and DEDC, LLC not less than 48 hours before each inspection so that they may attend.
1. Inspection 1: Materials delivered to the site, for compliance with the accepted submittals.
2. Inspection 2: Gas permeable layer, collection piping, fittings, bedding and cover, riser stubs, and any preinstalled test port tubing, before installation of the soil gas retarder.
3. Inspection 3: Soil gas retarder laps, seals, penetrations, and repairs, before placement of concrete.
4. Inspection 4: Slab perimeter, joint, and penetration sealing, and capping and labeling of risers, after slab placement and before installation of floor finishes.
5. Inspection 5: Above-slab piping, supports, slopes, firestopping, roof penetrations, and exhaust terminations, before concealment by walls and ceilings.

B. System Activation and PFE Testing:
1. Activate each system after the building envelope is substantially closed and the HVAC systems are operating in their normal occupied mode. Perform PFE testing in the presence of the Commissioning Authority.
2. Measure and record the static pressure at each riser test tap and the sub-slab pressure differential at each test port with the system operating.
3. Where any test port does not achieve the specified sub-slab pressure differential, investigate the cause, correct the system, and retest.
4. Adjust each fan speed so that the specified sub-slab pressure differential is achieved at every test port at the lowest practical fan speed. Record the final speed setting.
5. Set each monitor alarm setpoint based on the recorded start-up static pressure, as determined by the Delegated Designer.
6. Verify monitor alarm operation, including the alarm signal at the BAS, by simulating loss of system vacuum, together with the HVAC Contractor (controls) and the Commissioning Authority.
7. Verify that the system does not cause backdrafting of fuel-fired appliances.
8. Leak-test the fan connections and all discharge-side piping inside the building with each fan operating, using a chemical smoke tracer or an equivalent method accepted by the Delegated Designer. Correct any leakage and retest.
9. Close each test port and riser test tap after testing.

C. Post-Construction Radon Testing (by Owner): The Owner's radon testing agency, retained by the Commissioning Authority on behalf of the Owner, will perform initial post-construction radon testing as follows. Cooperate with the testing agency and maintain the specified building conditions during testing.
   1. Testing will be performed no sooner than 24 hours and no later than 30 days after activation of the radon mitigation system, in accordance with 25 Pa. Code Chapter 240.
   2. Testing will be conducted in accordance with ANSI/AARST MA-MFLB and EPA 402-R-92-014 under closed-building conditions, with HVAC systems operating in their normal occupied mode and apparatus bay overhead doors closed.
   3. Every occupied room and space in contact with the ground will be tested, including each sleeping room, day room, kitchen, and office, at not less than one test device per 2,000 sq feet and not less than one per enclosed occupied room, excluding closets, toilet rooms, and storage rooms. Apparatus bays will be tested at not less than one test device per 2,000 square feet, away from overhead doors and vehicle exhaust drops.
   4. Each room containing a radon fan or pressurized discharge piping will be tested with not less than one test device.
   5. Results will be reported to the Owner, Architect, DEDC, LLC, and the Contractor on the Pennsylvania DEP-approved result report form.

D. Corrective Work: Where any test result is 4.0 pCi/L or greater, the Delegated Designer shall diagnose the cause, submit proposed modifications for review, implement the modifications, reactivate and re-commission the system, and repeat the PFE testing in the affected areas. The Owner's testing agency will retest the affected areas. Corrective work, and the cost of the Owner's retesting after a failed test, shall be at no additional cost to the Owner. Corrective modifications shall comply with ANSI/AARST SGM-MFLB in addition to ANSI/AARST CC-1000.

E. Long-Term Testing (by Owner): During the first heating season following Substantial Completion, the Owner's testing agency will perform one long-term radon test (91 days minimum) in each sleeping room and in not less than 25 percent of the other locations tested. Results of 4.0 pCi/L or greater shall be corrected under the Installer Warranty.

F. Commissioning: Cooperate with the Commissioning Authority in accordance with Section 01 9113. Commissioning verification will include witnessing of PFE testing, verification of fan operation and speed settings, monitor alarm and BAS point verification, and review of labeling and the OM&M manual.

G. Pennsylvania DEP Reporting: The Delegated Designer shall file all mitigation reports and pay all fees required by 25 Pa. Code Chapter 240 for the installed active systems, and shall submit copies to the Owner.

H. The radon mitigation system will be considered defective if it does not pass the specified inspections and tests.

3.8 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate system operation, monitor indication, alarm response, and quarterly inspection procedures to the Owner's designated personnel. Provide not less than one hour of instruction.

B. Certification: Submit a written statement, signed by the Delegated Designer, certifying that the radon mitigation system has been installed in accordance with the accepted delegated design and ANSI/AARST CC-1000, and that post-construction test results comply with the specified performance requirements.

C. Turn over the OM&M manual and as-built drawings to the Owner.

3.9 PROTECTION

A. Protect installed collection piping, riser stubs, and test port tubing during placement of base course, retarder, reinforcing, and concrete by other contracts. Repair damage before concrete placement.

B. Keep riser openings capped until connection of the above-slab piping.

C. Protect installed fans, monitors, test taps, and labels from damage until Substantial Completion.

END OF SECTION 22 3800

SECTION 22 4000 - PLUMBING FIXTURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Tank type water closets.

B. Wall hung urinals.

C. Lavatories.

D. Wall-hung, solid surface, multistation lavatory units.

E. Wall-hung, multistation wash fountains.

F. Bathtubs and showers.

G. Shower receptors.

H. Showers.

I. Indoor drinking fountains.

J. Service sinks.

1.2 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ASME A112.18.1 - Plumbing Supply Fittings; 2018.

C. ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures; 2011.

D. ASME A112.19.2 - Ceramic Plumbing Fixtures; 2013.

E. ASME A112.19.5 - Flush Valves and Spuds for Water Closets, Urinals, and Tanks; 2017.

F. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices; 2015.

G. ASTM C1822 - Standard Specification for Insulating Covers on Accessible Lavatory Piping; 2015.

H. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

I. NSF 61 - Drinking Water System Components - Health Effects; 2017.

J. NSF 372 - Drinking Water System Components - Lead Content; 2016.

1.3 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

C. Maintenance Data: Include fixture trim exploded view and replacement parts lists.

D. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 6000 - Product Requirements for additional provisions.
2. Extra Faucet Washers: One set of each type and size.
3. Flush Valve Service Kits: One for each type and size.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Accept fixtures on site in factory packaging. Inspect for damage.

B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.6 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.2 TANK TYPE WATER CLOSETS

A. Manufacturers:
1. American Standard, Inc: www.americanstandard-us.com/#sle.
2. Kohler Company: www.kohler.com/#sle.
3. Zurn Industries, Inc: www.zurn.com/#sle.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Floor-Mounted Bowl:
1. ASME A112.19.2; siphon jet, vitreous china, 16.5 inches high, close-coupled closet combination with elongated rim, insulated vitreous china closet tank with fittings and lever flushing valve, bolt caps, vandalproof cover locking device.
2. Water Consumption: 1.6 gal per flush, maximum.

3. Pressure Assist Required

C. Bowl: ASME A112.19.2; floor mounted, siphon jet, vitreous china, 16.5 inches high, close-coupled closet combination with elongated rim, insulated vitreous china closet tank with fittings and lever flushing valve, bolt caps, vandalproof cover locking device. See Drawings for specific Model Information

D. Seat Manufacturers:
1. American Standard, Inc: www.americanstandard-us.com/#sle.
2. Bemis Manufacturing Company: www.bemismfg.com/#sle.
3. Zurn Industries.

2.3 WALL HUNG URINALS

A. Manufacturers:
1. American Standard, Inc: www.americanstandard-us.com/#sle.
2. Gerber Plumbing Fixtures LLC: www.gerberonline.com/#sle.
3. Kohler Company: www.kohler.com/#sle.
4. Zurn Industries, Inc: www.zurn.com/#sle.
5. Substitutions: See Section 01 6000 - Product Requirements.

B. Urinals: Vitreous china, ASME A112.19.2, wall hung with side shields and concealed carrier. See Drawings for specific Model Information
1. Consumption Volume: 1.0 gal per flush, maximum.
2. Flush Valve: Exposed (top spud).
3. Flush Operation: Sensor operated.
4. Trapway Outlet: Integral.

C. Flush Valves:
1. Manufacturers:
a. American Standard, Inc; _____: www.americanstandard-us.com/#sle.
b. Delany Products; _____: www.delanyproducts.com/#sle.
c. Zurn Industries, LLC; ZEMS Series: www.zurn.com/#sle.

2.4 LAVATORIES

A. Lavatory Manufacturers: See Drawings for Basis of Design Product
1. American Standard Inc: www.americanstandard.com.
2. Kohler Company: www.kohler.com/#sle.
3. Zurn Industries, Inc: www.zurn.com/#sle.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Supply Faucet Manufacturers: See Drawings for Basis of Design Product
1. American Standard Inc: www.americanstandard.com.
2. Kohler Company: www.kohler.com/#sle.
3. Zurn Industries, Inc: www.zurn.com/#sle.
4. Speakman: www.speakmancompany.com.

C. Accessories:

2.5 UNDER-LAVATORY PIPE SUPPLY COVERS

A. Basis of Design: Plumberex Specialty Products, Inc; www.plumberex.com/#sle.
1. Fusion Molded Under-Lavatory Insulators (Non-Sewn): Plumberex Handy-Shield Maxx.
2. Slim Fit Under-Lavatory Insulators (Non-Sewn): Plumberex Trap Gear.
3. Under-Lavatory Covers with Snap-Lock Fasteners (Molded): Plumberex Pro-Extreme.

B. General:
1. Insulate exposed drainage piping including hot, cold and tempered water supplies under lavatories or sinks per ADA Standards.
2. Construction: 1/8 inch PVC with antimicrobial, antifungal and UV resistant properties.
   a. Comply with ASTM C1822Type I for covers on accessible lavatory piping.
   b. Comply with ASME A112.18.9 for covers on accessible lavatory piping.
   c. Comply with ICC A117.1.
3. Fasteners: Reusable, snap-locking fasteners with no sharp or abrasive external surfaces. No cable ties allowed.

2.6 SHOWERS

A. Shower Manufacturers: See Drawings for Basis of Design Product

2.7 INDOOR DRINKING FOUNTAINS

A. Manufacturers:
1. Elkay Manufacturing Company: www.elkay.com/#sle.
2. Halsey Taylor: www.halseytaylor.com/#sle.
3. Substitutions: See Section 01 6000 - Product Requirements.

B. Fountain: See Drawings for specific Model Information

2.8 SERVICE SINKS

A. Service Sink Manufacturers: See Drawings for Specific Model information

B. Trim: ASME A112.18.1 exposed wall type supply with cross handles, spout wall brace, vacuum breaker, hose end spout, strainers, eccentric adjustable inlets, integral screwdriver stops with covering caps and adjustable threaded wall flanges.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

B. Verify that electric power is available and of the correct characteristics.

C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.2 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.3 INSTALLATION

A. Install each fixture with trap, easily removable for servicing and cleaning.

B. Provide chrome-plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.

C. Install components level and plumb.

D. Install and secure fixtures in place with wall supports and bolts.

3.4 ADJUSTING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.5 CLEANING

A. Clean plumbing fixtures and equipment.

3.6 PROTECTION

A. Protect installed products from damage due to subsequent construction operations.

B. Repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 22 4000

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SECTION 23 0517 - SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pipe sleeves.

B. Pipe-sleeve seals.

1.2 REFERENCE STANDARDS

A. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2016.

B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).

1.3 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store sleeve and sleeve seals in shipping containers, with labeling in place.

B. Provide temporary protective coating on cast iron and steel sleeves if shipped loose.

1.5 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.1 PIPE SLEEVES

A. Manufacturers:
   1. Flexicraft Industries; Pipe Wall Sleeve: www.flexicraft.com/#sle.
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. Vertical Piping:
   1. Sleeve Length: 1 inch above finished floor.
   2. Provide sealant for watertight joint.

C. Plastic or Sheet Metal: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.

D. Pipe Passing Through Mechanical, Laundry, and Animal Room Floors above Basement:
1. Galvanized steel pipe or black iron pipe with asphalt coating.
2. Connect sleeve with floor plate except in mechanical rooms.

E. Clearances:
1. Provide allowance for insulated piping.
2. Wall, Floor, Partitions, and Beam Flanges: 1 inch greater than external pipe diameter.
3. All Rated Openings: Caulked tight with fire stopping material in compliance with ASTM E814 in accordance with Section 07 8400 to prevent the spread of fire, smoke, and gases.

2.2 PIPE-SLEEVE SEALS

A. Manufacturers:
1. Flexicraft Industries; PipeSeal: www.flexicraft.com/#sle.
2. Substitutions: See Section 01 6000 - Product Requirements.

B. Modular Mechanical Sleeve-Seal:
1. Elastomer-based interlocking links continuously fill annular space between pipe and wall-sleeve, wall or casing opening.
2. Watertight seal between pipe and wall-sleeve, wall or casing opening.
3. Size and select seal component materials in accordance with service requirements.
4. Glass-reinforced plastic pressure end plates.

PART 3 EXECUTION

3.1 INSTALLATION

A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

B. Install piping to conserve building space, to not interfere with use of space and other work.

C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

D. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
1. Aboveground Piping:
   a. Pack solid using mineral fiber in compliance with ASTM C592.
   b. Fill space with an elastomer caulk to a depth of 0.50 inch where penetrations occur between conditioned and unconditioned spaces.
2. All Rated Openings: Caulk tight with fire stopping material in compliance with ASTM E814 in accordance with Section 07 8400 to prevent the spread of fire, smoke, and gases.

E. Manufactured Sleeve-Seal Systems:
1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.

2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
3. Locate piping in center of sleeve or penetration.
4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
5. Tighten bolting for a water-tight seal.
6. Install in accordance with manufacturer's recommendations.

F. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

3.2 CLEANING

A. Upon completion of work, clean all parts of the installation.

B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

END OF SECTION 23 0517

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SECTION 23 0548 - 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.

B. SUMMARY
1. This Section includes the following:
   a. Isolation pads.
   b. Isolation mounts.
   c. Restrained elastomeric isolation mounts.
   d. Freestanding and restrained spring isolators.
   e. Housed spring mounts.
   f. Elastomeric hangers.
   g. Spring hangers.
   h. Spring hangers with vertical-limit stops.
   i. Pipe riser resilient supports.
   j. Resilient pipe guides.
   k. Freestanding and restrained air-mounting system.
   l. Restrained vibration isolation roof-curb rails.
   m. Seismic snubbers.
   n. Restraining braces and cables.
   o. Steel and inertia, vibration isolation equipment bases.

C. DEFINITIONS
1. IBC: International Building Code.
2. ICC-ES: ICC-Evaluation Service.
3. OSHPD: Office of Statewide Health Planning and Development for the State of California.

D. PERFORMANCE REQUIREMENTS
1. Wind-Restraint Loading:
   a. Basic Wind Speed: 140mph
   b. Building Classification Category: IV.
   c. Minimum 10 lb/sq. ft. (48.8 kg/sq. m) multiplied by the maximum area of the HVAC component projected on a vertical plane that is normal to the wind direction, and 45 degrees either side of normal.
2. Seismic-Restraint Loading:
   a. See Drawings

E. ACTION SUBMITTALS
1. Product Data: For the following:
   a. Include rated load, rated deflection, and overload capacity for each vibration isolation device.

b. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.
c. Interlocking Snubbers: Include ratings for horizontal, vertical, and combined loads.

2. Delegated-Design Submittal: For vibration isolation and seismic-restraint details indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
   a. Design Calculations: Calculate static and dynamic loading due to equipment weight and operation, seismic and wind forces required to select vibration isolators, seismic and wind restraints, and for designing vibration isolation bases.
      1) Coordinate design calculations with wind load calculations required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.
   b. 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 has been examined for excessive stress and that none will exist.
   c. Vibration Isolation Base Details: Detail overall dimensions, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, base weights, equipment static loads, power transmission, component misalignment, and cantilever loads.
   d. Seismic and Wind Restraint Details:
      1) Design Analysis: To support selection and arrangement of seismic and wind restraints. Include calculations of combined tensile and shear loads.
      2) 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.
      3) 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.

F. INFORMATIONAL SUBMITTALS
1. Coordination Drawings: Show coordination of seismic bracing for HVAC piping and equipment with other systems and equipment in the vicinity, including other supports and seismic restraints.
2. Qualification Data: For professional engineer
3. Welding certificates.
4. Field quality-control test reports.

G. CLOSEOUT SUBMITTALS
1. Operation and Maintenance Data: For air-mounting systems to include in operation and maintenance manuals.

H. QUALITY ASSURANCE
1. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
2. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.

3. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
4. 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 not available, 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 VIBRATION ISOLATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Kinetics Noise Control.
2. Mason Industries.
3. Vibro-Acoustics.
4. Pads Arranged in single or multiple layers of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized-steel baseplates, and factory cut to sizes that match requirements of supported equipment.
   a. Resilient Material: Oil- and water-resistant neoprene
5. Mounts: Double-deflection type, with molded, oil-resistant rubber, hermetically sealed compressed fiberglass, or neoprene isolator elements with factory- drilled, encapsulated top plate for bolting to equipment and with baseplate for bolting to structure. Color-code or otherwise identify to indicate capacity range.
   a. Materials: Cast-ductile-iron or welded steel housing containing two separate and opposing, oil-resistant rubber or neoprene elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
   b. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.
6. Restrained Mounts: All-directional mountings with seismic restraint.
   a. Materials: Cast-ductile-iron or welded steel housing containing two separate and opposing, oil-resistant rubber or neoprene elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
   b. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.
7. Spring Isolators: Freestanding, laterally stable, open-spring isolators.
   a. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
   b. Minimum Additional Travel: 50 percent of the required deflection at rated load.
   c. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
   d. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
   e. Baseplates: Factory drilled for bolting to structure and bonded to 1/4-inch- (6-mm-) thick, rubber isolator pad attached to baseplate underside. Baseplates shall limit floor load to 500 psig (3447 kPa).

f. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

8. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic or limit-stop restraint.
   a. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to weight being removed; factory-drilled baseplate bonded to 1/4-inch- (6-mm-) thick, neoprene or rubber isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
   b. Restraint: Seismic or limit stop as required for equipment and authorities having jurisdiction.
   c. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
   d. Minimum Additional Travel: 50 percent of the required deflection at rated load.
   e. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
   f. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
9. Housed Spring Mounts: Housed spring isolator with integral seismic snubbers.
   a. Housing: Ductile-iron or steel housing to provide all-directional seismic restraint.
   b. Base: Factory drilled for bolting to structure.
   c. Snubbers: Vertically adjustable to allow a maximum of 1/4-inch (6-mm) travel up or down before contacting a resilient collar.
10. Elastomeric Hangers: Single or double-deflection type, fitted with molded, oil-resistant elastomeric isolator elements bonded to steel housings with threaded connections for hanger rods. Color-code or otherwise identify to indicate capacity range.
11. Spring Hangers: Combination coil-spring and elastomeric- insert hanger with spring and insert in compression.
   a. 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.
   b. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
   c. Minimum Additional Travel: 50 percent of the required deflection at rated load.
   d. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
   e. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
   f. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
   g. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.
12. Spring Hangers with Vertical-Limit Stop: Combination coil- spring and elastomeric-insert hanger with spring and insert in compression and with a vertical- limit stop.
   a. 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.
   b. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
   c. Minimum Additional Travel: 50 percent of the required deflection at rated load.
   d. Lateral Stiffness: More than 80 percent of rated vertical stiffness.

e. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
f. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
g. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.
h. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

13. Pipe Riser Resilient Support : All-directional, acoustical pipe anchor consisting of 2 steel tubes separated by a minimum of 1/2-inch- (13-mm-) thick neoprene. Include steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions. Design support for a maximum load on the isolation material of 500 psig (3.45 MPa) and for equal resistance in all directions.
14. Resilient Pipe Guides: Telescopic arrangement of 2 steel tubes or post and sleeve arrangement separated by a minimum of 1/2-inch- (13-mm-) thick neoprene. Where clearances are not readily visible, a factory-set guide height with a shear pin to allow vertical motion due to pipe expansion and contraction shall be fitted. Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

B. AIR-MOUNTING SYSTEMS
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. California Dynamics Corporation.
b. Firestone Industrial Products Company.
c. Kinetics Noise Control.
d. Mason Industries.
e. Vibration Eliminator Co., Inc.
2. Air Mounts: Freestanding, single or multiple, compressed-air bellows.
a. Assembly: Upper and lower steel sections connected by a replaceable, flexible, nylon-reinforced neoprene bellows.
b. Maximum Natural Frequency: 3 Hz.
c. Operating Pressure Range: 25 to 100 psig (172 to 690 kPa).
d. Burst Pressure: At least three times manufacturer's published maximum operating pressure.
e. Leveling Valves: Minimum of 3 required to maintain leveling within plus or minus 1/8 inch (3 mm).
3. Restrained Air Mounts : Housed compressed-air bellows.
a. Assembly: Upper and lower steel sections connected by a replaceable, flexible, nylon-reinforced neoprene bellows and spring, with angle-iron frame having vertical-limit stops and channel-section top with leveling adjustment and attachment screws.
b. Maximum Natural Frequency: 3 Hz.
c. Operating Pressure Range: 25 to 100 psig (172 to 690 kPa).
d. Burst Pressure: At least three times manufacturer's published maximum operating pressure.
e. Leveling Valves: Minimum of 3 required to maintain leveling within plus or minus 1/8 inch (3 mm).

C. RESTRAINED VIBRATION ISOLATION ROOF-CURB RAILS
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Amber/Booth Company, Inc.
b. California Dynamics Corporation.

c. Isolation Technology, Inc.
d. Kinetics Noise Control.
e. Mason Industries.
f. Thybar Corporation.
g. Vibration Eliminator Co., Inc.
h. Vibration Isolation.
i. Vibration Mountings & Controls, Inc.

2. General Requirements for Restrained Vibration Isolation Roof-Curb Rails: Factory-assembled, fully enclosed, insulated, air- and watertight curb rail designed to resiliently support equipment and to withstand seismic and wind forces.
3. Lower Support Assembly: Formed sheet-metal section containing adjustable and removable steel springs that support upper frame. Upper frame shall provide continuous support for equipment and shall be captive to resiliently resist seismic and wind forces. Lower support assembly shall have a means for attaching to building structure and a wood nailer for attaching roof materials, and shall be insulated with a minimum of 2 inches (50 mm) of rigid, glass-fiber insulation on inside of assembly.
4. Spring Isolators: Adjustable, restrained spring isolators shall be mounted on 1/4-inch- (6-mm-) thick, elastomeric vibration isolation pads and shall have access ports, for level adjustment, with removable waterproof covers at all isolator locations. Isolators shall be located so they are accessible for adjustment at any time during the life of the installation without interfering with the integrity of the roof.
   a. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic or wind restraint.
      1) Housing: Steel with resilient vertical-limit stops and adjustable equipment mounting and leveling bolt.
      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.
   b. Pads: Arranged in single or multiple layers of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized-steel baseplates, and factory cut to sizes that match requirements of supported equipment.
      1) Resilient Material: Oil- and water-resistant standard neoprene
5. Snubber Bushings: All-directional, elastomeric snubber bushings at least 1/4 inch (6 mm) thick.
6. Water Seal: Galvanized sheet metal with EPDM seals at corners, attached to upper support frame, extending down past wood nailer of lower support assembly, and counterflashed over roof materials.

D. VIBRATION ISOLATION EQUIPMENT BASES
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Amber/Booth Company, Inc.
   b. California Dynamics Corporation.
   c. Isolation Technology, Inc.
   d. Kinetics Noise Control.
   e. Mason Industries.
   f. Vibration Eliminator Co., Inc.
   g. Vibration Isolation.
   h. Vibration Mountings & Controls, Inc.

2. Steel Base: Factory-fabricated, welded, structural-steel bases and rails.
   a. Design Requirements: Lowest possible mounting height with not less than 1-inch (25- mm) clearance above the floor. Include equipment anchor bolts and auxiliary motor slide bases or rails.
      1) Include supports for suction and discharge elbows for pumps.
   b. Structural Steel: Steel shapes, plates, and bars complying with ASTM A 36/A 36M. Bases shall have shape to accommodate supported equipment.
   c. Support Brackets: Factory-welded steel brackets on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.
3. Inertia Base: Factory-fabricated, welded, structural-steel bases and rails ready for placement of cast-in-place concrete.
   a. Design Requirements: Lowest possible mounting height with not less than 1-inch (25- mm) clearance above the floor. Include equipment anchor bolts and auxiliary motor slide bases or rails.
      1) Include supports for suction and discharge elbows for pumps.
   b. Structural Steel: Steel shapes, plates, and bars complying with ASTM A 36/A 36M. Bases shall have shape to accommodate supported equipment.
   c. Support Brackets: Factory-welded steel brackets on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.
   d. Fabrication: Fabricate steel templates to hold equipment anchor-bolt sleeves and anchors in place during placement of concrete. Obtain anchor-bolt templates from supported equipment manufacturer.

E. SEISMIC-RESTRAINT DEVICES
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Amber/Booth Company, Inc.
   b. California Dynamics Corporation.
   c. Cooper B-Line, Inc.; a division of Cooper Industries.
   d. Hilti, Inc.
   e. Kinetics Noise Control.
   f. Loos & Co.; Cableware Division.
   g. Mason Industries.
   h. TOLCO Incorporated; a brand of NIBCO INC.
   i. Unistrut; Tyco International, Ltd.
2. Snubbers: Factory fabricated using welded structural-steel shapes and plates, anchor bolts, and replaceable resilient isolation washers and bushings.
   a. Anchor bolts for attaching to concrete shall be seismic-rated, drill-in, and stud-wedge or female-wedge type.
   b. Resilient Isolation Washers and Bushings: Oil- and water-resistant neoprene.
   c. Maximum 1/4-inch (6-mm) air gap, and minimum 1/4-inch- (6-mm-) thick resilient cushion.
3. Channel Support System: MFMA-3, shop- or field-fabricated support 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; and rated in tension, compression, and torsion forces.
4. Restraint Cables: ASTM A 492 stainless-steel cables with end connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; and with a minimum of two clamping bolts for cable engagement.

5. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.
6. 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.
7. 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.
8. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.
9. 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 E 488. Minimum length of eight times diameter.
10. Adhesive Anchor Bolts: Drilled-in and capsule anchor system containing polyvinyl 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 E 488.

F. FACTORY FINISHES
1. Finish: Manufacturer's standard prime-coat finish ready for field painting.
2. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.
   a. Powder coating on springs and housings.
   b. All hardware shall be galvanized. Hot-dip galvanize metal components for exterior use.
   c. Baked enamel or powder coat for metal components on isolators for interior use.
   d. Color-code or otherwise mark vibration isolation and seismic- and wind-control devices to indicate capacity range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and seismic- and wind-control devices for compliance with requirements for installation tolerances and other conditions affecting performance.

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.

D. APPLICATIONS
1. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application byan evaluation service member of ICC-ES
2. 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.
3. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

E. VIBRATION-CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION
1. Comply with requirements in Section 077200 "Roof Accessories" for installation of roof curbs, equipment supports, and roof penetrations.
2. Equipment Restraints:
   a. 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.
   b. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch (3.2 mm).
   c. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES providing required submittals for component.
3. Piping Restraints:
   a. Comply with requirements in MSS SP-127.
   b. Space lateral supports a maximum of 40 feet (12 m) o.c., and longitudinal supports a maximum of 80 feet (24 m) o.c.
   c. Brace a change of direction longer than 12 feet (3.7 m).
4. Install cables so they do not bend across edges of adjacent equipment or building structure.
5. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES providing required submittals for component.
6. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.
7. 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.
8. 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.
9. Drilled-in Anchors:
   a. 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.
   b. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
   c. 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.
   d. 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.
   e. Set anchors to manufacturer's recommended torque, using a torque wrench.
   f. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

F. ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION
1. 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.

G. ADJUSTING
1. Adjust isolators after piping system is at operating weight.
2. 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.
3. Adjust air-spring leveling mechanism.
4. Adjust active height of spring isolators.
5. Adjust restraints to permit free movement of equipment within normal mode of operation.

H. DEMONSTRATION
1. Engage a factory-authorized service representative to train Cleveland Clinic maintenance personnel to adjust, operate, and maintain air-mounting systems. Refer to Section 017900 "Demonstration and Training."

END OF SECTION 23 0548

SECTION 23 0553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Pipe markers.

D. Ceiling tacks.

E. Ceiling Tacks

1.2 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2015.

1.3 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.

C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

D. Product Data: Provide manufacturers catalog literature for each product required.

E. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

F. Project Record Documents: Record actual locations of tagged valves.

PART 2 PRODUCTS

2.1 IDENTIFICATION APPLICATIONS

A. Air Handling Units: Nameplates.

B. Air Terminal Units: Tags.

C. Control Panels: Nameplates.

D. Major Control Components: Nameplates.

E. Piping: Tags.

F. Pumps: Nameplates.

G. Tanks: Nameplates.

H. Valves: Tags and ceiling tacks where located above lay-in ceiling.

I. Water Treatment Devices: Nameplates.

2.2 MANUFACTURERS

A. Brady Corporation: www.bradycorp.com.

B. Champion America, Inc: www.Champion-America.com.

C. Seton Identification Products: www.seton.com/aec.

D. Substitutions: See Section 01 6000 - Product Requirements.

2.3 NAMEPLATES

A. Description: Laminated three-layer plastic with engraved letters.
1. Letter Color: White.
2. Letter Height: 1/4 inch.
3. Background Color: Black.

2.4 TAGS

A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.

B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

C. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.5 PIPE MARKERS

A. Color: Comply with ASME A13.1.

B. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

2.6 CEILING TACKS

A. Description: Steel with 3/4 inch diameter color coded head.

B. Color code as follows:
1. HVAC Equipment: Yellow.
2. Fire Dampers and Smoke Dampers: Red.
3. Heating/Cooling Valves: Blue.

PART 3 EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Install plastic pipe markers in accordance with manufacturer's instructions.

D. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.

E. Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.

F. Identify control panels and major control components outside panels with plastic nameplates.

G. Identify thermostats relating to terminal boxes or valves with nameplates.

H. Identify valves in main and branch piping with tags.

I. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION 23 0553

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SECTION 23 0593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

B. Testing, adjustment, and balancing of refrigerating systems.

C. Measurement of final operating condition of HVAC systems.

1.2 REFERENCE STANDARDS

A. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2008.

B. NEBB (TAB) - Procedural Standards for Testing Adjusting and Balancing of Environmental Systems; 2015, with Errata (2017).

C. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2002.

1.3 SUBMITTALS

A. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
   1. Submit to DEDC, LLC.
   2. Include at least the following in the plan:
      a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
      b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
      c. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
      d. Final test report forms to be used.
      e. Detailed step-by-step procedures for TAB work for each system and issue, including:
         1) Terminal flow calibration (for each terminal type).
         2) Diffuser proportioning.
         3) Branch/submain proportioning.
         4) Total flow calculations.
         5) Rechecking.
         6) Diversity issues.
      f. Expected problems and solutions, etc.
      g. Details of how TOTAL flow will be determined; for example:
         1) Air: Sum of terminal flows via control system calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations.
         2) Water: Pump curves, circuit setter, flow station, ultrasonic, etc.

h. Confirmation of understanding of the outside air ventilation criteria under all conditions.
i. Method of verifying and setting minimum outside air flow rate will be verified and set and for what level (total building, zone, etc.).
j. Procedures for formal deficiency reports, including scope, frequency and distribution.

B. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
1. Revise TAB plan to reflect actual procedures and submit as part of final report.
2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for DEDC, LLC and for inclusion in operating and maintenance manuals.
3. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
4. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
5. Units of Measure: Report data in both I-P (inch-pound) and SI (metric) units.
6. Include the following on the title page of each report:
a. Name of Testing, Adjusting, and Balancing Agency.
b. Address of Testing, Adjusting, and Balancing Agency.
c. Telephone number of Testing, Adjusting, and Balancing Agency.
d. Project name.
e. Project location.
f. Project Engineer.
g. Project Contractor.
h. Report date.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

A. TAB contractor shall review all of the drawings with special attention to the controls drawings as there is additional instruction on the drawings and sequence of operation as to how balancing shall be performed and what information the controls contractor is required to obtain.

B. TAB contractor shall perform ductwork leak tests prior to installation of ceiling. TAB contractor shall schedule this work thru the mechanical contractor.

C. Perform total system balance in accordance with one of the following:
1. SMACNA (TAB).

D. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

E. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.

F. TAB Agency Qualifications:
1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.

2. Certified by one of the following:
   a. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org/#sle.

G. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.2 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
1. Systems are started and operating in a safe and normal condition.
2. Temperature control systems are installed complete and operable.
3. Proper thermal overload protection is in place for electrical equipment.
4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
5. Duct systems are clean of debris.
6. Fans are rotating correctly.
7. Fire and volume dampers are in place and open.
8. Air coil fins are cleaned and combed.
9. Access doors are closed and duct end caps are in place.
10. Air outlets are installed and connected.
11. Duct system leakage is minimized.
12. Hydronic systems are flushed, filled, and vented.
13. Pumps are rotating correctly.
14. Proper strainer baskets are clean and in place.
15. Service and balance valves are open.

B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.

C. Beginning of work means acceptance of existing conditions.

3.3 PREPARATION

A. Hold a pre-balancing meeting at least one week prior to starting TAB work.
1. Require attendance by all installers whose work will be tested, adjusted, or balanced.

B. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to DEDC, LLC to facilitate spot checks during testing.

3.4 ADJUSTMENT TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

B. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.5 RECORDING AND ADJUSTING

A. Ensure recorded data represents actual measured or observed conditions.

B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.6 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

3.7 SCOPE

A. Test, adjust, and balance the following:
1. Plumbing Pumps.
2. VRF Systems
3. Packaged Heating/Cooling Units.
4. Make-up Air Units
5. Fans.
6. Air Filters.
7. Air Inlets and Outlets.

3.8 MINIMUM DATA TO BE REPORTED

A. Electric Motors:
1. Manufacturer.
2. Model/Frame.
3. HP/BHP.
4. Phase, voltage, amperage; nameplate, actual, no load.
5. RPM.
6. Service factor.
7. Sheave Make/Size/Bore.

B. V-Belt Drives:

1. Identification/location.
2. Required driven RPM.
3. Driven sheave, diameter and RPM.
4. Belt, size and quantity.
5. Motor sheave diameter and RPM.
6. Center to center distance, maximum, minimum, and actual.

C. Pumps:
1. Identification/number.
2. Manufacturer.
3. Size/model.
4. Impeller.
5. Service.
6. Design flow rate, pressure drop, BHP.
7. Actual flow rate, pressure drop, BHP.
8. Discharge pressure.
9. Suction pressure.
10. Total operating head pressure.

D. Air Cooled Condensers:
1. Identification/number.
2. Location.
3. Manufacturer.
4. Model number.
5. Serial number.
6. Entering DB air temperature, design and actual.
7. Leaving DB air temperature, design and actual.
8. Number of compressors.

E. Cooling Coils:
1. Identification/number.
2. Location.
3. Service.
4. Manufacturer.
5. Air flow, design and actual.
6. Entering air DB temperature, design and actual.
7. Entering air WB temperature, design and actual.
8. Leaving air DB temperature, design and actual.
9. Leaving air WB temperature, design and actual.
10. Water flow, design and actual.
11. Water pressure drop, design and actual.
12. Entering water temperature, design and actual.
13. Leaving water temperature, design and actual.
14. Saturated suction temperature, design and actual.
15. Air pressure drop, design and actual.

F. Heating Coils:
1. Identification/number.

2. Location.
3. Service.
4. Manufacturer.
5. Air flow, design and actual.
6. Water flow, design and actual.
7. Water pressure drop, design and actual.
8. Entering water temperature, design and actual.
9. Leaving water temperature, design and actual.
10. Entering air temperature, design and actual.
11. Leaving air temperature, design and actual.
12. Air pressure drop, design and actual.

G. Air Moving Equipment:
1. Location.
2. Manufacturer.
3. Model number.
4. Serial number.
5. Arrangement/Class/Discharge.
6. Air flow, specified and actual.
7. Return air flow, specified and actual.
8. Outside air flow, specified and actual.
9. Total static pressure (total external), specified and actual.
10. Inlet pressure.
11. Discharge pressure.
12. Sheave Make/Size/Bore.
13. Number of Belts/Make/Size.
14. Fan RPM.

H. Return Air/Outside Air:
1. Identification/location.
2. Design air flow.
3. Actual air flow.
4. Design return air flow.
5. Actual return air flow.
6. Design outside air flow.
7. Actual outside air flow.
8. Return air temperature.
9. Outside air temperature.
10. Required mixed air temperature.
11. Actual mixed air temperature.
12. Design outside/return air ratio.
13. Actual outside/return air ratio.

I. Exhaust Fans:
1. Location.
2. Manufacturer.
3. Model number.

4. Serial number.
5. Air flow, specified and actual.
6. Total static pressure (total external), specified and actual.
7. Inlet pressure.
8. Discharge pressure.
9. Sheave Make/Size/Bore.
10. Number of Belts/Make/Size.
11. Fan RPM.

J. Duct Traverses:
1. System zone/branch.
2. Duct size.
3. Area.
4. Design velocity.
5. Design air flow.
6. Test velocity.
7. Test air flow.
8. Duct static pressure.
9. Air temperature.
10. Air correction factor.

K. Duct Leak Tests:
1. Description of ductwork under test.
2. Duct design operating pressure.
3. Duct design test static pressure.
4. Duct capacity, air flow.
5. Maximum allowable leakage duct capacity times leak factor.
6. Test apparatus:
    a. Blower.
    b. Orifice, tube size.
    c. Orifice size.
    d. Calibrated.
7. Test static pressure.
8. Test orifice differential pressure.
9. Leakage.

L. Terminal Unit Data:
1. Manufacturer.
2. Type, constant, variable, single, dual duct.
3. Identification/number.
4. Location.
5. Model number.
6. Size.
7. Minimum static pressure.
8. Minimum design air flow.
9. Maximum design air flow.
10. Maximum actual air flow.

11. Inlet static pressure.

M. Air Distribution Tests:
1. Air terminal number.
2. Room number/location.
3. Terminal type.
4. Terminal size.
5. Design velocity.
6. Design air flow.
7. Test (final) velocity.
8. Test (final) air flow.
9. Percent of design air flow.

END OF SECTION 23 0593

SECTION 23 0713 - DUCT INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Glass Fiber, Flexible.

B. Glass Fiber, Rigid

C. Jackets.

D. Duct insulation.

E. Jacketing and accessories.

1.2 REFERENCE STANDARDS

A. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

B. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2017.

C. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2016.

D. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013.

E. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014.

F. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2016.

G. ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings; 2014.

H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.

I. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.

J. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005 (Revised 2009).

K. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.3 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.6 FIELD CONDITIONS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.2 GLASS FIBER, FLEXIBLE

A. Manufacturer:
1. Johns Manville: www.jm.com/#sle.
2. Owens Corning Corporation: www.ocbuildingspec.com/#sle.

B. Insulation: ASTM C553; flexible, noncombustible blanket.
1. K value: 0.36 at 75 degrees F, when tested in accordance with ASTM C518.
2. Minimum Density of 1.0 PCF.

C. Vapor Barrier Jacket:
1. 0.0032 inch vinyl.
2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
3. Secure with pressure-sensitive tape.

2.3 GLASS FIBER, RIGID

A. Manufacturer:

1. Johns Manville: www.jm.com/#sle.
2. Owens Corning Corp: www.owenscorning.com.

B. Insulation: ASTM C612; rigid, noncombustible blanket.
1. K Value: 0.24 at 75 degrees F, when tested in accordance with ASTM C518.
2. Maximum Service Temperature: 450 degrees F.
3. Maximum Water Vapor Absorption: 5.0 percent.
4. Maximum Density: 8.0 pcf.

C. Vapor Barrier Jacket:
1. 0.0032 inch vinyl.
2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.

2.4 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturers:
1. Aeroflex USA, Inc; Aerocel Sheet and Roll with PSA: www.aeroflexusa.com/#sle.
2. Armacell LLC; ArmaFlex Ultra with FlameDefense: www.armacell.us/#sle.
3. K-Flex USA LLC; Insul-Sheet: www.kflexusa.com/#sle.
4. Substitutions: See Section 01 6000 - Product Requirements

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1, in sheet form.
1. Minimum Service Temperature: Minus 40 degrees F.
2. Maximum Service Temperature: 180 degrees F.
3. Connection: Waterproof vapor barrier adhesive.

2.5 JACKETING AND ACCESSORIES

A. Aluminum Jacket:
1. Comply with ASTM B209/B209M, Temper H14, minimum thickness of 0.016 inch with factory-applied polyethylene and kraft paper moisture barrier on the inside surface.
2. Thickness: 0.016 inch sheet.
3. Finish: Smooth.
4. Joining: Longitudinal slip joints and 2 inch laps.
5. Fittings: 0.016 inch thick die-shaped fitting covers with factory-attached protective liner.
6. Metal Jacket Bands: 3/8 inch wide; 0.010 inch thick stainless steel.

B. Flexible Weather-Proofing Outdoor Jacket: Self-healing, field-applied outdoor cladding.
1. Material: Aluminum foil/polymer laminate with rubberized asphalt layer and acrylic adhesive.
2. Thickness: 34 mil, 0.034 inch.
3. Finish: Smooth.
4. Color: White.
5. Water Vapor Transmission: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
6. Mold Resistance: Pass when tested in accordance with ASTM C1338.

C. PVC Plastic.

1. Manufacturers:
   a. Johns Manville Corporation;www.jm.com.
   b. KFlexUSA
   c. b. Substitutions: See Section 01 6000 - Product Requirements.
2. Jacket: One piece molded type fitting covers and sheet material, white
   a. Minimum Service Temperature: 0 degrees F.
   b. Maximum Service Temperature: 150 degrees F.
   c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
   d. Thickness: 12 mil.
   e. Connections: Brush on welding adhesive.

PART 3 EXECUTION

3.1 EXAMINATION

A. Test ductwork for design pressure prior to applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.
   1. For rigid polyisocyanurate, installation shall only be completed by manufacturer licensed contractors.

B. Insulated Ducts Conveying Air Below Ambient Temperature:
   1. Provide insulation with vapor barrier jackets.
   2. Finish with tape and vapor barrier jacket.
   3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
   4. Insulate entire system, including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

C. Insulated Ducts Conveying Air Above Ambient Temperature:
   1. Provide with or without standard vapor barrier jacket.
   2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

D. Ducts Exposed in Mechanical Equipment Rooms or Finished Spaces: Finish with PVC Jacket (see section above).

E. Exterior Applications: Provide insulation with Aluminum or Flexible Weather Proofing Outdoor jacket. See section above

F. External Duct Insulation Application:
   1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
   2. Secure insulation without vapor barrier with staples, tape, or wires.
   3. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.

4. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

3.3 SCHEDULES

A. All supply and return air ducts and plenums shall be insulated with a minimum of R-6 insulation when located inside the building and a minimum of R-8 insulation when located outside the building. When located within a building assembly, the duct or plenum shall be separated from the building exterior or unconditioned or exempt spaces by a minimum of R-8 insulation.
   1. Exceptions
      a. When located within equipment
      b. When the design temperature difference between the interior and exterior of the duct or plenum does not exceed 15°F (8°C).

B. All exposed exterior duct to be insulated / jacketed

C. All ducts, air handlers and filter boxes shall be sealed. Joints and seams shall comply with Section 603.9 of the International Mechanical Code.

END OF SECTION 23 0713

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SECTION 23 0719 - HVAC PIPING INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Piping insulation.

B. Flexible removable and reusable blanket insulation.

C. Jacketing and accessories.

D. Engineered wall outlet seals and refrigerant piping insulation protection.

1.2 REFERENCE STANDARDS

A. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2016.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.

C. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.

D. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015.

E. ASTM G153 - Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials; 2013.

F. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.3 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.6 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.2 EPDM FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturers:
1. Armacell LLC; ArmaFlex Ultra with FlameDefense: www.armacell.us/#sle.
2. K-Flex USA LLC; K-Flex Titan: www.kflexusa.com/#sle.
3. Substitutions: See Section 01 6000 - Product Requirements.

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
1. Minimum Service Temperature: Minus 40 degrees F.
2. Maximum Normal Service Temperature: 220 degrees F.
3. Maximum "Upset Condition" Service Temperature: 250 degrees F for 10hr duration without degredation.
4. Connection: Waterproof vapor barrier adhesive.

2.3 JACKETING AND ACCESSORIES

A. PVC Plastic.
1. Manufacturers:
   a. Johns Manville Corporation; None - N/A: www.jm.com/#sle.
   b. K-Flex USA.
   c. Substitutions: See Section 01 6000 - Product Requirements.
2. Jacket: One piece molded type fitting covers and sheet material, white color.
   a. Minimum Service Temperature: 0 degrees F.
   b. Maximum Service Temperature: 150 degrees F.
   c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
   d. Thickness: 10 mil, 0.010 inch.
   e. Connections: Brush on welding adhesive.

B. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.
1. Finish: Smooth.

2.4 ENGINEERED WALL OUTLET SEALS AND REFRIGERANT PIPING INSULATION PROTECTION

A. Manufacturers:
1. Airex Manufacturing, Inc; None - N/A: www.airexmfg.com/#sle.
2. Substitutions: See Section 01 6000 - Product Requirements.

B. Basis of Design: Airex Manufacturing, Inc; www.airexmfg.com/#sle.
1. Pipe Penetration Wall Seal: Airex Titan Outlet.
2. Refrigeration Pipe Insulation Protection System: Airex E-Flex Guard.
3. Pipe Penetration Wall Seal and Insulation Protection System: Airex Pro-System Kit.

C. Pipe Penetration Wall Seal: Seals HVAC piping wall penetrations with compression gasket wall mounted rigid plastic outlet cover.
1. Outlet Cover Color: Gray.

D. Pipe strut / hanger insulation
1. Hydra-Zorb "Klo-Shure" Series 8, or 9 strut mounts
2. Hydra-Zorb TRH Hanger system
3. Substitutions: See Section 01600 - Product Requirements

E. Insulation Protection System: Refrigerant piping insulation PVC protective cover.
1. PVC Insulation Cover Color: White with full-length velcro fastener.
2. Weatherization and Ultraviolet Exposure Protection: Comply with ASTM G153.
3. Water/Vapor Permeability: Comply with ASTM E96/E96M.
4. Anti-Fungal and Anti-Microbial Resistance: Comply with ASTM G21.
5. Flame Spread and Smoke Development Rating of 24/450: Comply with ASTM E84 or UL 723.

PART 3 EXECUTION

3.1 EXAMINATION

A. Test piping for design pressure, liquid tightness, and continuity prior to applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Exposed Piping: Locate insulation and cover seams in least visible locations.

C. Insulated Pipes Conveying Fluids Below Ambient Temperature:
1. Insulate entire system, including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

D. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

E. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.

F. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, see Section 07 8400.

G. Pipe Exposed in Finished Spaces or Mechanical Rooms: Finish with insulation and white PVC Jacket (see above)

H. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

3.3 SCHEDULE

A. VRV/VRF Piping
1. High Pressure Vapor Line up to <1" diameter: 1.5" thick EPDM Flexible Elastomeric Cellular
2. Low Pressure Vapor Line up to <1" diameter: 1.0" thick EPDM Flexible Elastomeric Cellular
3. Liquid Line up to <1" diameter: 1.0" thick EPDM Flexible Elastomeric Cellular

B. Condensate Drains from Cooling Coils: 1/2" EPDM Flexible Elastomeric Celluar Insulation

END OF SECTION 23 0719

SECTION 23 0800 - COMMISSIONING OF HVAC

PART 1 GENERAL

1.1 SUMMARY

A. See Section 01 9113.01 - 90percentGeneral Commissioning Requirements for overall objectives; comply with the requirements of Section 01 9113.01.

B. The Commissioning Authority (CA) directs and coordinates all commissioning activities and provides Prefunctional Checklists and Functional Test Procedures for Contractor's use.

C. The following HVAC equipment is to be commissioned, including commissioning activities for the following specific items:
1. Control system.
2. Piping systems and equipment.
3. CO/NO2 monitoring & exhaust system
4. VRV systems
5. DOAS units
6. Kitchen MAU, Hoods, EFs, Ansul systems
7. Other equipment and systems explicitly identified elsewhere in Contract Documents as requiring commissioning.

1.2 REFERENCE STANDARDS

A. ASHRAE Guideline 1.1 - The HVAC Commissioning Process; 2007

1.3 SUBMITTALS

A. Updated Submittals: Keep the Commissioning Authority informed of all changes to control system documentation made during programming and setup; revise and resubmit when substantial changes are made.

B. Draft Prefunctional Checklists and Functional Test Procedures for Control System: Detailed written plan indicating the procedures to be followed to test, checkout and adjust the control system prior to full system Functional Testing; include at least the following for each type of equipment controlled:

C. Contractor shall draft Prefunctional Checklists and Functional Test Procedures for systems being commissioned: Detailed written plan indicating the procedures to be followed to test, checkout and adjust the control system prior to full system Functional Testing; include at least the following for each type of equipment controlled:
1. System name.
2. List of devices.
3. Step-by-step procedures for testing each controller after installation, including:
    a. Process of verifying proper hardware and wiring installation.

b. Process of downloading programs to local controllers and verifying that they are addressed correctly.
c. Process of performing operational checks of each controlled component.
d. Plan and process for calibrating valve and damper actuators and all sensors.
e. Description of the expected field adjustments for transmitters, controllers and control actuators should control responses fall outside of expected values.

4. Copy of proposed log and field checkout sheets to be used to document the process; include space for initial and final read values during calibration of each point and space to specifically indicate when a sensor or controller has "passed" and is operating within the contract parameters.
5. Description of the instrumentation required for testing.
6. Indicate what tests on what systems should be completed prior to TAB using the control system for TAB work. Coordinate with the Commissioning Authority and TAB contractor for this determination.

D. Startup Reports, Prefunctional Checklists, and Trend Logs: Submit for approval of Commissioning Authority.

E. HVAC Control System O&M Manual Requirements. In addition to documentation specified elsewhere, compile and organize at minimum the following data on the control system:
1. Specific step-by-step instructions on how to perform and apply all functions, features, modes, etc. mentioned in the controls training sections of this specification and other features of this system. Provide an index and clear table of contents. Include the detailed technical manual for programming and customizing control loops and algorithms.
2. Full as-built set of control drawings.
3. Full as-built sequence of operations for each piece of equipment.
4. Full points list; in addition to the information on the original points list submittal, include a listing of all rooms with the following information for each room:
   a. Floor.
   b. Room number.
   c. Room name.
   d. Air handler unit ID.
   e. Reference drawing number.
   f. Air terminal unit tag ID.
   g. Heating and/or cooling valve tag ID.
   h. Minimum air flow rate.
   i. Maximum air flow rate.
5. Full print out of all schedules and set points after testing and acceptance of the system.
6. Full as-built print out of software program.
7. Electronic copy on disk of the entire program for this facility.
8. Marking of all system sensors and thermostats on the as-built floor plan and HVAC drawings with their control system designations.
9. Maintenance instructions, including sensor calibration requirements and methods by sensor type, etc.
10. Control equipment component submittals, parts lists, etc.
11. Warranty requirements.
12. Copies of all checkout tests and calibrations performed by the Contractor (not commissioning tests).
13. Organize and subdivide the manual with permanently labeled tabs for each of the following data in the given order:
    a. Sequences of operation.
    b. Control drawings.

c. Points lists.
d. Controller and/or module data.
e. Thermostats and timers.
f. Sensors and DP switches.
g. Valves and valve actuators.
h. Dampers and damper actuators.
i. Program setups (software program printouts).

F. Project Record Documents: See Section 01 7800 for additional requirements.
1. Submit updated version of control system documentation, for inclusion with operation and maintenance data.
2. Show actual locations of all static and differential pressure sensors (air, water and building pressure) and air-flow stations on project record drawings.

G. Draft Training Plan: In addition to requirements specified in Section 01 7900, include:
1. Follow the recommendations of ASHRAE Guideline 1.1.
2. Control system manufacturer's recommended training.
3. Demonstration and instruction on function and overrides of any local packaged controls not controlled by the HVAC control system.

H. Training Manuals: See Section 01 7900 for additional requirements.
1. Provide three extra copies of the controls training manuals in a separate manual from the O&M manuals.

PART 2 PRODUCTS

2.1 TEST EQUIPMENT

A. Provide all standard testing equipment required to perform startup and initial checkout and required functional performance testing; unless otherwise noted such testing equipment will NOT become the property of Owner.

B. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required in order to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Owner; such equipment, tools, and instruments are to become the property of Owner.

PART 3 EXECUTION

3.1 PREPARATION

A. Furnish additional information requested by the Commissioning Authority.

B. Prepare a preliminary schedule for HVAC pipe and duct system testing, flushing and cleaning, equipment start-up and testing, adjusting, and balancing start and completion for use by the Commissioning Authority; update the schedule as appropriate.

C. Notify the Commissioning Authority when pipe and duct system testing, flushing, cleaning, startup of each piece of equipment and testing, adjusting, and balancing will occur; when commissioning activities not yet

performed or not yet scheduled will delay construction notify ahead of time and be proactive in seeing that the Commissioning Authority has the scheduling information needed to efficiently execute the commissioning process.

D. Put all HVAC equipment and systems into operation and continue operation during each working day of testing, adjusting, and balancing and commissioning, as required.

E. Provide test holes in ducts and plenums where directed to allow air measurements and air balancing; close with an approved plug.

F. Provide temperature and pressure taps in accordance with Contract Documents.
1. Provide a pressure/temperature plug at each water sensor that is an input point to the control system.

3.2 INSPECTING AND TESTING - GENERAL

A. Submit startup plans, startup reports, and Prefunctional Checklists for each item of equipment or other assembly to be commissioned.

B. Perform the Functional Tests directed by the Commissioning Authority for each item of equipment or other assembly to be commissioned.

C. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Owner.

3.3 TAB COORDINATION

A. TAB: Testing, adjusting, and balancing of HVAC.

B. Coordinate commissioning schedule with TAB schedule.

C. Review the TAB plan to determine the capabilities of the control system toward completing TAB.

D. Have all required Prefunctional Checklists, calibrations, startup and component Functional Tests of the system completed and approved by the Commissioning Authority prior to starting TAB.

3.4 CONTROL SYSTEM FUNCTIONAL TESTING

A. Do not start Functional Testing until all controlled components have themselves been successfully Functionally Tested in accordance with Contract Documents.

B. Using a skilled technician who is familiar with this building, execute the Functional Testing of the control system as required by the Commissioning Authority.

C. Functional Testing of the control system constitutes demonstration .

D. Functionally Test integral or stand-alone controls in conjunction with the Functional Tests of the equipment they are attached to, including any interlocks with other equipment or systems; further testing during control system Functional Test is not required unless specifically indicated below.

E. Demonstrate the following to the Commissioning Authority during testing of controlled equipment; coordinate with commissioning of equipment.
1. Setpoint changing features and functions.
2. Sensor calibrations.

F. If the control system, integral control components, or related equipment do not respond to changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice, under any of the conditions, sequences, or modes tested, correct all systems, equipment, components, and software required at no additional cost to Owner.

3.5 OPERATION AND MAINTENANCE MANUALS

A. Add design intent documentation furnished by DEDC, LLC to manuals prior to submission to Owner.

B. Submit manuals related to items that were commissioned to Commissioning Authority for review; make changes recommended by Commissioning Authority.

C. Commissioning Authority will add commissioning records to manuals after submission to Owner.

3.6 DEMONSTRATION AND TRAINING

A. Demonstrate operation and maintenance of HVAC system to Owner' personnel; if during any demonstration, the system fails to perform in accordance with the information included in the O&M manual, stop demonstration, repair or adjust, and repeat demonstration. Demonstrations may be combined with training sessions if appropriate.

B. These demonstrations are in addition to, and not a substitute for, Prefunctional Checklists and demonstrations to the Commissioning Authority during Functional Testing.

C. Provide hands-on training of Owner's designated personnel on operation and maintenance of the HVAC system, control system, and all equipment items indicated to be commissioned.

D. TAB Review: Instruct Owner's personnel for minimum 2 hours, after completion of TAB, on the following:
1. Review final TAB report, explaining the layout and meanings of each data type.
2. Discuss any outstanding deficient items in control, ducting or design that may affect the proper delivery of air or water.
3. Identify and discuss any terminal units, duct runs, diffusers, coils, fans and pumps that are close to or are not meeting their design capacity.
4. Discuss any temporary settings and steps to finalize them for any areas that are not finished.
5. Other salient information that may be useful for facility operations, relative to TAB.

E. Provide the services of manufacturer representatives to assist instructors where necessary.

F. Provide the services of the HVAC controls instructor at other training sessions, when requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.

END OF SECTION 23 0800

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SECTION 23 2300 - REFRIGERANT PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Piping.

B. Refrigerant.

C. Moisture and liquid indicators.

D. Valves.

E. Strainers.

F. Check valves.

1.2 REFERENCE STANDARDS

A. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2013.

B. ASHRAE Std 34 - Designation and Safety Classification of Refrigerants; 2013.

C. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing and Fusing Operators; 2017.

D. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2018.

E. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes; 2018.

F. ASME B31.5 - Refrigeration Piping and Heat Transfer Components; 2016.

G. ASME B31.9 - Building Services Piping; 2014.

H. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

I. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2016.

J. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2016.

K. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service; 2016.

L. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2011 (Amended 2012).

M. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2009.

1.3 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide general assembly of specialties, including manufacturers catalogue information. Provide manufacturers catalog data including load capacity.

C. Sustainable Design Documentation: Submit manufacturer's product data on refrigerant used, showing compliance with specified requirements.

D. Shop Drawings: Indicate schematic layout of system, including equipment, critical dimensions, and sizes.

E. Design Data: Submit design data indicating pipe sizing. Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.

F. Test Reports: Indicate results of leak test, acid test.

G. Manufacturer's Installation Instructions: Indicate support, connection requirements, and isolation for servicing.

H. Submit welders certification of compliance with ASME BPVC-IX.

I. Project Record Documents: Record exact locations of equipment and refrigeration accessories on record drawings.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum 5 years of documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store piping and specialties in shipping containers with labeling in place.

B. Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.

C. Dehydrate and charge components such as piping and receivers, seal prior to shipment, until connected into system.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Filter-Driers:
1. Use a filter-drier immediately ahead of liquid-line controls, such as thermostatic expansion valves, solenoid valves, and moisture indicators.

2.2 REGULATORY REQUIREMENTS

2.3 PIPING

A. Copper Tube: ASTM B280, H58 hard drawn or O60 soft annealed.
   1. Fittings: ASME B16.22 wrought copper.
   2. Joints: Braze, AWS A5.8M/A5.8 BCuP silver/phosphorus/copper alloy.

B. Copper Tube to 7/8 inch OD: ASTM B88 (ASTM B88M), Type K (A), annealed.
   1. Fittings: ASME B16.26 cast copper.
   2. Joints: Flared.

C. Pipe Supports and Anchors:
   1. Provide hangers and supports that comply with MSS SP-58.
      a. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
   2. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
   3. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
   4. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
   5. Vertical Support: Steel riser clamp.
   6. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
   7. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
   8. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.
   9. Rooftop Supports for Low-Slope Roofs: Steel pedestals with bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified; and as follows:
      a. Bases: High density, UV tolerant, polypropylene or reinforced PVC.
      b. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
      c. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
      d. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports; corrosion resistant material.
      e. Height: Provide minimum clearance of 6 inches under pipe to top of roofing.

2.4 REFRIGERANT

A. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) of less than 50.

B. Refrigerant: R410a as defined in ASHRAE Std 34.

2.5 MOISTURE AND LIQUID INDICATORS

A. Indicators: Single port type, UL listed, with copper or brass body, flared or soldered ends, sight glass, color coded paper moisture indicator with removable element cartridge and plastic cap; for maximum temperature of 200 degrees F and maximum working pressure of 500 psi.

2.6 VALVES

A. Ball Valves:
1. Two piece bolted forged brass body with teflon ball seals and copper tube extensions, brass bonnet and seal cap, chrome plated ball, stem with neoprene ring stem seals; for maximum working pressure of 500 psi and maximum temperature of 300 degrees F.

B. Service Valves:
1. Forged brass body with copper stubs, brass caps, removable valve core, integral ball check valve, flared or soldered ends, for maximum pressure of 500 psi.

2.7 STRAINERS

A. Straight Line or Angle Line Type:
1. Brass or steel shell, steel cap and flange, and replaceable cartridge, with screen of stainless steel wire or monel reinforced with brass; for maximum working pressure of 430 psi.

2.8 CHECK VALVES

A. Globe Type:
1. Cast bronze or forged brass body, forged brass cap with neoprene seal, brass guide and disc holder, phosphor-bronze or stainless steel spring, teflon seat disc; for maximum temperature of 300 degrees F and maximum working pressure of 425 psi.

PART 3 EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATION

A. Install refrigeration specialties in accordance with manufacturer's instructions.

B. Route piping in orderly manner, with piping parallel or perpendicular to building structure, and maintain gradient.

C. Install piping to conserve building space and avoid interference with use of space.

D. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

E. Provide clearance for installation of insulation and access to valves and fittings.

F. Insulate pipingNone - N/A; refer to Section 230719.

G. Follow ASHRAE Std 15 procedures for charging and purging of systems and for disposal of refrigerant.

3.3 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Test refrigeration system in accordance with ASME B31.5, and manufacturers recommendations.

3.4 SCHEDULES

A. Hanger Spacing for Copper Tubing.
1. 1/2 inch, 5/8 inch, and 7/8 inch OD: Maximum span, 5 feet; minimum rod size, 1/4 inch.
2. 1-1/8 inch OD: Maximum span, 6 feet; minimum rod size, 1/4 inch.
3. 1-3/8 inch OD: Maximum span, 7 feet; minimum rod size, 3/8 inch.
4. 1-5/8 inch OD: Maximum span, 8 feet; minimum rod size, 3/8 inch.
5. 2-1/8 inch OD: Maximum span, 8 feet; minimum rod size, 3/8 inch.
6. 2-5/8 inch OD: Maximum span, 9 feet; minimum rod size, 3/8 inch.

END OF SECTION 23 2300

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SECTION 23 3100 - HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Metal ducts.

B. Flexible ducts.

1.2 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2018.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.

C. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2018.

D. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2018.

E. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2017.

F. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005 (Revised 2009).

G. SMACNA (KVS) - Kitchen Ventilation Systems and Food Service Equipment Fabrication and Installation Guidelines; 2001.

H. SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual; 2012.

I. UL 1978 - Grease Ducts; Current Edition, Including All Revisions.

J. UL 2221 - Tests of Fire Resistive Grease Duct Enclosure Assemblies; Current Edition, Including All Revisions.

1.3 SUBMITTALS

A. Product Data: Provide data for duct materials.

B. 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.

C. Shop Drawings: Indicate duct fittings, particulars such as gauges, sizes, welds, and configuration prior to start of work for All systems.

D. Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate per appropriate seal class, following SMACNA (LEAK).

E. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience, and approved by manufacturer.

1.5 REGULATORY REQUIREMENTS

A. Construct ductwork to NFPA 90A, NFPA 90B, and NFPA 96 standards.

1.6 FIELD CONDITIONS

A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Provide UL Class 1 ductwork, fittings, hangers, supports, and appurtenances in accordance with NFPA 90A and SMACNA (DCS) guidelines unless stated otherwise.

B. Provide metal duct unless otherwise indicated. Fibrous glass duct can be substituted at the Contractor's option.

C. Acoustical Treatment: Provide sound-absorbing liners and sectional silencers for metal-based ducts in compliance with Section 23 3319.

D. Duct Shape and Material in accordance with Allowed Static Pressure Range:

E. Duct Sealing and Leakage in accordance with Static Pressure Class:
1. Low Pressure Service: From 1/2" in-wc to 3 in-wc:
   a. Seal: Class A, apply sealing of transverse joints and longitudinal seams.
   b. Leakage:
      1) Rectangular: Class 12 or 12 cfm/100 sq ft.
      2) Round: Class 6 or 6 cfm/100 sq ft.

F. Duct Fabrication Requirements:
1. Duct and Fitting Fabrication and Support: SMACNA (DCS) including specifics for continuously welded round and oval duct fittings.
2. Use reinforced and sealed sheet-metal materials at recommended gauges for indicated operating pressures or pressure class.
3. Construct tee's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide air foil turning vanes of perforated metal with glass fiber insulation.
4. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.
5. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
6. Provide turning vanes of perforated metal with glass fiber insulation when an acoustical lining is required.
7. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

G. All Ducts: Galvanized steel.

H. Low Pressure Supply (System with Cooling Coils): 2 inch wg pressure class, galvanized steel.

I. Return and Relief: 1 inch wg pressure class, galvanized steel.

J. Kitchen Cooking Hood Exhaust: 1 inch wg pressure class, galvanized steel.

2.2 DUCTWORK FABRICATION

A. Slip and Drive ductwork joints not allowed.

2.3 METAL DUCTS

A. Material Requirements:
1. Galvanized Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.

B. Round Spiral Duct:
1. Round spiral lock seam duct with galvanized steel outer wall.

C. Connectors, Fittings, Sealants, and Miscellaneous:
1. Fittings: Manufacture with solid inner wall of perforated galvanized steel.
2. Transverse Duct Connection System: SMACNA "E" rated rigid class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips in accordance with SMACNA (DCS).
3. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
   a. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
   b. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.

4. Gasket Tape:
    a. Provide butyl rubber gasket tape for a flexible seal between transfer duct connector (TDC), transverse duct flange (TDF), applied flange connections, and angle ring connections.

D. Flexible Ducts: UL 181, Class 1, polyethylene film, mechanically fastened and rolled using galvanized steel to form a spiral helix.

E. Double Wall Insulated Round Ducts: Round spiral lockseam duct with 304 (2B finish) stainless steel outer wall, perforated SS steel inner wall; fittings with solid inner wall.
1. Insulation:
    a. Material: Fiberglass.

F. Double Wall Insulated Rectangular Ducts: Rectangular spiral lockseam duct with 304 (2B finish) stainless steel outer wall, perforated SS steel inner wall; fittings with solid inner wall.
1. Insulation:
    a. Material: Fiberglass.

G. Flexible Ducts: Black polymer film supported by helically wound spring steel wire.
1. Maximum flexible duct length to be 6'-0" with no more than one 90 degree bend.
2. Manufacturers:
    a. Thermaflex Model M-KE.
    b. Hart and Cooley Model F216.

H. Transverse Duct Connection System: SMACNA "E" rated rigidly class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips in accordance with SMACNA (DCS).
1. Manufacturers:
    a. Ductmate Industries, Inc, a DMI Company; None - N/A: www.ductmate.com/#sle.
    b. Elgen Manufacturing Company, Inc; None - N/A: www.elgenmfg.com/#sle.

I. Round Duct Connection System: Interlocking duct connection system in accordance with SMACNA (DCS).
1. Manufacturers:
    a. Ductmate Industries, Inc, a DMI Company; None - N/A: www.ductmate.com/#sle.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install, support, and seal ducts in accordance with SMACNA (DCS).

B. Install products following the manufacturer's instructions.

C. During construction, provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering the ductwork system.

D. Duct sizes indicated are inside precise dimensions. For lined ducts, maintain sizes inside lining.

E. Provide openings in ductwork as indicated to accommodate thermometers and controllers. Provide pilot tube openings as indicated for testing of systems, complete with metal can with spring device or screw to

insure against air leakage. For openings, insulate ductwork and install insulation material inside a metal ring.

F. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

G. Use double nuts and lock washers on threaded rod supports.

H. At exterior wall louvers, seal duct to louver frame and install blank-out panels.

3.2 CLEANING

A. Clean thoroughly each duct system as indicated within Section 23 0130.51.

B. Clean duct systems with high power vacuum machines. Protect equipment that could be harmed by excessive dirt with filters or bypass during cleaning. Provide adequate access to the ductwork for cleaning purposes.

3.3 PRESSURE TESTING

A. Prior to the balancing of the duct system by the AABC certified balancing contractor all ductwork shall be tested by the mechanical contractor for duct leakage in accordance with SMACNA Standards and AABC Standards Chapter 23. Duct leakage shall not exceed 1% for a duration of (10) ten minutes. Test pressures shall be as per SMACNA, however, not less than the following:
1. Low Pressure Duct:
    a. 25% above system operating pressure, but not less than 2" w.c. (500 Pa).

B. Insulation materials shall not be applied until systems have been witnessed to meet the above testing requirements.

C. The testing and balancing contractor shall witness and certify all duct pressure tests.

D. Additional leak testing requirements:
1. Disassemble, reassemble, and seal segments of duct systems to accomodate leakage testing and for compliance with test requirements.
2. If static pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.
3. Provide seven (7) days advance notice for testing.

3.4 SCHEDULES

A. Ductwork Pressure Class:
1. Supply (Heating Systems): 2 inch
2. Supply (System with Cooling Coils): 2 inch.
3. Return Ductwork: 1 inch.
4. General Exhaust: 1 inch.
5. Outside Air Intake: 1 inch.
6. Combustion Air: 1 inch (250 Pa)

END OF SECTION 23 3100

SECTION 23 3300 - AIR DUCT ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Air turning devices/extractors.

B. Backdraft dampers - metal.

C. Backdraft dampers.

D. Duct access doors.

E. Duct test holes.

F. Flexible duct connectors.

G. Volume control dampers.

1.2 REFERENCE STANDARDS

A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2018.

B. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005 (Revised 2009).

1.3 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide for shop fabricated assemblies including volume control dampers. Include electrical characteristics and connection requirements.

C. Manufacturer's Installation Instructions: Provide instructions for fire dampers.

D. Project Record Drawings: Record actual locations of access doors and test holes.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect dampers from damage to operating linkages and blades.

PART 2 PRODUCTS

2.1 AIR TURNING DEVICES/EXTRACTORS

A. Manufacturers:
1. Krueger-HVAC, Division of Air System Components: www.krueger-hvac.com/#sle.
2. PCI Industries, Inc; Pottorff Brand : www.portorff.com.

3. Titus HVAC, a brand of Johnson Controls: www.titus-hvac.com/#sle.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Multi-blade device with blades aligned in short dimension; steel construction; with individually adjustable blades, mounting straps.

2.2 BACKDRAFT DAMPERS

A. Manufacturers:
1. Louvers & Dampers, Inc, a brand of Mestek, Inc: www.louvers-dampers.com/#sle.
2. Nailor Industries, Inc: www.nailor.com/#sle.
3. Ruskin Company: www.ruskin.com/#sle.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Multi-Blade, Parallel Action Gravity Balanced Backdraft Dampers: Galvanized steel, with center pivoted blades of maximum 6 inch width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

2.3 DUCT ACCESS DOORS

A. Fabricate in accordance with SMACNA (DCS) and as indicated.

B. Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ducts, install minimum 1 inch thick insulation with sheet metal cover.
1. Less Than 12 inches Square: Secure with sash locks.
2. Up to 18 inches Square: Provide two hinges and two sash locks.
3. Up to 24 by 48 inches: Three hinges and two compression latches with outside and inside handles.
4. Larger Sizes: Provide an additional hinge.

C. Access doors with sheet metal screw fasteners are not acceptable.

2.4 DUCT TEST HOLES

A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.
1. Manufacturers:
2. Carlisle HVAC Products; Dynair Test Port with Red Cap with O-Ring Seal: www.carlislehvac.com/#sle.

2.5 FLEXIBLE DUCT CONNECTORS

A. Manufacturers:
1. Carlisle HVAC Products; Dynair Connector Plus G90 Steel Offset Seam Neoprene Fabric: www.carlislehvac.com/#sle.
2. Substitutions: See Section 01 6000 - Product Requirements.

B. Fabricate in accordance with SMACNA (DCS) and as indicated.

C. Flexible Duct Connections: Fabric crimped into metal edging strip.
1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz/sq yd.
a. Net Fabric Width: Approximately 2 inches wide.
2. Metal: 3 inches wide, 24 gauge, 0.0239 inch thick galvanized steel.

2.6 VOLUME CONTROL DAMPERS

A. Manufacturers:
1. Louvers & Dampers, Inc, a brand of Mestek, Inc: www.louvers-dampers.com/#sle.
2. Nailor Industries, Inc: www.nailor.com/#sle.
3. Ruskin Company: www.ruskin.com/#sle.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Fabricate in accordance with SMACNA (DCS) and as indicated.

C. Single Blade Dampers: Fabricate for duct sizes up to 6 x 30 inch.

D. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

E. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon, thermoplastic elastomer, or sintered bronze bearings.

F. Quadrants:
1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
3. Where rod lengths exceed 30 inches provide regulator at both ends.

PART 3 EXECUTION

3.1 PREPARATION

A. Verify that electric power is available and of the correct characteristics.

3.2 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). See Section 23 3100 for duct construction and pressure class.

B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide for cleaning kitchen exhaust ducts in accordance with NFPA 96. Provide minimum 8 x 8 inch size for hand

access, 18 x 18 inch size for shoulder access, and as indicated. Provide 4 x 4 inch Review locations prior to fabrication.

D. Provide duct test holes where indicated and required for testing and balancing purposes.

E. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.

F. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.

G. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

H. Provide air turning devices within duct whenever long radius elbows are not utilized.

END OF SECTION 23 3300

SECTION 23 3423 - HVAC POWER VENTILATORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wall exhausters.

B. Upblast roof exhausters.

C. Inline centrifugal fans and blowers.

1.2 REFERENCE STANDARDS

A. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2017.

B. UL 705 - Power Ventilators; Current Edition, Including All Revisions.

C. UL 762 - Outline of Investigation for Power Roof Ventilators for Restaurant Exhaust Appliances; Current Edition, Including All Revisions.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the installation of ventilators with size, location and installation of service utilities.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on fans and accessories, including fan curves with specified operating point plotted, power, rpm, sound power levels at rated capacity, and electrical characteristics and connection requirements.

C. Manufacturer's Instructions: Indicate installation instructions.

D. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Fan Belts: One set for each individual fan.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.6 FIELD CONDITIONS

A. Permanent ventilators may be used for ventilation during construction only after ductwork is clean, filters are in place, bearings have been lubricated, and fan has been test run under observation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Carnes, a division of Carnes Company Inc: www.carnes.com/#sle.

B. Greenheck Fan Corporation: www.greenheck.com/#sle.

C. Loren Cook Company: www.lorencook.com/#sle.

2.2 WALL EXHAUSTERS

A. Manufacturers:
1. Carnes, a division of Carnes Company Inc: www.carnes.com/#sle.
2. Greenheck Fan Corporation: www.greenheck.com/#sle.
3. PennBarry, Division of Air System Components: www.pennbarry.com/#sle.

B. Fan Unit: V-belt or direct driven with spun aluminum housing; resiliently mounted motor; 1/2 inch mesh, 0.062 inch thick aluminum wire bird screen.

C. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked, and line voltage motor drive, power open, spring return.

D. Sheaves: For V-belt drives, provide cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm can be reached with sheaves set at mid-position; fan shaft with self-aligning prelubricated ball bearings.

2.3 UPBLAST ROOF EXHAUSTERS

A. Manufacturers:
1. Carnes, a division of Carnes Company Inc; VUDK: www.carnes.com/#sle.
2. Greenheck Fan Corporation: www.greenheck.com/#sle.
3. Substitutions: See Section 01 6000 - Product Requirements.

B. Direct Drive Fan:
1. Fan Wheel:
   a. Type: Non-overloading, backward inclined centrifugal.
   b. Material: Aluminum, statically and dynamically balanced.
2. Housing:

a. Construct of heavy gauge aluminum including curb cap, windband, and motor compartment.
b. Rigid internal support structure.
c. One-piece fabricated or fully welded curb-cap base to windband for leak proof construction.
d. Construct drive frame assembly of heavy gauge steel, mounted on vibration isolators.
e. Provide breather tube for fresh air motor cooling and wiring.

C. Shafts and Bearings:
1. Fan Shaft:
a. Ground and polished steel with anti-corrosive coating.
b. First critical speed at least 25 percent over maximum cataloged operating speed.
2. Bearings:
a. Permanently sealed or pillow block type.
b. Minimum L10 life in excess of 100,000 hours (equivalent to L50 average life of 500,000 hours), at maximum cataloged operating speed.
c. 100 percent factory tested.

D. Drive Assembly:
1. Belts, pulleys, and keys oversized for a minimum of 150 percent of driven horsepower.
2. Belts: Static free and oil resistant.
3. Fully machined cast iron type, keyed and securely attached to the wheel and motor shafts.
4. Motor pulley adjustable for final system balancing.
5. Readily accessible for maintenance.

E. Roof Curb: 18 inch high self-flashing of galvanized steel with continuously welded seams, built-in cant strips, insulation and curb bottom, curb bottom, ventilated double wall, and factory installed nailer strip. Contractor to provide and install. Cooridinate with Roofing Contractor for roofing work

F. Drain Trough: Allows for single-point drainage of water, grease, and other residues.

2.4 INLINE CENTRIFUGAL FANS AND BLOWERS

A. Manufacturers:
1. Greenheck Fan Corporation: www.greenheck.com/#sle.
2. Loren Cook Company: www.lorencook.com/#sle.
3. Panasonic Corporation of North America; WhisperLine: www.panasonic.com/#sle.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Centrifugal Fan Unit: V-belt or direct driven, with galvanized steel housing lined with acoustic insulation, resiliently-mounted motor, gravity backdraft damper in discharge.

C. Performance Ratings: As indicated on drawings.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Secure roof exhausters with cadmium plated steel lag screws to roof curb.

C. Extend ducts to roof exhausters into roof curb. Counterflash duct to roof opening.

D. Provide sheaves required for final air balance.

E. Install backdraft dampers on inlet to roof and wall exhausters.

END OF SECTION 23 3423

SECTION 23 3439 - HIGH-VOLUME, LOW-SPEED PROPELLER FANS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. High-volume, low-speed propeller fans.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

B. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.3 SUBMITTALS

A. Product Data: Provide data on fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels at rated capacity, and electrical characteristics and connection requirements.

B. Manufacturer's Instructions: Indicate installation instructions.

C. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store under cover and elevated above grade.

1.6 FIELD CONDITIONS

A. Fans may not be used for ventilation during construction.

1.7 WARRANTY

A. Provide 10 year manufacturer warranty for Mechanical and 5 year manufacturer warranty for electrical (1 yr Labor included).

PART 2 PRODUCTS

2.1 HIGH-VOLUME, LOW-SPEED PROPELLER FANS

A. Manufacturers:
1. Big Ass Fans.
2. Greenheck

B. Performance Ratings: See Drawing Schedule

C. Mounting Options: Structure.

D. Direct Drive Fan:
1. Statically and dynamically balanced.
2. Motors:
a. Open drip-proof (ODP).
b. Heavy duty ball bearing type.
c. Mount on vibration isolators or resilient cradle mounts, out-of-airstream.
d. Fully accessible for maintenance.

E. Shafts and Bearings:
1. Fan Shaft:
a. Ground and polished steel with anti-corrosive coating.
b. First critical speed at least 25 percent over maximum cataloged operating speed.
2. Bearings:
a. Permanently sealed or pillow block type.
b. Minimum L10 life in excess of 100,000 hours (equivalent to L50 average life of 500,000 hours), at maximum cataloged operating speed.
c. 100 percent factory tested.

F. Accessories:

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Secure fan with stainless steel lag screws to structure.

END OF SECTION 23 3439

SECTION 23 3516 - ENGINE EXHAUST SYSTEMS

PART 1 GENERAL

1.1 REFERENCE STANDARDS

A. UL 508 - Industrial Control Equipment; Current Edition, Including All Revisions.

B. UL 508A - Industrial Control Panels; 2013.

C. UL 900 - Standard for Air Filter Units; Current Edition, Including All Revisions.

1.2 SUMMARY

A. Section Includes: This Section specifies an engine exhaust removal system.

1.3 REFERENCES

A. Reference Standards:
1. American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE):
   a. ANSI/ASHRAE Standard 52.2-2012 – Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size (ANSI Approved).
2. Underwriters Laboratories Inc. (UL):
   a. UL 508A – Standard for Industrial Control Panels.
   b. UL 900 – Standard for Air Filter Units.
3. Underwriters Laboratories of Canada. (ULC):
   a. ULC/CAN S111 – Standard Method of Fire Tests for Air Filter Units.
4. National Fire Protection Association (NFPA)
   a. NFPA 1500 – Standard on Fire Department Occupational Safety and Health Program, 2013

1.4 SUBMITTALS

A. Product Data: Manufacturer’s standard specifications and descriptive literature, including:
1. Spec-Data product sheet.
2. Catalog cut-sheets.
3. Wiring diagrams.
4. Sample warranty.

B. Manufacturer’s written instructions, including:
1. Delivery, storage and handling.
2. Preparation and installation.
3. Maintenance.

C. Warranty:
1. Manufacturer’s 5 year warranty, from date of substantial completion, covering defects in materials and workmanship, excluding consumable filters.

1.5 QUALITY ASSURANCE

A. Installer: Acceptable to the manufacturer, experienced in performing work of this section and specialized in installation of work similar to that required for this project.

1.6 DELIVERY, STORAGE & HANDLING

A. Deliver materials in accordance with manufacturer's written instructions.

B. Deliver materials in manufacturer's original packaging with identification labels intact.

C. Store materials protected from exposure to harmful weather conditions and at temperature conditions in accordance with
   1. manufacturer's written instructions.

D. Remove packaging materials from site and dispose of at appropriate recycling facilities.

PART 2 PRODUCTS

2.1 ENGINE EXHAUST REMOVAL SYSTEM

A. Manufacturer: Air Vacuum Corporation.
   1. Contact: P.O. Box 0517; Dover, NH 03821-0517; Phone: 800-540-7264; 603-743-4332; Fax: 603-743-3111; Email:
      a. sales@airvacuumcorporation.com; Website: www.airvac911.com.
   2. Single Source Responsibility: Provide components and materials specified in this section from a single manufacturer.
   3. Substitutions: No substitutions permitted.

B. Air Vacuum Corporation, AIRVAC 911: Self-contained, fully automatic, recirculating, hoseless system with vertical intake and 360 degree horizontal clean air output; designed to remove hazardous gases and particulate from indoor vehicle parking bays and eliminate exhaust backwash in accordance with ANSI/ASHRAE 52.2, UL 508A, UL 900, ULC/CAN S111 and NFPA 1500.
   1. Installation: Ceiling-hung with chain or threaded rod, between vehicle bays {CH#10573363}. Power is required to each unit through the AVEC electrical controller. Low-voltage wiring and connections are necessary for activation devices.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that conditions of work previously installed under other sections or contracts are acceptable for product installation in accordance with manufacturer's written instructions prior to installation of engine exhaust removal system.
   1. Notify Airvac911 of unacceptable conditions upon discovery.
   2. Proceed with installation only after unacceptable conditions have been corrected.

3.2 PREPARATION

A. Prepare work to receive engine exhaust removal system in accordance with manufacturer's written instructions and
   1. approved submittals.

3.3 INSTALLATION

A. Install engine exhaust removal system in accordance with manufacturer's written instructions and approved submittals.

B. Accurately fit, align, securely fasten and install free from distortion or defects.

C. Test, adjust and balance for proper operation.

D. Clean, lubricate and adjust moving parts.

3.4 CLEANING

A. Perform daily progress cleaning.

B. Upon completion, remove surplus materials, rubbish, tools and equipment.

C. Collect recyclable waste and dispose of at appropriate recycling facilities.

3.5 PROTECTION

A. Protect installed product from damage during construction in accordance with manufacturer's written instructions.

B. Repair or replace adjacent materials damaged by installation of engine exhaust removal system.

3.6 MAINTENANCE

A. Maintain engine exhaust removal system in accordance with manufacturer's instructions .

END OF SECTION 23 3516

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SECTION 23 3700 - AIR OUTLETS AND INLETS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Diffusers:

B. Registers/grilles:

C. Louvers:

1.2 REFERENCE STANDARDS

A. ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Inlets; 2006 (Reaffirmed 2011).

B. UL 2518 - Standard for Safety Air Dispersion Systems; Current Edition, Including All Revisions.

C. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.3 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

C. Project Record Documents: Record actual locations of air outlets and inlets.

1.4 QUALITY ASSURANCE

A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.

PART 2 PRODUCTS

2.1 GRD MANUFACTURERS (See Drawings for Models)

A. Price Industries: www.price-hvac.com/#sle.

B. Titus, a brand of Air Distribution Technologies: www.titus-hvac.com/#sle.

C. Tuttle and Bailey: www.tuttleandbailey.com/#sle.

D. Substitutions: See Section 01 6000 - Product Requirements.

2.2 LOUVER MANUFACTURERS (See Drawings for Models)

A. Greenheck

B. Ruskin

C. Substitutions: See Section 01 6000 - Product Requirements

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.

C. Install diffusers to ductwork with air tight connection.

D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.

E. Paint ductwork visible behind air outlets and inlets matte black.

F. Paint ductwork visible behind air outlets and inlets matte black, see Section 09 9123.

END OF SECTION 23 3700

SECTION 23 3810 - FIRE READY HOOD

PART 1 - GENERAL

1.1 SUMMARY

A. This section specifies fully integrated, pre-engineered fire suppression range hood systems.

1.2 DEFINITIONS

A. Range hood, unit, kitchen hood and hood system; for purposes of this specification section, these terms all have the same definition.

B. Residential grade fire suppression: a hood suppression system that fulfills the 300A standard, being designed to protect a residential-grade cooking appliance that is used within a commercial space.

C. Eyebrow, compensating, short circuit hood types are not allowed.

1.3 RELATED WORK

A. Section 26 05 21, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW): Electrical Connections.

1.4 QUALITY CONTROL

A. Installer Qualifications: Experienced in mechanical equipment installation or supervised by an experienced mechanical equipment installer.
   1. Where required to complete equipment installation, electrician and plumber shall be licensed in jurisdiction where project is located.

B. NSF Compliance: Equipment bears NSF Certification Mark (when required)

C. UL Listing: Equipment has been evaluated according to UL or ETL 300A and is labeled for intended use.

D. Fire-Protection Systems: to be pre-engineered and factory integrated into the design of the hood

E. Seismic Restraint:
   1. Comply with requirements in Section 13 05 41, SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS.
   2. Comply with applicable guidelines for seismic restraint of kitchen equipment contained in SMACNA's "Kitchen Ventilation Systems and Food Service Equipment Guidelines," Appendix A.

F. In-Use Service: The manufacturer maintains that the system can be operated or maintained by any qualified maintenance technician. However, the manufacturer will offer web-based certification training by request. The manufacturer does not provide field service.

1.5 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Manufacturer's Literature and Data:
1. Include manufacturer's address and telephone number.
2. Include catalog or model numbers, and illustrations and descriptions of ventilators and accessories.

C. Installation Drawings: Show dimensions; method of assembly; and details of installation, adjoining construction, coordination with service utilities, and other work required for a complete installation.

D. Field Test Reports: Indicate whether demonstration will be necessary, dates and times of tests and certify test results.

E. Operating Instructions: Include operating instructions covering operation of all components and maintenance procedures covering proper cleaning and necessary lubrication or adjustments to controls.

1.6 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

B. ICC Evaluation Service Listing Criteria #1031 (LC1031)

C. C. ICC Evaluation Services PMG Listing #1293 (PMG1293)

D. UL or ETL Standard 300A

PART 2 - PRODUCTS

EXHAUST HOODS

2.1 Basis of Design: Denlar

2.2 See Range Hood Schedule in drawings for hood performance requirements

2.3 Hood shall be constructed of 18 & 20 gauge (type 304) polished stainless steel. Hood shall have fire suppression system factory installed into the hood system. Activation of the mechanical fire suppression system shall be by 212 or 280-degree fusible link (30" vs. 36" sizes). Fire suppression agent will be amerex 660 low ph wet chemical suppressant. Unit shall include fuel shutdown option for gas, electric or dual element devices. The hood system will also have multiple alarm and monitoring contacts factory installed into the hoodVICES. THE HOOD SYSTEM WILL ALSO HAVE MULTIPLE ALARM AND MONITORING CONTACTS FACTORY INSTALLED INTO THE HOOD

2.4 System interconnected with included shunt trip breaker and/or gas solenoid valve of equipment located below ventilator for power and fuel shutoff during system actuation

A. Environmental Monitoring / Internal Monitoring / Pre-Suppression

1. Two temperature sensors are located on the inner face of the hood; one at a medium set point, the other at high. Under cooking conditions, when the medium set point is reached, the fan is turned on high. This feature dissipates the heat from the area but also draws it into the unit, past the fusible links in the system. If temperatures continue to rise and the high temperature set point is reached, the system reacts by shutting down power to the range prior to suppression system release. When this occurs, the unit's internal alarm is activated so that occupants are notified that the system is working to prevent further escalation of a potential fire. This is considered two stages of pre-suppression, where the unit is interacting with the cooking environment - working to minimize the risk of a fire event
    a. Should temperatures continue to rise, fire is present. The fusible links will melt, mechanically actuating the suppression system and releasing a low PH wet chemical agent across the cook-top. At actuation, the system will also make a second attempt to shut down power to the range; in the event of a flash-fire, or something that happens too quickly to register with the temperature sensors. The system will continue to sound its internal alarm while also communicating a "fire code" back to a monitored alarm panel.
    b. The PLC Self-Monitoring-System also monitors the entire suppression assembly for completeness and continuity. If the suppression system is ever compromised through a loss of pressure or broken connection, or tampering of any kind, the unit reacts by shutting down power to the range. In this case the suppression system is compromised therefor the range shouldn't be in use. Under this condition, the system communicates a separate "maintenance code" saying that the unit is down and needs service. When preemptive shutdown occurs, the system and the cooking equipment will not come back on-line until the GRRS is reset.

B. F. Options
1. Manual Pull Station (MPK) - Mechanical assembly allowing the fire suppression system to be actuated manually normally located at the point of egress.
2. Handicapped Accessible Controls (ADA) - Separate control system designed to mirror the front-end controls of the hood, to be installed at under counter-top height.
3. Powder Coating (PC) - The hood system can be powder coated in a variety of standard colors, the manufacturer can also color match.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install hood system level and plumb with access clearances required for operation, maintenance and cleaning and in accordance with the manufacturer's published documentation.
1. Show on drawings overhead or rear support for equipment specified in this section.
    a. Coordinate installation of ventilators with overhead supports
    b. Interconnect ventilators to service utilities.
    c. Install seismic restraints for equipment if required.

3.2 FIELD TESTING

A. Functional Test: using manufacturer-supplied procedure, short internal sensors to demonstrate shutdown and communication features.

B. Puff Test: using manufacturer supplied test cylinder, replace suppressant cylinder in system with test (nitrogen only) cylinder. Replace fusible links in line with a “test link”. Cut the test link and allow the system to actuate, performing all of its standard functions.

3.3 CLEAN-UP

A. At completion of the installation, clean and adjust equipment as required to produce ready-for-use condition.
   1. Where stainless-steel surfaces are damaged during installation procedures, repair finishes in order to match adjoining undamaged surfaces.

3.4 INSTRUCTIONS

A. Instruct personnel and transmit operating instructions in accordance with requirements.

END OF SECTION 23 3810

SECTION 23 4000 - HVAC AIR CLEANING DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Disposable, extended area panel filters.

B. Filter gauges.

1.2 REFERENCE STANDARDS

A. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size; 2017.

B. UL 900 - Standard for Air Filter Units; Current Edition, Including All Revisions.

1.3 SUBMITTALS

A. Product Data: Provide data on filter media, filter performance data, filter assembly and filter frames, dimensions, motor locations and electrical characteristics and connection requirements.

B. Shop Drawings: Indicate filter assembly and filter frames, dimensions, motor locations, and electrical characteristics and connection requirements.

C. Manufacturer's Installation Instructions: Indicate assembly and change-out procedures.

D. Operation and Maintenance Data: Include instructions for operation, changing, and periodic cleaning.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. Extra Filters: One set of each type and size.

1.4 QUALITY ASSURANCE

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 FILTER MANUFACTURERS

A. American Air Filter Company, Inc: www.aafintl.com/#sle.

B. Camfil, a company of the The Camfil Group: www.camfil.us/#sle.

C. Substitutions: See Section 01 6000 - Product Requirements.

2.2 DISPOSABLE, EXTENDED AREA PANEL FILTERS

A. Media: UL 900 Class 1, pleated, lofted, non-woven, reinforced cotton fabric; supported and bonded to welded wire grid by corrugated aluminum separators.
1. Frame: Non-flammable.
2. Nominal size: 12 by 24 inches.
3. Nominal thickness: 1 inch.

B. Minimum Efficiency Reporting Value (MERV): 8, when tested in accordance with ASHRAE Std 52.2.

C. Rating, per ASHRAE Std 52.2:
1. Weight Arrestance: 85 percent.
2. Initial resistance at 500 fpm face velocity: 0.20 in-wc.
3. Recommended final resistance: 0.9 in-wc.

2.3 FILTER GAUGES

A. Manufacturers:
1. Dwyer Instruments, Inc; _____: www.dwyer-inst.com/#sle.
2. H.O. Trerice Co; _____: www.trerice.com/#sle.
3. Weiss Instruments; _____: www.weissinstruments.com/#sle.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Direct Reading Dial: 3-1/2 inch diameter diaphragm actuated dial in metal case, vent valves, black figures on white background, front recalibration adjustment, range 0 to 0.5 in-wc, 2 percent of full scale accuracy.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install air cleaning devices in accordance with manufacturer's instructions.

B. Prevent passage of unfiltered air around filters with felt, rubber, or neoprene gaskets.

C. Install filter gauge static pressure tips upstream and downstream of filters. Mount filter gauges on outside of filter housing or filter plenum, in accessible position. Adjust and level.

D. Do not operate fan system until filters (temporary or permanent) are in place. Replace temporary filters used during construction and testing, with clean set.

E. Provide filter gauges on filter banks, installed with separate static pressure tips upstream and downstream of filters.

END OF SECTION 23 4000

SECTION 23 7499 - PACKAGED DOAS WITH ENERGY RECOVERY

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes units with integral heating and cooling for rooftop installation. Integral Energy Recovery device shall be a rotary air-to-air total enthalpy wheel. Integral heat source shall be Indirect Gas-Fired furnace. Integral cooling source shall be packaged DX. Airflow arrangement shall be Outdoor Air only. Each unit shall be constructed in a horizontal configuration and shall incorporate additional product requirements as listed in Section 2 of this specification.

B. SUBMITTALS
1. Product Data: For each type or model include the following:
    a. Complete fan performance curves for both Supply Air and Exhaust Air, with system operating conditions indicated, as tested in an AMCA Certified Chamber.
    b. Sound performance data for both Supply Air and Exhaust Air, as tested in an AMCA Certified chamber.
    c. Motor ratings, electrical characteristics and motor and fan accessories.
    d. Performance ratings for all chilled water or DX coils.
    e. Dimensioned drawings for each type of installation, showing isometric and plan views, to include location of attached ductwork and service clearance requirements.
    f. Estimated gross weight of each installed unit.
    g. Installation, Operating and Maintenance manual (IOM) for each model.
    h. Microprocessor Controller (DDC) specifications to include available options and operating protocols. Include complete data on all factory-supplied input devices.
    i. AHRI Certified coil performance ratings with system operating conditions indicated. Ratings shall be in accordance with Standard 410.
    j. Energy wheel performance data for both summer and winter operation.

C. QUALITY ASSURANCE
1. Source Limitations: Obtain unit with all appurtenant components or accessories from a single manufacturer.
2. For the actual fabrication, installation, and testing of work under this section, use only thoroughly trained and experienced workers completely familiar with the items required and with the manufacturer's current recommended methods of installation.
3. Product Options: Drawings must indicate size, profiles and dimensional requirements of unit and are to be based on the specific system indicated. Refer to Division 1 Section "Product Requirements".
4. Certifications
    a. Blowers shall be AMCA Certified for air flow.
    b. Entire unit shall be ETL Certified per U.L. 1995 and bear an ETL sticker.
    c. Energy Wheel shall be AHRI Certified, per Standard 1060.
    d. Coils shall be Recognized Components for ANSI/UL 1995, CAN / CSA C22.2 No 236.05. DX and water coils shall be AHRI Certified per standard 410-2001.
    e. Indirect gas-fired furnace shall be ETL Certified as a component of the ERU. Indirect gas-fired furnace shall be an ETL Recognized Component of the ERU per ANSI Z83.8.

D. COORDINATION
1. Coordinate size and location of all building penetrations required for installation of each unit and associated plumbing and electrical systems.
2. Coordinate location of water system fittings to ensure correct positioning for connection to the water coil and condensate drain pipe.
3. Coordinate sequencing of construction of associated plumbing, HVAC, electrical supply, roofing contractor.

E. EXTRA MATERIALS
1. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   a. Filters: 1 set(s) of MERV 8 disposable Supply Air and Exhaust Air filters and 1 set(s) of MERV 8 and MERV 13 disposable final filters for each unit.
   b. One set of energy wheel belts.

F. WARRANTY
1. The mechanical contractor shall provide two (2) years maintenance, including parts, labor (including travel time), for all DOAS equipment

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with specifications contained within this document, manufacturers offering products that may be incorporated into the work include, but are not limited to:
1. Trane
2. Valent Air Management Systems
3. Mitsubishi Electric US, Inc.

B. MANUFACTURED UNITS
1. Unit shall be fully assembled at the factory and consist of an insulated metal cabinet, exhaust air blower, evaporator coil, energy wheel, indirect gas-fired furnace, packaged DX system, phase and brownout protection, motorized dampers, curb assembly, filter assembly intake air, supply air blower assembly, exhaust/relief blower assembly, filter assembly for exhaust air, and an electrical control center. All specified components and internal accessories factory installed are tested and prepared for single-point high voltage connection except with electric post heat which has dual point power.

C. CABINET
1. Materials: Formed, double wall insulated metal cabinet, fabricated to permit access to internal components for maintenance.
   a. Outside casing: 18 gauge, galvanized (G90) steel meeting ASTM A653 for components that do not receive a painted finish. Pre-painted components as supplied by the factory shall have polyester urethane paint on 18 gauge G60 galvaneal steel. Components that receive a painted finish per A / E specification shall be painted with a polyester urethane powder coat.
   b. Internal assemblies: 24 gauge, galvanized (G90) steel except for motor supports which shall be minimum 14 gauge galvanized (G90) steel.
2. Cabinet Insulation: Comply with NFPA 90A and NFPA 90B and erosion requirements of UL 181.

a. Materials: Fiberglass insulation. If insulation other than fiberglass is used, it must also meet the Fire Hazard Classification shown below.
   1) Thickness: 2 inch (50 mm)
   2) Fire Hazard Classification: Maximum flame spread of 25 and smoke developed of 50, when tested in accordance with ASTM C 411.

3. Access panels / doors: Unit shall be equipped with insulated, hinged doors or removable access panels to provide easy access to all major components. Doors and access panels shall be fabricated of 18 gauge galvanized G90 steel or painted galvannealed steel.
4. Supply Air blower assemblies: Blower assembly shall consist of an electric motor and direct-drive fans. Assembly shall be mounted on heavy gauge galvanized steel rails and further mounted on 1.125 inch thick neoprene vibration isolators. Blower motors shall be capable of continuous speed modulation and controlled by a VFD.
5. Exhaust Air blower assemblies: Blower assembly shall consist of an electric motor and a direct-drive fan. Assembly shall be mounted on heavy gauge galvanized steel rails and further mounted on 1.125 inch thick neoprene vibration isolators. Blower motor shall be capable of continuous speed modulation and controlled by a VFD.
6. Evaporator Coil: Evaporator coil shall be AHRI Certified and shall be (silver) soldered or brazed into the compressed refrigerant system. Coil shall be constructed of copper tubing, permanently bonded to aluminum fins and enclosed in a galvanized steel frame. If two compressors are used as components of the unit, then the evaporator coil shall be of "interlaced" configuration, permitting independent operation of either compressor without conflict with the other compressor.
7. Control panel / connections: Units shall have an electrical control center where all high and low voltage connections are made. Control center shall be constructed to permit single-point high voltage power supply connections. RTU shall be equipped with a Unit Disconnect Switch.
8. Energy wheel: Energy wheel shall be of total enthalpy, rotary air-to-air type and shall be an element of a removable energy wheel cassette. The cassette shall consist of a galvanized steel framework (designed to produce laminar air flow through the wheel), an energy wheel as specified and a motor and drive assembly. The cassette shall incorporate a pre-tensioned urethane drive belt with a five year warranty. The wheel media shall be a polymer film matrix in a stainless steel framework and be comprised of individual segments that are removable for servicing. Non-segmented energy wheels are not acceptable. Silica gel desiccant shall be permanently bonded to the polymer film and is designed and constructed to permit cleaning and servicing. The energy wheel is to have a five year warranty. Performance criteria are to be as specified in AHRI Standard 1060, complying with the Combined Efficiency data in the submittal.
9. Modulating frost control. Control system shall include an outdoor air thermostat and pressure sensor on the wheel assembly to initiate frost control sequence.
10. Indirect gas furnace
    a. Shall be ETL Certified as a component of the unit.
    b. Shall have an integral combustion gas blower.
    c. Shall be ETL Certified for installation downstream of a cooling coil.
    d. Shall have fault sensors to provide fault conditions to optional digital controller or building controls.
    e. Shall have 4-pass tubular heat exchangers, constructed of type 409 stainless steel. Heat exchanger tubes shall be installed on the vest plate by means of swaged assembly, welded connections are not acceptable. Heat exchanger tubes shall be supported by a minimum of two fabricated assemblies that support the tubes and also permit expansion and contraction of the tubes.
    f. Heat exchanger shall have a 10 year extended warranty.

g. Furnace control shall be 4:1 Modulating.
h. Shall be encased in a weather-tight metal housing with intake air vents. Large, metal lift-off door shall provide easy access to the enclosed vest plate, control circuitry, gas train, burner assembly and exhaust blower.
i. Shall have solid state controls permitting stand-alone operation or control by building controllers.

11. Packaged DX System: Unit shall have an integral compressor(s) and evaporator coil located within the weather-tight unit housing. Condenser coils and appurtenant condenser fan assemblies shall be factory installed as integral subassemblies of the unit and mounted on the exterior of the unit. Condenser fan motors shall be three phase, type 56 frame, Open Air Over and Shaft Up. Each condenser fan motor shall have a vented frame, rated for continuous duty and be equipped with an automatic reset thermal protector. Motors shall be UL Recognized and CSA Certified. The refrigerant compressor(s) shall be digital hermetic scroll-type and shall be equipped with liquid line filter drier, thermostatic expansion valves (TXV)(s), manual reset high pressure and low pressure cutouts and all appurtenant sensors, service ports and safety devices. Compressed refrigerant system shall be fully charged with R-410A refrigerant. Each compressor shall be factory-equipped with an electric crankcase heater to boil off liquid refrigerant from the oil.
12. Packaged DX Control and Diagnostics: The Packaged DX system shall be controlled by an onboard digital controller (DDC) that indicates both owner-supplied settings and fault conditions that may occur. The DDC shall be programmed to indicate the following faults:
    a. Global alarm condition (active when there is at least one alarm)
    b. Supply Air Proving alarm
    c. Dirty Filter Alarm
    d. Compressor Trip alarm
    e. Compressor Locked Out alarm
    f. Supply Air Temperature Low Limit alarm
        1) Sensor #1 Out of Range (outside air temperature)
        2) Sensor #2 Out of Range (supply air temperature)
        3) Sensor #3 Out of Range (cold coil leaving air temperature)
13. Phase and brownout protection: Unit shall have a factory-installed phase monitor to detect electric supply phase loss and voltage brown-out conditions. Upon detection of a fault, the monitor shall disconnect supply voltage to all motors.
14. Motorized dampers / Intake Air, Motorized dampers of low leakage type shall be factory installed.
15. Curb Assembly: A curb assembly made of 14 gauge galvanized steel shall be provided by the factory for assembly and installation as part of this division. The curb assembly shall provide perimeter support of the entire unit and shall have duct adapter(s) for supply air and return air. Curb assembly shall enclose the underside of the unit and shall be sized to fit into a recess in the bottom of the unit. Contractor shall be responsible for coordinating with roofing contractor to ensure curb unit is properly flashed to provide protection against weather/moisture penetration. Contractor shall provide and install appropriate insulation for the curb assembly. The curb shall be the height of 14 in..
16. Service receptacle: 120 VAC GFCI service outlet shall be factory-provided and installed by this contractor in a location designated by the A / E. Service outlet requires a dedicated single phase electric circuit. Unit contains a 120 VAC transformer to provide power to service outlet.
17. Hail Guards: Protects the condensing unit from damage due to extreme weather conditions such as hail and flying debris.
18. Vapor Tight Lights: Provide service lights mounted in the unit to be used during times of routine maintenance. The lights must be wired by others on the jobsite, as they will not be wired through the unit control center.

D. BLOWER
1. Blower section construction, Supply Air: direct drive motor and blower shall be assembled on a 14 gauge galvanized steel platform and shall be equipped with 1.125 inch thick neoprene vibration isolation devices.
2. Blower assemblies: Shall be statically and dynamically balanced and designed for continuous operation at maximum rated fan speed and horsepower.
3. Fan: Airfoil plenum fan statically and dynamically balanced, AMCA certified for air and sound performance, mounted on ground and polished steel fan shafts with ball bearing pillow blocks. Bearings shall be selected for a minimum L10 life in excess of 50,000 hours at maximum catalogued speeds.
4. Blower section motor source quality control: Blower performance shall be factory tested for flow rate, pressure, power, air density, rotation speed and efficiency. Ratings are to be established in accordance with AMCA 210, "Laboratory Methods of Testing Fans for Rating".

E. MOTORS
1. General: Blower motors greater than 3/4 horsepower shall be "NEMA Premium" unless otherwise indicated. Compliance with EPAct minimum energy-efficiency standards for single speed ODP and TE enclosures is not acceptable. Motors shall be heavy-duty, permanently lubricated type to match the fan load and furnished at the specified voltage, phase and enclosure.
2. Motors shall be 60 cycle, 3 phase 208 volts.

F. UNIT CONTROLS
1. The unit shall be constructed so that it can function as a stand-alone heating and cooling system controlled by factory-supplied controllers, thermostats and sensors or it can be operated as a heating and cooling system controlled by a Building Management System (BMS). This unit shall be controlled by a factory-installed microprocessor programmable controller (DDC) that is connected to various optional sensors.
2. Unit shall incorporate a DDC controller with integral LCD screen that provides text readouts of status. DDC controller shall have a built-in keypad to permit operator to access read-out screens without the use of ancillary equipment, devices or software. DDC controllers that require the use of equipment or software that is not factory-installed in the unit are not acceptable. Alarm readouts consisting of flashing light codes are not acceptable. Owner-specified ventilating conditions can be input by means of pushbuttons.
3. Unit supply fan shall be configured for Constant Volume (ON/OFF).
4. Unit exhaust fan shall be configured for building pressure by factory.
5. Outside Air / Return Air damper control shall be
6. Economizer control shall be temperature / dew point.
7. Dirty filter sensor shall be factory installed.
8. Operating protocol: The DDC shall be factory-programmed for Modbus.
9. Variable Frequency Drive (VFD): unit shall have factory installed variable frequency drive for modulation of the supply and exhaust air blower assemblies. The VFD shall be factory-programmed for unit-specific requirements and shall not require additional field programming to operate.
10. M-NET connection: unit shall have factory installed connection hardware to interface with Mitsubishi Electric City Multi VRF systems. This hardware must enable the unit to be monitored and controlled from a remote interface that is also integrated to control the MEUS VFR systems.

G. FILTERS
1. Unit shall have permanent metal filters located in the outdoor air intake and shall be accessible from the exterior of the unit. MERV 8 disposable pleated filters shall be provided in the supply air stream.

MERV 8 and MERV 13 disposable pleated filters shall be provided in the supply final air stream and MERV 8 filters in the exhaust air stream.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to start of installation, examine area and conditions to verify correct location for compliance with installation tolerances and other conditions affecting unit performance. See unit IOM.

B. Examine roughing-in of plumbing, electrical and HVAC services to verify actual location and compliance with unit requirements. See unit IOM.

C. Proceed with installation only after all unsatisfactory conditions have been corrected.

D. INSTALLATION
1. Installation shall be accomplished in accordance with these written specifications, project drawings, manufacturer's installation instructions as documented in manufacturer's IOM, Best Practices and all applicable building codes.

E. CONNECTIONS
1. In all cases, industry Best Practices shall be incorporated. Connections are to be made subject to the installation requirements shown above.
2. Piping installation requirements are specified in Division 22 (Plumbing). Drawings indicate general arrangement of piping, fittings and specialties.
3. Duct installation and connection requirements are specified in Division 23 of this document.
4. Electrical installation requirements are specified in Division 26 of this document.

F. FIELD QUALITY CONTROL
1. Manufacturer's Field Service: Engage a factory authorized service representative to inspect field assembled components and equipment installation, to include electrical and piping connections. Report results to A / E in writing. Inspection must include a complete startup checklist to include (as a minimum) the following: Completed Start-Up Checklists as found in manufacturer's IOM.

G. START-UP SERVICE
1. Engage a factory authorized service representative to perform startup service. Clean entire unit, comb coil fins as necessary, install clean filters. Measure and record electrical values for voltage and amperage. Refer to Division 23 "Testing, Adjusting and Balancing" and comply with provisions therein.

H. DEMONSTRATION AND TRAINING
1. Engage a factory authorized service representative to train owner's maintenance personnel to adjust, operate and maintain the entire unit. Refer to Division 01 Section Closeout Procedures and Demonstration and Training.

END OF SECTION 23 7499

SECTION 23 8129 - VARIABLE-REFRIGERANT-FLOW HVAC SYSTEMS

PART 1 GENERAL

1.1 REFERENCE STANDARDS

A. AHRI 1230 - Performance Rating of Variable Refrigerant Flow (VRF) Multi-Split Air-Conditioning and Heat Pump Equipment; 2021.

B. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2018.

C. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).

D. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2016.

E. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus; 2018.

F. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service; 2016.

G. ASTM B306 - Standard Specification for Copper Drainage Tube (DWV); 2013.

H. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2016.

I. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2015, with Editorial Revision (2018).

J. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40; 2017.

K. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2012 (Reapproved 2018).

L. ASTM F438 - Standard Specification for Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40; 2017.

M. ASTM F441/F441M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80; 2015.

N. ASTM F493 - Standard Specification for Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings; 2014.

O. ASTM F656 - Standard Specification for Primers for Use in Solvent Cement Joints of Poly(Vinyl Chloride) (PVC) and Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe and Fittings; 2025.

P. ISO 9001 - Quality management systems -- Requirements; 2015.

Q. ISO 14001 - Environmental Management Systems — Requirements with Guidance for Use; 2015, with Amendment (2024).

R. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

S. NFPA 262 - Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces; 2023.

1.2 SUMMARY

A. Section includes complete VRF HVAC system(s) which may include, but not limited to, the following components:
1. Indoor, exposed, wall-mounted units.
2. Indoor, concealed, ceiling-mounted units for ducting.
3. Indoor, concealed, multi-position units for ducting.
4. Indoor, recessed, ceiling-mounted units with 33x33” grilles.
5. Indoor, recessed, ceiling-mounted units with 24x24” grilles.
6. Indoor, recessed, one-way ceiling-mounted units.
7. Indoor, suspended, ceiling-mounted units.
8. Indoor, energy recovery ventilator.
9. Indoor, shut-off valve kits (SVKs)
10. Indoor, heat recovery control units (HRCUs).
11. Indoor, water-source heat recovery units.
12. Outdoor, air-source heat-pump units.
13. Outdoor, air-source heat recovery units.
14. VRF system controls.
15. VRF system refrigerant and oil.
16. VRF system control cable.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications:
1. Nationally recognized manufacturer of VRF HVAC systems and products.
2. Shipped VRF HVAC systems with similar requirements to local market for a continuous period of 5 years within time of bid.
3. VRF HVAC systems and products that have been successfully tested and in use on at least 5 completed projects.
4. Having complete published online catalog literature, installation, and operation and maintenance manuals for all products intended for use. Resources must be publicly available without login or sign-in as registered account.
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. 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 to have successfully completed manufacturer training for proper installation of systems, including, but not limited to, equipment, piping, controls, and accessories indicated and furnished for installation.
2. Installer certificate 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 experience with VRF products being installed for period within 3 consecutive years before time of bid.
    b. Demonstrated experience on 3 projects of similar VRF system complexity, scope, and value.

C. ISO Compliance: System equipment and components furnished by VRF HVAC system manufacturer shall be manufactured in an ISO 9001 and ISO 14001 facility.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in a clean and dry place. 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.

B. Cover unit openings before installation to prevent dirt and dust from entering inside of units. If required to remove coverings during unit installation, reapply coverings over openings after unit installation and remove just prior to operating unit.

C. Comply with manufacturer's written rigging and installation instructions for unloading and moving to final installed location.

1.5 SUBMITTALS

A. Product Data: Provide drawings indicating dimensions, rough-in connections, and electrical characteristics and connection requirements.

B. Manufacturer's Instructions: Include assembly instructions, support details, connection requirements, and start-up instructions.

C. Manufacturer's qualification statement.

D. Installer's qualification statement.

E. Sustainable Design Documentation: Submit manufacturer's product data on refrigerant used, showing compliance with specified requirements.

F. Operation and Maintenance Data: Provide maintenance data, parts lists, controls, and accessories. Include trouble-shooting guide.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing the work of the type this section and approved by manufacturer, with minimum three years of documented experience.

1.7 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 10 year(s) from date of Substantial Completion.
      b. For Parts, 10 year(s) from date of Substantial Completion.

B. Installer's Labor Warranty: Installer agrees to repair or replace equipment and components that fail(s) in materials or workmanship within specified warranty period.
   1. Warranty Period 1 year from date of substantial completion.

PART 2 PRODUCTS

2.1 VRF HVAC SYSTEMS

A. Manufacturers: Basis of design is CITY MULTI. Subject to compliance with requirements, provide products by one of the following brands only:
   1. Mitsubishi Electric & Electronics USA, Inc.
   2. Trane, Inc.
   3. Daikin Applied

2.2 SYSTEM DESCRIPTION

A. VRF HVAC system(s) with variable capacity in response to varying cooling and heating loads. System shall consist of multiple indoor units, outdoor unit module(s), and HRCUs or SVKs when shown on Drawings. Piping, controls, and electrical power to components make operating system(s) complying with requirements indicated.
   1. System(s) operation being heat pump or heat recovery as indicated on Drawings.
   2. Each system with one refrigerant circuit serving all indoor units connected to system.

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. AHRI Compliance: System and equipment performance certified according to AHRI 1230-2023.

D. UL Compliance: Comply with UL 60335-2-40.

2.3 INDOOR, EXPOSED, WALL-MOUNTED UNITS

A. Description: Factory-assembled and tested complete unit with components, piping, wiring, and controls required for mating to piping, power, and controls field connections.

B. Cabinet:
1. Material: Painted steel, or coated steel frame covered by a plastic cabinet, with an architectural acceptable finish suitable for tenant occupancy on exposed surfaces.
2. Insulation: Manufacturer's standard internal insulation to provide thermal resistance and prevent condensation.
3. Internal Access: Removable panels of adequate size for field access to internal components for inspection, cleaning, service, and replacement.
4. Coil Assembly:
5. Coil Casing: Aluminum, galvanized, or stainless steel.
6. Coil Fins: Aluminum, mechanically bonded to tubes, with arrangement required by performance.
7. Coil Tubes: Copper, of diameter and thickness required by performance.
8. Capacity Control: DX coil by electronic modulating type valve with linear or proportional characteristics. Hydronic coil by modulating control valve.
9. Unit Internal Tubing: Copper tubing with brazed joints.
10. Unit Internal Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.
11. Factory Charge: Dehydrated air or nitrogen.
12. Testing: Factory pressure tested and verified to be without leaks.

C. Drain Assembly:
1. Pan: Non-ferrous material, with bottom sloped to low point drain connection.
2. Condensate Removal: Gravity.
    a. If a floor drain is not available at unit, provide unit with field-installed condensate pump accessory.
3. Field Piping Connection: Non-ferrous material.

D. Fan and Motor Assembly:
1. Fan(s):
    a. Direct-drive arrangement.
    b. Single or multiple fans connected to a common motor shaft and driven by a single motor.
    c. Fabricated from non-ferrous components or ferrous components with corrosion protection finish.
    d. Wheels statically and dynamically balanced.
2. Motor: Brushless DC or electronically commutated with permanently lubricated bearings.
3. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.
4. Speed Settings and Control: Multiple or variable speed with speed setting adjustable via central or wall controllers when present.
5. Vibration Control: Integral isolation to dampen vibration transmission.

E. Filter Assembly:
1. Access: Front, to accommodate filter replacement without the need for tools.
2. Media: Manufacturer's standard washable filter with antimicrobial treatment.

F. Grille Assembly: Manufacturer's standard discharge grille within front face of unit cabinet.
1. Motorized Vane: Adjustable or oscillating flow pattern.

G. Field-Installed Unit Accessories:
1. Condensate pump with integral white plastic housing for exposed surface mounting directly under indoor unit capable of at least 10 feet of lift with drain pan level sensor and overflow switch.

H. Unit Controls:
1. Factory-Installed Sensors:
   a. Unit inlet air temperature.
   b. Coil entering refrigerant or water temperature.
   c. Coil leaving refrigerant or water temperature.
   d. Refrigerant detection if coil is DX.
2. Features and Functions:
   a. Self-diagnostics.
   b. Time delay.
   c. Auto-restart.
   d. Auto operation mode.
   e. Manual operation mode.
   f. Filter service notification.
   g. Run test switch.

I. Unit Electrical:
1. Field Connection: Single point connection to power entire unit and integral controls.
2. Disconnecting Means: Field-installed circuit breaker or switch, complying with NFPA 70.

2.4 INDOOR, CONCEALED, CEILING-MOUNTED UNITS FOR DUCTING

A. Description: Factory-assembled and tested complete unit with components, piping, wiring, and controls required for mating to ductwork, piping, power, and controls field connections.

B. Cabinet:
1. Material: Galvanized steel.
2. Insulation: Manufacturer's standard internal insulation to provide thermal resistance and prevent condensation.
3. Duct Connections: Extended collar or flange, or designated exterior cabinet surface, designed for attaching field-installed ductwork.
4. Internal Access: Removable panels or hinged doors of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. Coil Assembly:
1. Coil Casing: Aluminum, galvanized, or stainless steel.
2. Coil Fins: Aluminum, mechanically bonded to tubes, with arrangement required by performance.
3. Coil Tubes: Copper, of diameter and thickness required by performance.
4. Capacity Control: DX coil by electronic modulating type valve with linear or proportional characteristics. Hydronic coil by modulating control valve.
5. Unit Internal Tubing: Copper tubing with brazed joints.
6. Unit Internal Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.
7. Factory Charge: Dehydrated air or nitrogen.
8. Testing: Factory pressure tested and verified to be without leaks.

D. Drain Assembly:
   1. Pan: Non-ferrous material, with bottom sloped to low point drain connection.
   2. Condensate Removal: Unit-mounted lifting mechanism, capable of lifting drain water to an elevation above top of cabinet (sizes 54 and smaller only).
   3. Field Piping Connection: Non-ferrous material.

E. Fan and Motor Assembly:
   1. Fan(s):
      a. Direct-drive arrangement.
      b. Single or multiple fans connected to a common motor shaft and driven by a single motor.
      c. Fabricated from non-ferrous components or ferrous components with corrosion-resistant finish.
      d. Wheels statically and dynamically balanced.
   2. Motor: PSC, Brushless DC or electronically commutated with permanently lubricated bearings.
   3. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.
   4. Speed Settings and Control: Multiple or variable speed with speed setting adjustable via central or wall controllers when present.
   5. External Static Settings: Vary based on Low, Medium, or High Static models. Models as shown on Drawings
      a. Low Static settings include 0.02, 0.06, 0.14, or 0.20” WG.
      b. Medium Static settings include 0.14, 0.20, 0.28, 0.40, or 0.60” WG.
      c. High Static settings include 0.40 or 1.00” WG for 208V and 0.60 or 1.00” WG for 230V.
   6. Vibration Control: Integral isolation to dampen vibration transmission.

F. Filter Assembly:
   1. Access: Bottom, side, or rear to accommodate field installation and replacement without need for tools.
   2. Media: Poly Propylene Honeycomb Fabric (Washable) with Low and Medium Static models. No filter provided with High Static models.

G. Field-Installed Unit Accessories:
   1. Condensate pump capable of at least 10 feet of lift.

H. Unit Controls:
   1. Factory-Installed Sensors:
      a. Unit inlet air temperature.
      b. Coil entering refrigerant or water temperature.
      c. Coil leaving refrigerant or water temperature.
      d. Refrigerant detection if coil is DX.
   2. Features and Functions:
      a. Self-diagnostics.
      b. Time delay.
      c. Auto-restart.
      d. External static pressure control.
      e. Auto operation mode.
      f. Manual operation mode.
      g. Filter service notification.
      h. Drain assembly high water level safety shutdown and notification.
      i. Run test switch.

I. Unit Electrical:
1. Field Connection: Single point connection to power unit and integral controls.
2. Disconnecting Means: Field-installed circuit breaker or switch.

2.5 INDOOR, CONCEALED, MULTI-POSITION UNITS FOR DUCTING

A. Description: Factory-assembled complete unit with components, piping, wiring, and controls required for mating to ductwork, piping, power, and controls field connections.

B. Cabinet:
1. Material: Painted steel.
2. Insulation: Manufacturer's standard internal insulation to provide thermal resistance and prevent condensation.
3. Duct Connections: Extended collar or flange, or designated exterior cabinet surface, designed for attaching field-installed ductwork.
4. Internal Access: Removable panels or hinged doors of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. Coil Assembly:
1. Coil Casing: Aluminum, galvanized, or stainless steel.
2. Coil Fins: Aluminum, mechanically bonded to tubes, with arrangement required by performance.
3. Coil Tubes: Copper, of diameter and thickness required by performance.
4. Capacity Control: DX coil by electronic modulating type valve with linear or proportional characteristics.
5. Unit Internal Tubing: Copper tubing with brazed joints.
6. Unit Internal Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.
7. Factory Charge: Dehydrated air or nitrogen.
8. Testing: Factory pressure tested and verified to be without leaks.

D. Drain Assembly:
1. Pan: Non-ferrous material, with bottom sloped to low point drain connection.
2. Condensate Removal: Gravity.
   a. If a floor drain is not available at unit, provide unit with field-installed condensate pump accessory.
3. Field Piping Connection: Non-ferrous material.

E. Fan and Motor Assembly:
1. Fan(s):
   a. Direct-drive arrangement.
   b. Single or multiple fans connected to a common motor shaft and driven by a single motor.
   c. Fabricated from non-ferrous components or ferrous components with corrosion-resistant finish.
   d. Wheels statically and dynamically balanced.
2. Motor: Brushless DC or electronically commutated with permanently lubricated bearings.
3. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.
4. Speed Settings and Control: Multiple or variable speed with speed setting adjustable via central or wall controllers when present.
5. External Static Settings: 0.30, 0.50, or 0.80” WG.

6. Vibration Control: Integral isolation to dampen vibration transmission.

F. Filter Assembly:
1. Access: Front to accommodate field installation and replacement without need for tools.
2. Media: Poly Propylene Honeycomb Fabric (Washable).

G. Field-Installed Unit Accessories:
1. Accessory electric heat kit mounted directly to unit air outlet connection, heat amount per Drawings, separate power supply required.
2. Condensate pump capable of at least 10 feet of lift with drain pan level sensor and overflow switch.

H. Unit Controls:
1. Factory-Installed Sensors:
   a. Unit inlet air temperature.
   b. Coil entering refrigerant temperature.
   c. Coil leaving refrigerant temperature.
   d. Refrigerant detection.
2. Features and Functions:
   a. Self-diagnostics.
   b. Time delay.
   c. Auto-restart.
   d. External static pressure control.
   e. Auto operation mode.
   f. Manual operation mode.
   g. Filter service notification.
   h. Drain assembly high water level safety shutdown and notification.
   i. Run test switch.

I. Unit Electrical:
1. Field Connection: Single point connection to power unit and integral controls.
2. Disconnecting Means: Field-installed circuit breaker or switch.

2.6 INDOOR, RECESSED, CEILING-MOUNTED UNITS WITH 33x33” GRILLES

A. Description: Factory-assembled and tested complete unit with components, piping, wiring, and controls required for mating to ductwork, piping, power, and controls field connections.

B. Cabinet:
1. Material: Painted steel, or coated steel frame covered by a plastic cabinet, with an architectural acceptable finish suitable for tenant occupancy on exposed surfaces.
2. Insulation: Manufacturer's standard internal insulation to provide thermal resistance and prevent condensation.
3. Internal Access: Removable panels of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. Coil Assembly:
1. Coil Casing: Aluminum, galvanized, or stainless steel.
2. Coil Fins: Aluminum, mechanically bonded to tubes, with arrangement required by performance.
3. Coil Tubes: Copper, of diameter and thickness required by performance.

4. Capacity Control: DX coil by electronic modulating type valve with linear or proportional characteristics. Hydronic coil by modulating control valve.
5. Internal Tubing: Copper tubing with brazed joints.
6. Internal Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.
7. Factory Charge: Dehydrated air or nitrogen.
8. Testing: Factory pressure tested and verified to be without leaks.

D. Drain Assembly:
1. Pan: Non-ferrous material, with bottom sloped to low point drain connection.
2. Condensate Removal: Unit-mounted integral lifting mechanism, capable of lifting drain water to an elevation above top of cabinet.
3. Field Piping Connection: Non-ferrous material.

E. Fan and Motor Assembly:
1. Fan(s):
   a. Direct-drive arrangement.
   b. Single or multiple fans connected to a common motor shaft and driven by a single motor.
   c. Fabricated from non-ferrous components or ferrous components with corrosion protection finish.
   d. Wheels statically and dynamically balanced.
2. Motor: Brushless DC or electronically commutated with permanently lubricated bearings.
3. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.
4. Speed Settings and Control: Multiple or variable speed with speed setting adjustable via central or wall controllers when present.
   a. Airflow volume shall vary based on three unit height settings.
5. Vibration Control: Integral isolation to dampen vibration transmission.

F. Filter Assembly:
1. Access: Bottom, to accommodate filter replacement without the need for tools.
2. Media: Washable screen.

G. Return/Discharge-Air Grille Assembly: Attached to bottom of unit cabinet.
1. Discharge Pattern: Include accessory air outlet shutter plates as required for two, three, or four-way throw as indicated on Drawings.
   a. Discharge Pattern Adjustment: Field-adjustable settings for up and down range of motion.
   b. Discharge Pattern Closure: Ability to close individual discharges of units with multiple patterns using wall-mounted controller.
2. Motorized Vanes: Modulating up and down flow pattern for uniform room air distribution.
3. Alternate Branch Supply Duct Connection: Sheet metal knockout for optional connection to one supply branch duct as shown on Drawings. Utilize accessory air outlet shutter plate with branch ducting.

H. Integral Occupant and Location Detection: Unit includes occupant and location detection for automatic air distribution and energy saving setback control in the following manner.
1. Air Distribution
   a. Distribution operation: Integral occupant and location detection will not be utilized to control air distribution. During COOL mode, vanes move to horizontal airflow direction. During HEAT mode, vanes move to down airflow direction.

I. Outdoor Air Ventilation Connection: Sheet metal knockout for connection to outdoor air ventilation duct per Drawings.

J. Unit Controls:
1. Factory-Installed Sensors:
   a. Unit inlet air temperature.
   b. Coil entering refrigerant or water temperature.
   c. Coil leaving refrigerant or water temperature.
   d. Room occupancy/location.
   e. Refrigerant detection if coil is DX
2. Features and Functions:
   a. Integral occupancy and location sensor.
   b. Time delay.
   c. Auto-restart.
   d. Auto operation mode.
   e. Manual operation mode.
   f. Filter service notification.
   g. Drain assembly high water level safety shutdown and notification.
   h. Run test switch.

K. Unit Electrical:
1. Field Connection: Single point connection to power entire unit and integral controls.
2. Disconnecting Means: Field-installed circuit breaker or switch, complying with NFPA 70.

2.7 INDOOR, RECESSED, CEILING-MOUNTED UNITS WITH 24x24” GRILLES

A. Description: Factory-assembled and tested complete unit with components, piping, wiring, and controls required for mating to ductwork, piping, power, and controls field connections.

B. Cabinet:
1. Material: Painted steel, or coated steel frame covered by a plastic cabinet, with an architectural acceptable finish suitable for tenant occupancy on exposed surfaces.
2. Insulation: Manufacturer's standard internal insulation to provide thermal resistance and prevent condensation.
3. Internal Access: Removable panels of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. Coil Assembly:
1. Coil Casing: Aluminum, galvanized, or stainless steel.
2. Coil Fins: Aluminum, mechanically bonded to tubes, with arrangement required by performance.
3. Coil Tubes: Copper, of diameter and thickness required by performance.
4. Capacity Control: DX coil by electronic modulating type valve with linear or proportional characteristics. Hydronic coil by modulating control valve.
5. Internal Tubing: Copper tubing with brazed joints.
6. Internal Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.
7. Factory Charge: Dehydrated air or nitrogen.
8. Testing: Factory pressure tested and verified to be without leaks.

D. Drain Assembly:

1. Pan: Non-ferrous material, with bottom sloped to low point drain connection.
2. Condensate Removal: Unit-mounted integral lifting mechanism, capable of lifting drain water to an elevation above top of cabinet.
3. Field Piping Connection: Non-ferrous material.

E. Fan and Motor Assembly:
1. Fan(s):
   a. Direct-drive arrangement.
   b. Single or multiple fans connected to a common motor shaft and driven by a single motor.
   c. Fabricated from non-ferrous components or ferrous components with corrosion protection finish.
   d. Wheels statically and dynamically balanced.
2. Motor: Brushless DC or electronically commutated with permanently lubricated bearings.
3. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.
4. Speed Settings and Control: Multiple or variable speed with speed setting adjustable via central or wall controllers when present.
5. Vibration Control: Integral isolation to dampen vibration transmission.

F. Filter Assembly:
1. Access: Bottom, to accommodate filter replacement without the need for tools.
2. Media: Washable screen.

G. Return/Discharge-Air Grille Assembly: Attached to bottom of unit cabinet.
1. Discharge Pattern: Four-way throw.
   a. Discharge Pattern Adjustment: Field-adjustable settings for up and down range of motion for individual vanes. Provide Deluxe controller to enable configuration.
2. Motorized Vanes: Modulating up and down flow pattern for uniform room air distribution.

H. Integral Occupant and Location Detection: Unit includes occupant and location detection for automatic air distribution and energy saving setback control in the following manner-
1. Air Distribution
   a. Default distribution operation: Integral occupant and location detection will not be utilized to control air distribution. During COOL mode, vanes move to horizontal airflow direction. During HEAT mode, vanes move to down airflow direction.

I. Outdoor Air Ventilation Connection: Sheet metal knockout for optional connection to outdoor air ventilation duct.

J. Unit Controls:
1. Factory-Installed Sensors:
   a. Unit inlet air temperature.
   b. Coil entering refrigerant or water temperature.
   c. Coil leaving refrigerant or water temperature.
   d. Refrigerant detection if coil is DX.
2. Features and Functions:
   a. Integral occupancy and location sensor.
   b. Time delay.
   c. Auto-restart.
   d. Auto operation mode.
   e. Manual operation mode.

f. Filter service notification.
g. Drain assembly high water level safety shutdown and notification.
h. Run test switch.

K. Unit Electrical:
1. Field Connection: Single point connection to power entire unit and integral controls.
2. Disconnecting Means: Field-installed circuit breaker or switch, complying with NFPA 70.

2.8 INDOOR, RECESSED, ONE-WAY CEILING-MOUNTED UNITS

A. Description: Factory-assembled and tested complete unit with components, piping, wiring, and controls required for mating to ductwork, piping, power, and controls field connections.

B. Cabinet:
1. Material: Painted steel, or coated steel frame covered by a plastic cabinet, with an architectural acceptable finish suitable for tenant occupancy on exposed surfaces.
2. Insulation: Manufacturer's standard internal insulation to provide thermal resistance and prevent condensation.
3. Internal Access: Removable panels of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. Coil Assembly:
1. Coil Casing: Aluminum, galvanized, or stainless steel.
2. Coil Fins: Aluminum, mechanically bonded to tubes, with arrangement required by performance.
3. Coil Tubes: Copper, of diameter and thickness required by performance.
4. Capacity Control: DX coil by electronic modulating type valve with linear or proportional characteristics.
5. Internal Tubing: Copper tubing with brazed joints.
6. Internal Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.
7. Factory Charge: Dehydrated air or nitrogen.
8. Testing: Factory pressure tested and verified to be without leaks.

D. Drain Assembly:
1. Pan: Non-ferrous material, with bottom sloped to low point drain connection.
2. Condensate Removal: Unit-mounted integral lifting mechanism, capable of lifting drain water to an elevation above top of cabinet.
3. Field Piping Connection: Non-ferrous material.

E. Fan and Motor Assembly:
1. Fan(s):
a. Direct-drive arrangement.
b. Single or multiple fans connected to a common motor shaft and driven by a single motor.
c. Fabricated from non-ferrous components or ferrous components with corrosion protection finish.
d. Wheels statically and dynamically balanced.
2. Motor: PSC, Brushless DC or electronically commutated with permanently lubricated bearings.
3. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.
4. Speed Settings and Control: Multiple or variable speed with speed setting adjustable via central or wall controllers when present.
5. Vibration Control: Integral isolation to dampen vibration transmission.

F. Filter Assembly:
1. Access: Bottom, to accommodate filter replacement without the need for tools.
2. Media: Washable screen.

G. Return/Discharge-Air Grille Assembly: Attached to bottom of unit cabinet.
1. Discharge Pattern: One-way throw.
a. Discharge Pattern Adjustment: Field-adjustable settings for up and down range of motion for individual vanes.
2. Motorized Vanes: Modulating up and down flow pattern for uniform room air distribution.

H. Field-Installed Unit Accessories:
1. Condensate pump capable of at least 10 feet of lift.

I. Unit Controls:
1. Factory-Installed Sensors:
a. Unit inlet air temperature.
b. Coil entering refrigerant temperature.
c. Coil leaving refrigerant temperature.
d. Refrigerant detection.
2. Features and Functions:
a. Integral occupancy and location sensor.
b. Time delay.
c. Auto-restart.
d. Auto operation mode.
e. Manual operation mode.
f. Filter service notification.
g. Drain assembly high water level safety shutdown and notification.
h. Run test switch.

J. Unit Electrical:
1. Field Connection: Single point connection to power entire unit and integral controls.
2. Disconnecting Means: Field-installed circuit breaker or switch, complying with NFPA 70.

2.9 INDOOR, SUSPENDED, CEILING-MOUNTED UNITS

A. Description: Factory-assembled and tested complete unit with components, piping, wiring, and controls required for mating to piping, power, and controls field connections.

B. Cabinet:
1. Material: Painted or coated steel frame covered by a plastic cabinet, with an architectural acceptable finish suitable for tenant occupancy on exposed surfaces.
2. Insulation: Manufacturer's standard internal insulation to provide thermal resistance and prevent condensation.
3. Internal Access: Removable panels of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. DX Coil Assembly:
1. Coil Casing: Aluminum, galvanized, or stainless steel.
2. Coil Fins: Aluminum, mechanically bonded to tubes, with arrangement required by performance.

3. Coil Tubes: Copper, of diameter and thickness required by performance.
4. Expansion Valve: Electronic modulating type with linear or proportional characteristics.
5. Internal Tubing: Copper tubing with brazed joints.
6. Internal Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.
7. Factory Charge: Dehydrated air or nitrogen.
8. Testing: Factory pressure tested and verified to be without leaks.

D. Drain Assembly:
1. Pan: Non-ferrous material, with bottom sloped to low point drain connection.
2. Condensate Removal: Gravity.
    a. If a floor drain is not available at unit, provide unit with field-installed condensate pump accessory.
3. Field Piping Connection: Non-ferrous material.

E. Fan and Motor Assembly:
1. Fan(s):
    a. Direct-drive arrangement.
    b. Single or multiple fans connected to a common motor shaft and driven by a single motor.
    c. Fabricated from non-ferrous components or ferrous components with corrosion protection finish.
    d. Wheels statically and dynamically balanced.
2. Motor: Brushless DC or electronically commutated with permanently lubricated bearings.
3. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.
4. Speed Settings and Control: Multiple or variable speed with speed setting adjustable via central or wall controllers when present.
5. Vibration Control: Integral isolation to dampen vibration transmission.

F. Filter Assembly:
1. Access: Bottom, to accommodate filter replacement without the need for tools.
2. Media: Manufacturer's washable filter with antimicrobial treatment.

G. Discharge-Air Grille Assembly: Mounted in front of unit cabinet.
1. Discharge Pattern: One-way throw.
2. Discharge Pattern Adjustment: Field-adjustable limits for range of pattern.
3. Motorized Vanes: Modulating up and down flow pattern for uniform room air distribution.

H. Return-Air Grille Assembly: Manufacturer's standard.

I. Outdoor Air Ventilation Connection: Sheet metal knockout for optional connection to outdoor air ventilation duct.

J. Field-Installed Unit Accessories:
1. Condensate pump capable of at least 10 feet of lift with drain pan level sensor and overflow switch.

K. Unit Controls:
1. Factory-Installed Sensors:
    a. Unit inlet air temperature.
    b. Coil entering refrigerant temperature.
    c. Coil leaving refrigerant temperature.
    d. Refrigerant detection.

2. Features and Functions:
    a. Time delay.
    b. Auto-restart.
    c. Auto operation mode.
    d. Manual operation mode.
    e. Filter service notification.
    f. Drain assembly high water level safety shutdown and notification.
    g. Run test switch.

L. Unit Electrical:
1. Field Connection: Single point connection to power entire unit and integral controls.
2. Disconnecting Means: Field-installed circuit breaker or switch, complying with NFPA 70.

2.10 INDOOR, ENERGY RECOVERY VENTILATOR

A. Description: Factory-assembled and tested complete unit with components, wiring, and controls required for mating to ductwork, power, and controls field connections.

B. Cabinet:
1. Material: Galvanized steel.
2. Insulation: Self-extinguishing urethane foam.
3. Duct Connections: Extended collar or flange, or designated exterior cabinet surface, designed for attaching field-installed ductwork.
4. Internal Access: Removable panels or hinged doors of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. Energy Recovery Heat-Exchanger Bypass:
1. Low Leakage Damper: with electric actuator with integral controls to bypass up to 70% of outdoor air flow around the energy recovery heat exchanger during times of favorable weather, and there is no energy-saving benefit to circulate air across the energy recovery heat exchanger.

D. Fan and Motor Assemblies: Separate fan and motor assemblies for supply and exhaust airstreams with control for equal airflow.
1. Fan(s):
    a. Direct-drive arrangement.
    b. Fabricated from non-ferrous components or ferrous components with corrosion protection finish.
    c. Wheels statically and dynamically balanced.
2. Motor: Brushless DC or electronically commutated with permanently lubricated bearings.
3. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.
4. Speed Settings and Control:
    a. Single-phase units shall include four speed settings or variable speed with a speed range of least 25 percent.
    b. Three-phase units shall include independent control for supply and exhaust air to enable & control pressurization.
5. Vibration Control: Integral isolation to dampen vibration transmission.

E. Filter Assemblies: Separate filter assemblies for outdoor air and exhaust airstreams entering energy recovery heat exchanger.
1. Access: Removable maintenance access panel.

2. Efficiency: MERV 7.
3. Replaceable Media: Extended surface, panel, or cartridge with antimicrobial treatment fiber media.

F. Energy Recovery Heat Exchanger:
1. Total (sensible and latent) energy exchange between outdoor air and exhaust airstreams with performance indicated on Drawings.
2. Fixed element with no moving parts.
3. Plate Material and Coating: Chemically treated paper with selective hygroscopicity, moisture permeability, and gas barrier properties.
4. AHRI 1060 certified and bearing the AHRI label.
5. Entering Outside Air Temperature Range: Shall be between 14°F and 104°F to avoid intermittent supply air fan operation-
   a. OFF for 10 minutes, ON for 60 minutes if entering OA below 14°F.
   b. OFF for 55 minutes, ON for 5 minutes if entering OA below 5° F.

G. Unit Controls:
1. Factory-Installed Sensors:
   a. Unit entering outdoor air temperature.
   b. Unit entering exhaust air temperature.
2. Features and Functions: Self-diagnostics, time delay, auto-restart.

H. Unit Electrical:
1. Field Connection: Single point connection to power entire unit and integral controls.
2. Disconnecting Means: Field-installed circuit breaker or switch, complying with NFPA 70.

2.11 INDOOR, VENTILATED HEAT RECOVERY CONTROL UNITS (HRCUs)

A. Description: Factory-assembled and tested complete unit with components, piping, wiring, and controls required for mating to piping, power, and controls field connections.
1. Specially designed for use in systems with simultaneous heating and cooling.
2. Systems shall include one or multiple units designed by variable refrigerant system manufacturer for field interconnection to make a single refrigeration circuit and multiple indoor units.
3. Units shall respond to calls for HEAT or COOL operation from indoor units by enabling refrigerant or water flow as equipment shown on Drawings require.
   a. If flow direction from HRCU alternates, flow in COOL direction to indoor units in HEAT mode during outdoor unit defrost sequence is not allowed.

B. Cabinet:
1. Galvanized-steel construction.
2. Insulation: Manufacturer's standard internal insulation to provide thermal resistance and prevent condensation.
3. Internal Access:
   a. Removable panels or hinged doors of adequate size.
   b. Access to all internal components for inspection, cleaning, service, or replacement.
4. Qty (2) 4” duct connection ports for exhaust and intake air

C. Drain Pan: If required by manufacturer's design, provide unit with non-ferrous drain pan with bottom sloped to a low point drain connection.

D. Assemblies and Specialties:
1. Specially designed by manufacturer for type of VRF HVAC system being installed, either two or three pipe.
2. Each branch circuit shall have refrigerant and/or water control valve(s) to control flow.
3. Units serving DX indoor units shall include mitigation shut-off valves at each branch circuit.
4. Each branch port connection shall be fitted with an isolation valve to simplify service to any individual branch.

E. Unit Controls:
1. Factory-Installed Sensors:
a. Liquid inlet temperature.
b. Bypass exit area temperature.
c. Bypass outlet temperature.
d. Bypass inlet temperature.
e. High pressure sensor.
f. Medium pressure sensor.
g. Integral Refrigerant Leak Detector Sensor

F. Refrigerant Leak Detection:
1. Sequence upon receiving leak detection signal from any DX indoor unit:
a. Shut-off valves for each port(s) connected DX indoor unit(s) having detected refrigerant close.
b. If indoor unit fan(s) where refrigerant is detected is set to AUTO, fan switches to ON.
c. Refrigerant detection signal output activated.
d. Normal operation continues uninterrupted for ports and DX indoor units where refrigerant is not detected.
2. Sequence upon receiving leak detection signal from integral leak detection sensor
a. All connected indoor and outdoor units within the system are stopped
b. Shut-off valves for liquid and suction lines close
c. Dry contact output from TBX1-2 is activated
d. Alarm output signal TBX3-4 is activated
e. Error Code 1524 appears on local controller and central controller

G. Unit Electrical:
1. Field Connection: Single point connection to power entire unit and integral controls.
2. Disconnecting Means: Field-installed circuit breaker or switch, complying with NFPA 70.

2.12 OUTDOOR, AIR-SOURCE HEAT RECOVERY UNITS

A. Description: Factory-assembled and tested complete unit designed for use in systems with simultaneous heating and cooling.
1. Systems shall consist of one unit, or multiple unit modules that are designed by variable refrigerant system manufacturer for field interconnection to make a single refrigeration circuit, heat recovery control unit(s), and multiple indoor units.

B. Cabinet:
1. Galvanized steel and coated with a corrosion-resistant finish.
a. Coating with documented salt spray test performance of 2000 hours according to ASTM B117 surface scratch test (SST) procedure.

2. Internal Access: Removable panels or hinged doors of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. Compressor and Motor Assembly:
1. One or more positive-displacement, direct-drive and hermetically sealed scroll compressor(s) with inverter drive. Non-inverter compressors—where LRA applies—are not allowed.
2. Protection: Integral protection against the following-
   a. Refrigerant overcharge and undercharge
   b. High and low refrigerant pressure.
   c. High refrigerant and oil temperature.
   d. Liquid flood back.
   e. Thermal and overload.
   f. Voltage fluctuations.
   g. Phase failure and phase reversal.
   h. Short cycling.
3. Speed Control: Configurable to maintain refrigerant evaporating and condensing temperatures while varying refrigerant flow to satisfy cooling and heating loads.
   a. Cooling mode fixed 32°F evaporator temperature.
   b. Cooling mode fixed 43°F evaporator temperature.
   c. Cooling mode variable 32-48°F evaporator temperature.
   d. Heating mode high COP operation.
   e. Heating mode high heating output operation.
4. Vibration Control: Integral isolation to dampen vibration transmission.
5. Oil Management: Timed sequence enabled during extended periods of reduced refrigerant flow to ensure proper lubrication over entire operating range. Sequences which rely on sensing oil level risk sensor failure or sensor placement not accounting for line length and are not allowed.
6. Crankcase heaters with integral control to maintain safe operating temperature.
7. Fusible plug.

D. Heat-Exchanger Assembly: Individual coil segments for each unit face to simplify future service replacement costs. Documented salt spray test performance of 2000 hours according to ASTM B117 surface test (SST) procedure.
1. Plate Fin Coils:
   a. Casing: Aluminum, galvanized, or stainless steel.
   b. Fins: Aluminum or copper, mechanically bonded to tubes, with arrangement required by performance.
   c. Tubes: Copper, of diameter and thickness required by performance.
2. Zinc-Coated Aluminum Vertical Flat Tube Coils:
   a. Series of tubes containing a series of multiple, parallel flow channels layered between refrigerant header manifolds.
   b. Construct fins, tubes, and header manifolds of aluminum alloy.

E. Heat-Exchanger Defrost Strategy:
1. Alternate methods based on ambient temperatures.
   a. Hot-gas method to maximize efficiency during mild ambient temperatures. Method prolongs defrost sequence.
      1) Segmented coil (single-module systems) or alternating modules (twinned systems) to deliver simultaneous defrost and HEAT delivery indoors.

b. Reverse-cycle method to maximize comfort during extreme ambient temperatures. Method shortens defrost sequence.
1) Leverage below 33.8°F for single-module systems and below 23°F for twinned systems to deliver shorter defrost cycles.

2. Preheat Defrost Operation: Signal to indoor units operating in HEAT to increase space temperature before the start of defrost sequence.

F. Heat-Exchanger Fan and Motor Assembly:
1. Fan(s): Propeller type.
a. Direct-drive arrangement.
b. Fabricated from non-ferrous components.
c. Statically and dynamically balanced.
2. Fan Guards: Removable safety guards complying with OSHA regulations. If using metal materials, coat with corrosion-resistant coating to match performance indicated for heat exchanger coil.
3. Motor(s): Brushless DC or electronically commutated with permanently lubricated bearings and rated for outdoor duty.
4. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.

G. Field-Installed Unit Accessories:
1. Snow/Hail Protection Kit: Provide heat exchanger coil guards and fan hoods to protect against hail damage.

H. Unit Controls:
1. Enclosure: Manufacturer's standard, and suitable for unprotected outdoor locations.
2. Factory-Installed Controller: Configurable digital control.
3. Factory-Installed Sensors:
a. Refrigerant suction temperature.
b. Refrigerant discharge temperature.
c. Outdoor air temperature.
d. Refrigerant high pressure.
e. Refrigerant low pressure.
4. Features and Functions: Self-diagnostics, time delay, auto-restart, USB connector to allow running system data up to five days based on storage capacity of memory stick when provided.

I. Unit Electrical:
1. Field Connection: Single point connection to power each unit module or factory-twinned unit and integral controls.
2. Disconnecting Means: Field-installed circuit breaker or switch, complying with NFPA 70.

2.13 VRF SYSTEM CONTROLS

A. General Requirements:
1. Communicating network may include: Indoor units, outdoor units, HRCUs, SVKs and integral controls connect through a manufacturer-selected network.
2. Network Communication Protocol: Manufacturer proprietary control communication between interconnected units.
3. Integration with Building Automation System: ASHRAE 135, BACnet IP and certified by BACnet Testing Lab (BTL), including the following-

a. Ethernet connection via RJ-45 connectors and port with transmission
b. Integration shall include control,monitoring,scheduling,change of value notifications

4. Operator Interface:
   a. Operators shall interface with system and unit controls through the following:
      1) Operator interfaces integral to controllers
      2) [Manufacturer-provided central controller.
      3) Integration with Building Automation System.
   b. Users shall be capable of interface with controllers for indoor units' control to extent privileges are enabled. Control features available to users shall include the following:
      1) On/off control.
      2) Temperature set-point adjustment.
      3) Fan speed control.

B. Wired Controllers and Sensors for Indoor Units
1. Simple Controllers for Indoor Units:
   a. Single controller capable of controlling multiple indoor units as group.
   b. Integral room temperature sensor
   c. Temperature Units: Fahrenheit and Celsius.
   d. On/Off: Turns indoor unit on or off.
   e. Operation Mode: Cool, Heat, Auto, Dehumidification, Fan Only.
   f. Temperature Display and Set-Point: Separate set points for Cooling, Heating. Adjustable in 1-degree Fahrenheit increments between.
   g. Fan Speed Setting: Select between available options furnished with unit.
   h. Airflow Direction Setting: If applicable to indoor unit style, select between available options furnished with the unit.
   i. Service Notification Display: "Filter".
   j. Error Code Notification Display: Used by service personnel to troubleshoot abnormal operation and equipment failure.
   k. Low-voltage power required for controller shall be powered through non-polar connections to indoor unit.

2.14 VRF SYSTEM REFRIGERANT AND OIL

A. Refrigerant:
1. As required by VRF HVAC system manufacturer for system to comply with performance requirements indicated.
2. ASHRAE 34, Class A2L
3. R-32.

B. Oil:
1. As required by VRF HVAC system manufacturer and to comply with performance requirements indicated.

2.15 VRF SYSTEM CONTROL CABLE

A. General Requirements: Refer to and verify all wire and cabling requirements with the manufacturer's current installation and operation manuals to ensure compliance with the latest standards and

specifications. Cables may not be spliced and shall be continuous from terminal to terminal. Do not splice cable.

B. Low-Voltage Control Network Cabling:
   1. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.
      a. Shielded wire (2-core) 16 AWG—CVVS, CPEVS or MVVS.
      b. PVC insulation and jacket.
      c. Foil shielded.
      d. Flame Resistance: Comply with NFPA 262.
      e. Maximum cable distance (distance to farthest components) is 1,640 feet.
      f. Maximum cable distance from OU to connected IU is 656 feet.
      g. Maximum total cable length (sum of all network cabling) is 6,560 feet.

C. Low-Voltage Wall-Mounted Controller Cabling to Indoor Units:
   1. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.
      a. 22 AWG, 2-conductor unshielded 7-stranded bare copper wire.
         1) Residential / multi-family style controllers require 4-conductor.
         2) Touch controllers with integral occupancy and light sensing controllers require low-voltage control network cabling to the network.
      b. PVC insulation and jacket.
      c. Flame Resistance: Comply with NFPA 262.
      d. Maximum cable distance (distance from controller to indoor unit) varies by controller style. Refer to manufacturer Submittal or Installation Guides.

D. Transmission power booster provided if additional signal power is required based on connected devices. Coordinate with VRF manufacturer and install near middle of communication bus when required.

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. 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.

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.

C. Pad-Mounted Installations: Install outdoor units on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
1. Attachment: Install anchor bolts to elevations required for proper attachment to supported equipment.
2. Grouting: Place grout under equipment supports and make bearing surface smooth.

D. Roof-Mounted Installations: Install outdoor units on equipment supports specified in Section 077200 "Roof Accessories." Anchor units to supports with removable, stainless-steel fasteners.

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 230500 "Common Work Results for HVAC."

L. Install escutcheons for piping and tubing penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230500 "Common Work Results for HVAC."

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 as specified in Section 230516 “Hangers and Supports for HVAC Piping and Equipment.”
3. Prepare tubing ends and make mating connections to provide a pressure tight and leak-free installation.

B. Select system components with minimum 650 psig pressure rating.

C. Install piping as short and direct as possible, with a minimum number of joints and fittings.

D. 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.

E. Install refrigerant piping and tubing in protective conduit where installed below ground.

F. Install refrigerant piping and tubing in rigid or flexible conduit in locations where exposed to mechanical damage.

G. 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. Traps to entrain oil in vertical runs are not allowed.
4. Inverted traps for twinned systems may be required by manufacturer.
5. Liquid lines may be installed level.

H. When brazing, remove or protect components that could be damaged by heat. Braze pipes with a dry nitrogen purge to avoid oxidation.

I. Before installation, clean piping, tubing, and fittings to cleanliness level required by VRF HVAC system manufacturer.

J. Joint Construction:
1. Brazed Joints
a. Ream ends of tubes and remove burrs.
b. Remove scale, slag, dirt, and debris from inside and outside of tube and fittings before assembly.
c. Construct joints in accordance with AWS's "Brazing Handbook," "Pipe and Tube" Chapter.
d. Use Type BAg (cadmium-free silver) alloy for joining copper with bronze.
e. The piping being brazed shall be purged of air to remove the oxygen and filled with one of the following inert gases: oxygen-free nitrogen, helium or argon. The piping system shall be purged with an inert gas for a minimum time corresponding to five volume changes through the piping system prior to brazing. The pre-purge rate shall be at a minimum velocity of 100 feet per minute (0.56 yard/s). The inert gas shall be directly connected to the tube system being brazed to

prevent the entrainment of ambient air. After the pre-purge, the inert gas supply shall be maintained through the piping during the brazing operation at a minimum pressure of 1.0 psi and a maximum pressure of 3.0 psi. The joint shall be brazed with a filler metal conforming to AWS A5.8

2. Mechanically Pressed Joints
    a. The installing contractor shall be fully trained and qualified by the manufacturer of the mechanically pressed joints to install the selected piping connections.
    b. Mechanical joints shall be installed in accordance with the manufacturer's instructions.
3. Flared Joints
    a. Flared fittings shall be installed in accordance with the manufacturer's instructions. The flared fitting shall be used with the tube material specified by the fitting manufacturer. The flared tube end shall be made by a tool designed for that operation.
4. Soldered Joints
    a. Use of soldered joints is prohibited within VRF systems.

3.8 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.

3.9 INSTALLATION OF DUCT, ACCESSORIES, AND AIR OUTLETS

A. Where installing ductwork adjacent to equipment, allow space for service and maintenance.

3.10 IDENTIFICATION

A. Identify system equipment, piping, tubing, and valves. Comply with requirements for identification specified in Section 230553 "Identification for HVAC Piping and Equipment."

3.11 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 manufacturer-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-trained and authorized service representative shall provide on-site visits during 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 50 percent completion of system(s).
      c. 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.
   5. Final Inspection before Startup:
      a. Before inspection, Installer to provide written request to manufacturer stating the system is fully installed according to 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. A factory-trained and authorized service representative 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) Condensate removal acceptable.
   16) Fan settings and readings within an acceptable range.
   17) Unit airflow direction within an acceptable range.
   18) If applicable, fan external static pressure setting.
   19) Filter type and condition acceptable.
   20) Noise level within an acceptable range.
   21) Refrigerant or hydronic piping properly connected and insulated.
   22) Condensate drain piping properly connected and insulated.
   23) If applicable, ductwork properly connected.
   24) If applicable, external interlocks properly connected.
   25) 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, including compressor speed control.
   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) For water-source outdoor units, water piping properly connected and insulated.
17) For water-source outdoor units, proof of water flow checked for proper operation.
18) Remarks.

f. Installer shall provide manufacturer with the requested documentation including as-built piping lengths and technical support during inspection.
g. Installer shall correct observed deficiencies found by the inspection.
h. 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.
i. 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.
j. 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: Not less than 24 hours 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 and Hydronic 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:
   a. Refrigerant piping to a test pressure of not less than 600 psig using dry nitrogen.
   b. Hydronic piping to a test pressure of not less than 43 psig.
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 and to system manufacturer.

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 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 and to system manufacturer.
6. Upon successful completion of evacuation testing, system shall be charged with refrigerant.

E. System Refrigerant Charge:
1. System Installer shall consult system manufacturer to determine the correct system refrigerant charge based on as-built piping lengths.
2. Installer shall charge system following VRF HVAC system manufacturer's written instructions.
3. Total refrigerant charge shall be recorded and permanently displayed at the system's outdoor unit.

3.12 STARTUP SERVICE

A. Installer shall engage a factory-trained and authorized service representative of VRF HVAC system manufacturer to perform system(s) startup supervision.
1. Complete startup service of each separate system.
2. 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 outdoor unit’s power supply is connected 12 to 24 hours before startup of system.
3. Check each indoor unit's response to demand for cooling and heating.
4. Check each indoor unit's response to changes in airflow settings.
5. Check each indoor unit, outdoor unit, and HRCU when present for proper condensate removal.

C. Installer shall accompany factory-trained and authorized 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 one hour 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.

3.13 ADJUSTING

A. Adjust equipment and components to function smoothly and lubricate as recommended by manufacturer.

B. Adjust initial temperature set points. Adjust initial airflow settings and discharge airflow patterns.

C. Set field-adjustable switches according to VRF HVAC system manufacturer's written instructions, and as indicated.

3.14 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 four 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.

3.15 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.

C. Schedule:
1. Schedule training with Owner at least 10 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.

D. Location: Owner shall provide a suitable on-site location to host classroom training.

E. 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.

F. Training Format: Individual training modules shall include classroom training followed by hands-on field demonstration and training.

G. Training Materials: Provide training materials in electronic format to each attendee.

1. Offer online instructional videos showing general operation and maintenance that are coordinated with operation and maintenance manuals.

H. Acceptance: Obtain Owners written acceptance that training is complete, and requirements indicated have been satisfied.

END OF SECTION 23 8129

SECTION 23 8210 - GAS-FIRED INFRARED UNIT HEATERS

PART 1 GENERAL

1.1 CODES AND STANDARDS

A. American National Standard / CSA Standard Gas-Fired Low Intensity Infrared Heaters: Construct and certify gas-fired infrared heaters in accordance with latest edition ANSI Z83.20 / CSA 2.34 "Gas-Fired Low-Intensity Infrared Heaters" including all current supplements.

B. Installation Compliance: United States: Refer to National Fuel Gas Code NFPA 54/ANSI Z223.1 - latest revision. Canada: Refer to Natural Gas and Propane Installation Code CSA B149.1 - latest revision.

C. CSA Compliance: Provide CSA Seal affixed to each burner name plate and provide CSA Certification of heater design as vented or unvented infrared heater for indoor installation.

D. National Standard Gas Piping Compliance: Install and connect gas piping to gas fired infrared heaters in accordance with United States: Refer to National Fuel Gas Code NFPA 54/ANSI Z223.1 - latest revision. Canada: Refer to Natural Gas and Propane Installation Code CSA B149.1 - latest revision.

E. National Electrical Code Compliance: Install and connect electrical wiring to gas fired infrared heaters in accordance with: 1.) United States: Refer to National Electrical Code®, NFPA 70 - latest revision. Wiring must conform to the most current National Electrical Code®, local ordinances and any special diagrams furnished. 2.) Canada: Refer to Canadian Electrical Code, CSA C22.1 Part 1 - latest revision.

F. National Performance Rating for Gas Fired Infrared Heaters Standard: Radiant output of gas fired infrared heaters shall be rated in accordance with AHRI Standard 1330. Refer to Performance Rating for Radiant Output of Gas Fired Infrared Heaters Standard CAN/ANSI/AHRI 1330-2015.

1.2 WARRANTY

A. Provide written warranty, by manufacturer, agreeing to replace/repair, within warranty period, components of gas fired infrared systems furnished by manufacturer, which are defective in either material or workmanship, provided manufacturer's instructions for handling, installing, protecting, and maintaining units have been adhered to during warranty periods follows:

B. Three (3) year warranty on the burner system from the date of final acceptance of the infrared heaters

1.3 SUBMITTALS

A. Product Data: Provide typical catalog of information including arrangements.

B. Shop Drawings
   1. Submit schedules of equipment and enclosures typically indicating length and number of pieces of element and enclosure, corner pieces, end caps, cap strips, access doors, pilaster covers, and comparison of specified heat required to actual heat output provided.

C. Manufacturer's Instructions: Indicate installation instructions and recommendations.

D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.

E. Warranty: Submit manufacturer's warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.4 QUALITY ASSURANCE

A. Approved Manufacturers
1. Infrared heating system shall be COMPACT™ BH radiant heaters as manufactured by Roberts Gordon LLC., Buffalo, New York.

B. Manufacturer's Qualifications
1. Firms regularly engaged in manufacture of gas fired radiant systems with characteristics, sizes, and capacities required, whose products have been in satisfactory use in similar service for not less than 15 years.

C. Alternate Manufacturers
1. Other low intensity infrared heaters (of equal or greater thermal efficiency) (of an Infrared Factory (IF) as high as 15 when tested in accordance to AHRI standard 1330 for Radiant Output of Gas Fired Infrared Heaters,) and with the same or lower burner firing rate capacity, and with the infrared distribution pattern shown on drawing may be acceptable provided they meet the intent of these specifications and prior approval in writing is obtained from the engineer at least twenty (20) days before the bid date. If such systems are approved, the contractor assumes responsibility for the design, performance and expense of same. The redesigned system, gas piping, and electric wiring shall be done by a registered mechanical engineer. Shop drawings of the entire new system shall be provided by this contractor. The contractor should state the amount to be credited to the owner due to this substitution.
    a. Where approved substitutes are used, the contractor assumes all responsibility for physical dimensions and all other resulting changes. This responsibility extends to cover all extra work as necessitated by other trades as a result of the substitutions.
    b. The engineer reserves the right to require the contractor to remove and replace any material or equipment which does not meet specifications or does not have any prior approval as a substitute item. Work shall be completed immediately without cost or inconvenience to the owner.

D. Manufacturer's Qualifications
1. Alternate Manufacturers
    a. Other low intensity infrared heaters (of equal or greater thermal efficiency) (of an Infrared Factory (IF) as high as 15 when tested in accordance to AHRI standard 1330 for Radiant Output of Gas Fired Infrared Heaters,) and with the same or lower burner firing rate capacity, and with the infrared distribution pattern shown on drawing may be acceptable provided they meet the intent of these specifications and prior approval in writing is obtained from the engineer at least twenty (20) days before the bid date. If such systems are approved, the contractor assumes responsibility for the design, performance and expense of same. The redesigned system, gas piping, and electric wiring shall be done by a registered mechanical engineer. Shop drawings of the entire new system shall be provided by this contractor. The contractor should state the amount to be credited to the owner due to this substitution.

b. Where approved substitutes are used, the contractor assumes all responsibility for physical dimensions and all other resulting changes. This responsibility extends to cover all extra work as necessitated by other trades as a result of the substitutions.
c. The engineer reserves the right to require the contractor to remove and replace any material or equipment which does not meet specifications or does not have any prior approval as a substitute item. Work shall be completed immediately without cost or inconvenience to the owner.

PART 2 PRODUCTS

2.1 EQUIPMENT

A. Burner Box
1. (Natural Gas) (Propane) model, nickel plated steel burner cup, outside air adapter, direct spark ignition, three try ignition module, all components easily accessed, durable spot welded construction, mica flame observation window, balanced air rotor, gas and electric controls are separated from the combustion air stream, stainless steel flexible gas line and high-pressure gas cock assembly included, for U.S. models only.
2. Heater shall be equipped with permanently lubricated combustion blower with thermal overload protection.

B. Burner Controls
1. Factory Wired: All burners shall be factory wired for 120 volts AC with transformer for 24 volts AC DSI operation and supplied with a grounded three wire pigtail located at rear of burner.
2. Fail-Safe Controls: To assure a high degree of fail-safe operation, the design shall include an air proving safety pressure switch to verify blower operation before gas valve opens. In the event of a power failure the gas valve in burners close in safe position.
3. 3. Ignition Controls: All gas firing burner units shall be equipped with a Direct Spark Ignition Module (DSI) fully automatic. The DSI module shall have a 15-second flame response time per ignition trial before lockout occurs. In addition, the DSI module shall be capable of a minimum of 3 trials for ignition to provide maximum reliability.

C. Reflectors - High Efficiency
1. Provide high radiant reflective (aluminum) (stainless steel) reflectors installed over all heat exchanger tube. Provide wide parabolic design reflector with 12 reflective surfaces and additional ribbing formed into reflector sides for added rigidity. Reflector shall be capable of producing an Infrared Factor (IF) as high as 15 when tested in accordance to AHRI standard 1330 for Radiant Output of Gas Fired Infrared Heaters. Reflector shall reflect 100% of the infrared energy that it receives from the heat exchanger tube directly to the floor. Reflectors with less than 12 reflective surfaces shall not be allowed. In order to maximize radiant output and reduce convective heat losses, reflectors are to extend below the bottom of the heat exchanger tube. Provide continuous reflector over all tube and fitting heat exchanger surfaces. Provide reflector end caps as necessary to reduce convective heat losses.

D. Thermostats
1. Provide where indicated Mount thermostat 5 ft. - 6 ft. (1.5 - 2 m) above finish floor or otherwise as noted on the drawing.

E. Radiant Piping - Heat Exchanger

1. 1. Radiant Tube: Shall be new 4 in. (10 cm) O.D. (Heat Treated Aluminized) (Hot-Rolled) steel tube X 16 gauge wall with an emissivity factor of 0.80 or greater. ALUMITHERM® steel (aluminized steel/titanium alloy) tubing will be supplied on the first 10 ft. of each radiant heater.
2. 2. Fittings: Shall be 4 in. (10 cm) O.D. Aluminized steel X 16 gauge wall. Tubes shall be as described in the installation, operation and service manual.
3. 3. Hanging Materials: All system's tube must be supported in accordance with acceptable practices, local codes, seismic requirements, and applicable standards and as shown on plans. Heat exchanger tube shall pitch down at least .5 in. per 20' (1.27 cm per 6.1 m) away from burner box.

PART 3 INSTALLATION

3.1 INSTALLATION OF GAS FIRED RADIANT HEATERS

A. General
1. Install gas fired infrared heaters as indicated, in accordance with manufacturer's installation operation and service manual and in compliance with applicable codes and approvals. Allow adequate space for servicing or removal of the unit without disturbing other piping or equipment.

B. Support
1. Suspend heat exchanger, burner, gas piping, conduit, and reflectors from building substrate as indicated, or if not indicated, in manner to provide durable and safe installation; and in accordance with manufacturer's installation operation and service manual. Mounting height to be a minimum feet from floor level.

C. Clearance to Combustibles
1. Always maintain clearance to combustibles as outlined and printed on burner nameplate and in manufacturer's product data. Measure clearance distance from surface of heat exchanger or as indicated by approval agency's listing.

D. Venting
1. Install vent piping as indicated on plans and as required by the manufacturer. Terminate where indicated on the drawings with a vent terminal assembly as supplied by the manufacturer. The venting must be installed in accordance with the requirements within the installation operation and service manual and the following codes: United States: Refer to National Fuel Gas Code NFPA 54/ANSI Z223.1 - latest revision.

E. Gas Piping
Install gas piping as indicated and in accordance and in compliance with applicable codes and approval: United States: Refer to National Fuel Gas Code NFPA 54/ANSI Z223.1 - latest revision. Canada: Refer to Natural Gas and Propane Installation Code CSA B149.1 - latest revision.
1. Required Gas Supply Inlet Pressures:
Natural Gas
40,000-150,000 Btu/h 4.6" wc Min 14" wc Max
2. Local Codes: Gas supply piping must meet local requirements and be sized in accordance with Btu/h demand, available pressure and total length of supply line required for the installation. Connection from supply line to burner unit must be made in accordance with installation operation and service manual. Gas shut-off cock, as supplied with unit, and controls in unit must not be subjected to more than 1/2 lb. or 14" wc pressure.
3. Drip Legs: Provide drip legs at all gas risers.

F. Electrical Wiring
1. Install electrical wiring as indicated. Connect power wiring to burners and control wiring between burners and thermostats in accordance with manufacturer's wiring diagrams.

G. Thermostats
1. Mount thermostats 5 ft. - 6 ft. above finished floor, if not otherwise indicated.

H. Thermostat Guards
1. All thermostats to be covered with a locking thermostat cover.

3.2 FIELD QUALITY CONTROL

A. Start-Up
1. Start-up, test, and adjust gas fired infrared heaters in accordance with manufacturer's start-up instructions in the installation operation and service manual, and Utility Company's requirements. Check and calibrate controls, adjust burners if applicable according to manufacturer's installation operation and service manual instructions for maximum efficiency.

3.3 CLOSEOUT PROCEDURES

A. Training
1. Provide services of manufacturer's technical representative to instruct operating personnel in operation and maintenance of gas fired radiant heaters.
2. Schedule instruction with operating building owner, provide at least 7 days notice.

END OF SECTION 23 8210

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SECTION 23 8500 - GAS DETECTION SYSTEM

PART 1 - GENERAL

1.1 REFERENCE STANDARDS

A. 29 CFR 1910.1000 - Air Contaminants; Current Edition.

B. ACGIH - Ultraviolet Radiation, TLV Physical Agents; 2010, 7th edition.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. NFPA 72 - National Fire Alarm and Signaling Code; 2016.

E. UL 2075 - Standard for Gas and Vapor Detectors and Sensors; Current Edition, Including All Revisions.

F. UL 61010-1 - Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 1: General Requirements; Current Edition, Including All Revisions.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary General Conditions and other Division 01 Specification Sections, apply to this Section.

1.3 SUMMARY

A. Provide a complete installation of a toxic gas detection system to protect the designated area from harmful gas build up. System to include remote sensors with audible/visual alarm devices to communicate the state of the alarm to the control panel. System to modulate exhaust fans to clear the condition. Control panel to communicate alarm conditions via digital screen and output relays.

B. The system shall include, but not be limited to, the following:
1. Future expandability
2. Display of toxic gas concentration
3. Ability to modify alarm set points
4. Automatic fan start/stop in alarm
5. Display of alarm status
6. Re-set and Mute functions

1.4 REFERENCES

A. Comply with the latest editions of the following codes and standards as adopted and amended by the Authority Having Jurisdiction (AHJ), unless otherwise noted:
1. International Building Code (IBC).
2. International Mechanical Code (IMC), including requirements for gas detection and ventilation control of enclosed parking garages and repair garages.

3. International Fire Code (IFC).
4. NFPA 70, National Electrical Code.
5. NFPA 72, National Fire Alarm and Signaling Code, where the system interfaces with the building fire alarm system.
6. UL 2075, Standard for Gas and Vapor Detectors and Sensors.
7. UL 61010-1, Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use.
8. NEMA 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
9. ASHRAE Standard 62.1, Ventilation and Acceptable Indoor Air Quality.
10. OSHA 29 CFR 1910.1000, Air Contaminants, and ACGIH Threshold Limit Values (TLVs) for carbon monoxide and nitrogen dioxide.

B. Where requirements of codes and standards conflict, the most stringent requirement shall govern.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical data for the control panel, each detector type, audible/visual alarm devices, and accessories. Include sensor technology, detection range, accuracy, response time, expected sensor life, operating temperature and humidity limits, electrical characteristics, enclosure ratings, dimensions, and UL listing.

B. Shop Drawings: Submit the following:
1. Floor plans showing the location and mounting height of the control panel, each detector, and each alarm device, with the manufacturer's published coverage area indicated for each detector.
2. Power and control wiring diagrams, including field wiring between the control panel, detectors, alarm devices, exhaust fan starters or VFDs, motorized dampers, and the Building Management System (BMS).
3. Points list and interface details for all relay and 0-10 Vdc outputs and all BMS connections.
4. Written sequence of operation with proposed alarm set points for pre-alarm, high alarm, and full alarm conditions for each gas and for temperature, coordinated with Part 3 of this Section.

C. Coordination: Submit evidence that wiring, set points, and interface requirements have been coordinated with Division 23 HVAC controls and Division 26 electrical work.

D. Quality Assurance Submittals: Submit manufacturer's factory calibration certificates for each detector and installer qualification data.

E. Field Test Reports: Submit commissioning and functional test reports documenting detector response to calibration gas, alarm set point verification, fan and damper response, and BMS alarm annunciation.

F. Operation and Maintenance Data: Submit manufacturer's operation and maintenance manuals, including calibration procedures, recommended calibration and sensor replacement intervals, spare parts list, and final set point schedule. Include in the operation and maintenance manuals specified in Division 01.

G. Warranty: Submit sample warranty documents and final executed warranties.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in the manufacture of toxic gas detection systems of the type specified, with a minimum of five (5) years of documented experience.

B. Installer Qualifications: Installer shall be factory authorized or trained by the manufacturer and experienced in the installation of gas detection systems of similar size and scope.

C. Listing and Labeling: Control panel and detectors shall be listed and labeled in accordance with UL 2075 by a qualified testing agency acceptable to the AHJ. Electrical components shall be listed and labeled as defined in NFPA 70.

D. Calibration: Detectors shall be factory calibrated prior to shipment and shall be field verified with manufacturer-supplied calibration gas during commissioning.

E. Start-up Services: Engage a factory-authorized service representative to inspect the completed installation, verify wiring and set points, place the system in operation, and certify in writing that the system is installed and operating in accordance with the manufacturer's requirements.

F. Training: Provide a minimum of two (2) hours of on-site instruction for the Owner's personnel covering system operation, alarm response, reset and mute functions, set point adjustment, calibration, and routine maintenance.

G. Pre-installation Coordination: Coordinate detector locations with ductwork, lighting, doors, and exhaust fan locations so that detectors are not placed in direct airflow of supply air, exhaust inlets, or vehicle exhaust discharge.

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer shall warrant the control panel, detectors, and accessories against defects in materials and workmanship for a period of thirty-six (36) months from date of Substantial Completion. Refer to the Limited Warranty terms in Part 3 of this Section.

B. Installer's Warranty: Contractor shall warrant the complete installation, including wiring, connections, and interfaces to fans, dampers, and the BMS, against defects in materials and workmanship for a period of one (1) year from date of Substantial Completion. Repair or replace defective work at no cost to the Owner.

C. Warranty shall include recalibration or replacement of any detector found to be out of the manufacturer's published accuracy tolerance during the warranty period.

D. Warranty period shall commence on the date of Substantial Completion and shall be in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents.

PART 2 - PRODUCTS

2.1 Control Panel type AGS Parksafe

A. The control panel will be 120 Vac powered, individually powering, and accepting the inputs of multiple remote detectors. The unit will clearly display the condition of an alarm and provide a re-set and mute function. The unit shall provide a digital touch screen for menu’s and set up functions as well as real time detector read out. The unit shall be UL certified and listed complying to UL 2075 standards. Mount the panel at AFF. 48”

B. The control panel will be capable of effecting on/off, two speed and VFD fan controls via on board relays and 0-10vdc outputs, for local activation of fans or dampers (or other equipment), the relay will change state in alarm and revert back once the alarm has been removed.

C. Relays shall be provided for pre-alarm, high alarm and full alarm thresholds. A separate damper relay shall be provided which can be configured on site to actuate at a determined threshold.

D. The control panel shall be capable of operating within relative humidity ranges of 5-95% non- condensing and temperature ranges of -4° F to 140° F (-20° C to 60° C).

E. The unit will accept up to sixteen (16) remote detectors although less may be required for designated detection area.

F. For local activation of audible alarms, the transmitter shall have an on-board device able to generate an audible output of 85 dBA @ 10 feet

G. Unit will be installed as per manufacturer's instructions and recommendations.

2.2 Detectors type

A. Nitrogen Dioxide detectors AGSNO2PS shall be 24 VAC powered by the control panel. Hard wired with 4#18-22AWG cable. The unit will operate in relative humidity of 15 – 90% RH non condensing, in a temperature of 4° to 122° (-20° to 50° C) with a accuracy of +/-5% of full scale and a range of 0-10ppm. The detector will utilize an electrochemical cell diffusion barrier type sensor with an expected life span of 2-3 years. The unit will provide power on indication, alarm indication, and fault indication. Manual calibration of the unit is not necessary. Mount as per manufacturer's instructions direct to 3/4" conduit or on double electrical rough in box. Dimensions of 5in x 7in approx.

B. Carbon Monoxide detectors AGSCOPS will be 24 VAC powered by the control panel. Hard wired with 4#18-22AWG cable. The unit will operate in relative humidity of 15 – 90% RH non condensing, in a temperature of 4° to 122° (-20° to 50° C) with a accuracy of +/-2% of full scale and a range of 0-10000ppm. The detector will utilize a passive semi conductor diffusion barrier type sensor with an expected life span of 5-7 years. The unit will provide power on indication, alarm indication, and fault indication. Manual calibration of the unit is not necessary. Mount as per manufacturer's instructions direct to 3/4" conduit or on double electrical rough in box. Dimensions of 5in x 7in approx.

C. Detectors shall be capable of providing a temperature reading to the ventilation control panel.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install hazardous gas monitoring equipment including sensors, audible alarms, as shown on Contract Drawings, and as recommended by manufacturer of equipment, and as required by authorities having jurisdiction.

B. Install conduit and wiring from sensors to control panel and to the fan starters/ HVAC control panel as recommended by manufacturer of equipment.

3.2 SEQUENCE OF OPERATION

A. If any NO2 sensor detects 1 PPM gas, the exhaust fans operate and motorized dampers open. If hazardous gas level reaches 2 PPM, High Alarm fans will be signaled to ramp up on turn on additional fans. Control unit shall provide an audible alarm. If High Alarm condition exists for extended period of time control unit shall go into full alarm sounding beacons and initiating BMS connectivity. Full alarm shall require manual re-set of the equipment.

B. If any CO sensor detects 25ppm??? <100ppm the exhaust fans operate and motorized dampers open. If the CO level reaches 100> High Alarm level the fans will be signaled to ramp up or turn on additional fans. If High Alarm condition exists for extended period of time control unit shall go into full alarm sounding beacons and initiating BMS connectivity. Full alarm shall require manual re-set of the equipment.

C. If any detector registers a temperature rise above the pre-set alarm threshold the fans shall be signaled to operate and the dampers opened.

3.3 COMMISSIONING

A. After installation, test equipment to demonstrate operation of functions described above under sequence of operation.

B. Provide testing kits (including gas bottles) for testing and calibration by Commission technician. AGSCOGASKIT AGSNO2GASKIT

3.4 WARRANTY.

A. Limited Warranty
1. American Gas Safety, LLC. warrants to the original purchaser and/or ultimate customer ("Purchaser") of AGS products ("Product") that if any part thereof proves to be defective in material or workmanship within thirty six (36) months, such defective part will be repaired or replaced, free of charge, at AGS' discretion if shipped prepaid to AGS 4500 140th Ave N. Suite 114, Clearwater, FL 33762, in a package equal to or in the original container. The Product will be returned freight prepaid and repaired or replaced if it is determined by AGS that the part failed due to defective materials or workmanship. The repair or replacement of any such defective part shall be AGS' sole and exclusive responsibility and liability under this limited warranty

END OF SECTION 23 8500

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SECTION 26 0519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Single conductor building wire.

B. Underground feeder and branch-circuit cable.

C. Service entrance cable.

D. Metal-clad cable.

E. Wire and cable for 600 volts and less.

F. Wiring connectors.

G. Electrical tape.

H. Heat shrink tubing.

I. Oxide inhibiting compound.

J. Wire pulling lubricant.

K. Cable ties.

L. Firestop sleeves.

1.2 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping.

B. Section 26 0526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.

C. Section 26 0533.13 - Conduit for Electrical Systems: Additional installation requirements for cables installed in conduit systems.

D. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

E. Section 26 2100 - Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conductors.

1.3 REFERENCE STANDARDS

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2018).

B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011 (Reapproved 2017).

C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010 (Reapproved 2014).

D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2014).

E. ASTM B800 - Standard Specification for 8000 Series Aluminum Alloy Wire for Electrical Purposes - Annealed and Intermediate Tempers; 2005 (Reapproved 2015).

F. ASTM B801 - Standard Specification for Concentric-Lay-Stranded Conductors of 8000 Series Aluminum Alloy Wire for Subsequent Covering of Insulation; 2016.

G. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2017.

H. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes; 2013.

I. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

J. NECA 104 - Recommended Practice for Installing Aluminum Building Wire and Cable; 2012.

K. NECA 120 - Standard for Installing Armored Cable (AC) and Metal-Clad Cable (MC); 2012.

L. NECA 121 - Standard for Installing Nonmetallic-Sheathed Cable (Type NM-B) and Underground Feeder and Branch-Circuit Cable (Type UF); 2007.

M. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2009.

N. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.

O. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

P. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.

Q. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.

R. UL 267 - Outline of Investigation for Wire-Pulling Compounds; Most Recent Edition, Including All Revisions.

S. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.

T. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.

U. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.

V. UL 493 - Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables; Current Edition, Including All Revisions.

W. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.

X. UL 1569 - Metal-Clad Cables; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
3. Notify DEDC, LLC of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.

C. Design Data: Indicate voltage drop and ampacity calculations for aluminum conductors substituted for copper conductors. Include proposed modifications to raceways, boxes, wiring gutters, enclosures, etc. to accommodate substituted conductors.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

1.8 FIELD CONDITIONS

A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F, unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify DEDC, LLC and obtain direction before proceeding with work.

PART 2 PRODUCTS

2.1 CONDUCTOR AND CABLE APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

C. Concealed Dry Interior Locations: Use only building wire in raceway or metal clad cable.

D. Exposed Dry Interior Locations: Use only building wire in raceway.

E. Above Accessible Ceilings: Use only building wire in raceway or metal clad cable.

F. Wet or Damp Interior Locations: Use only building wire with Type UF insulation in raceway.

G. Exterior Locations: Use only building wire with Type THWN-2 insulation in raceway.

H. Use solid conductor for feeders and branch circuits 10 AWG and smaller.

I. Use stranded conductors for control circuits.

J. Use conductor not smaller than 12 AWG for power and lighting circuits.

K. Use conductor not smaller than 14 AWG for control circuits.

L. Use 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 75 feet.

2.2 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

D. Comply with NEMA WC 70.

E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

G. Conductors for Grounding and Bonding: Also comply with Section 26 0526.

H. Conductors and Cables Installed Exposed in Spaces Used for Environmental Air (only where specifically permitted): Plenum rated, listed and labeled as suitable for use in return air plenums.

I. Conductor Material:
1. Provide copper conductors except where aluminum conductors are specifically indicated or permitted for substitution. Conductor sizes indicated are based on copper unless specifically indicated as aluminum. Conductors designated with the abbreviation "AL" indicate aluminum.
   a. Substitution of aluminum conductors for copper is permitted, when approved by Owner and authority having jurisdiction, only for the following:
      1) Services: Copper conductors size 1/0 AWG and larger.
      2) Feeders: Copper conductors size 1/0 AWG and larger.
   b. Where aluminum conductors are substituted for copper, comply with the following:
      1) Size aluminum conductors to provide, when compared to copper sizes indicated, equivalent or greater ampacity and equivalent or less voltage drop.
      2) Increase size of raceways, boxes, wiring gutters, enclosures, etc. as required to accommodate aluminum conductors.

3) Provide aluminum equipment grounding conductor sized according to NFPA 70.
4) Equip electrical distribution equipment with compression lugs for terminating aluminum conductors.

2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
3. Tinned Copper Conductors: Comply with ASTM B33.
4. Aluminum Conductors (only where specifically indicated or permitted for substitution): AA-8000 series aluminum alloy conductors recognized by ASTM B800 and compact stranded in accordance with ASTM B801 unless otherwise indicated.

J. Minimum Conductor Size:
1. Branch Circuits: 12 AWG.
   a. Exceptions:
      1) 20 A, 120 V circuits longer than 75 feet: 10 AWG, for voltage drop.
      2) 20 A, 120 V circuits longer than 150 feet: 8 AWG, for voltage drop.
2. Control Circuits: 14 AWG.

K. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

L. Conductor Color Coding:
1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
2. Color Coding Method: Integrally colored insulation.
   a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
3. Color Code:
   a. 208Y/120 V, 3 Phase, 4 Wire System:
      1) Phase A: Black.
      2) Phase B: Red.
      3) Phase C: Blue.
      4) Neutral/Grounded: White.
   b. Equipment Ground, All Systems: Green.
   c. Travelers for 3-Way and 4-Way Switching: Pink.
   d. For control circuits, comply with manufacturer's recommended color code.

2.3 SINGLE CONDUCTOR BUILDING WIRE

A. Manufacturers:
1. Copper Building Wire:
   a. Cerro Wire LLC: www.cerrowire.com/#sle.
   b. Encore Wire Corporation: www.encorewire.com/#sle.
   c. General Cable Technologies Corporation: www.generalcable.com/#sle.
   d. Southwire Company: www.southwire.com/#sle.
   e. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: Single conductor insulated wire.

C. Conductor Stranding:
   1. Feeders and Branch Circuits:
      a. Size 10 AWG and Smaller: Solid.
      b. Size 8 AWG and Larger: Stranded.
   2. Control Circuits: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation:
   1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
      a. Size 4 AWG and Larger: Type XHHW-2.
      b. Installed Underground: Type XHHW-2.
      c. Fixture Wiring Within Luminaires: Type TFFN/TFN for luminaires with labeled maximum temperature of 90 degrees C; Approved suitable type for luminaires with labeled maximum temperature greater than 90 degrees C.
   2. Aluminum Building Wire (only where specifically indicated or permitted for substitution): Type XHHW-2.

F. Conductor: Copper.

G. Insulation Voltage Rating: 600 volts.

H. Insulation: NFPA 70 , Type THHN/THWN.

I. Insulation: Thermoplastic material rated 75 degrees C.

2.4 UNDERGROUND FEEDER AND BRANCH-CIRCUIT CABLE

A. Description: NFPA 70, Type UF multiple-conductor cable listed and labeled as complying with UL 493, Type UF-B.

B. Provide equipment grounding conductor unless otherwise indicated.

C. Conductor Stranding:
   1. Size 10 AWG and Smaller: Solid.
   2. Size 8 AWG and Larger: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Cable Jacket: Listed and labeled as sunlight resistant.

2.5 METAL-CLAD CABLE

A. Manufacturers:
   1. AFC Cable Systems Inc: www.afcweb.com/#sle.
   2. Encore Wire Corporation: www.encorewire.com/#sle.
   3. Southwire Company: www.southwire.com/#sle.

B. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.

C. Conductor Stranding:
   1. Size 10 AWG and Smaller: Solid.
   2. Size 8 AWG and Larger: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.

F. Provide dedicated neutral conductor for each phase conductor where indicated or required.

G. Grounding: Full-size integral equipment grounding conductor.

H. Armor: Steel, interlocked tape.

I. Description: NFPA 70, Type MC.

J. Conductor: Copper.

K. Insulation Voltage Rating: 600 volts.

L. Insulation Temperature Rating: 75 degrees C.

M. Insulation Material: Thermoplastic.

N. Armor Material: Steel.

O. Armor Design: Interlocked metal tape.

2.6 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

B. Connectors for Grounding and Bonding: Comply with Section 26 0526.

C. Wiring Connectors for Splices and Taps:
   1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
   2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.
   3. Connectors for Aluminum Conductors: Use compression connectors.

D. Wiring Connectors for Terminations:
   1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
   2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
   3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
   4. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.
   5. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.

6. Stranded Conductors Size 10 AWG and Smaller: Use crimped terminals for connections to terminal screws.
7. Conductors for Control Circuits: Use crimped terminals for all connections.

E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.

F. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.

G. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.

H. Mechanical Connectors: Provide bolted type or set-screw type.

I. Compression Connectors: Provide circumferential type or hex type crimp configuration.

J. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.

2.7 ACCESSORIES

A. Electrical Tape:
1. Manufacturers:
   a. 3M: www.3m.com/#sle.
   b. Substitutions: See Section 01 6000 - Product Requirements.
2. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.
3. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.
4. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil; suitable for continuous temperature environment up to 194 degrees F and short-term 266 degrees F overload service.
5. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil; suitable for continuous temperature environment up to 176 degrees F.
6. Varnished Cambric Electrical Tape: Cotton cambric fabric tape, with or without adhesive, oil-primed and coated with high-grade insulating varnish; minimum thickness of 7 mil; suitable for continuous temperature environment up to 221 degrees F.
7. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil.

B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.

C. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.

D. Wire Pulling Lubricant:
1. Listed and labeled as complying with UL 267.
2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.

3. Suitable for use at installation temperature.

E. Cable Ties: Material and tensile strength rating suitable for application.

F. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that work likely to damage wire and cable has been completed.

C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.

D. Verify that raceway installation is complete and supported.

E. Verify that field measurements are as indicated.

F. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.3 INSTALLATION

A. Circuiting Requirements:
1. Unless dimensioned, circuit routing indicated is diagrammatic.
2. When circuit destination is indicated without specific routing, determine exact routing required.
3. Arrange circuiting to minimize splices.
4. Include circuit lengths required to install connected devices within 10 ft of location indicated.
5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
6. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
7. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is not permitted.
8. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.

B. Install products in accordance with manufacturer's instructions.

C. Perform work in accordance with NECA 1 (general workmanship).

D. Install aluminum conductors in accordance with NECA 104.

E. Install underground feeder and branch-circuit cable (Type UF-B) in accordance with NECA 121.

F. Install metal-clad cable (Type MC) in accordance with NECA 120.

G. Installation in Raceway:
1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
2. Pull all conductors and cables together into raceway at same time.
3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

H. Exposed Cable Installation (only where specifically permitted):
1. Route cables parallel or perpendicular to building structural members and surfaces.
2. Protect cables from physical damage.

I. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

J. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.
2. Installation in Vertical Raceways: Provide supports where vertical rise exceeds permissible limits.

K. Terminate cables using suitable fittings.
1. Metal-Clad Cable (Type MC):
   a. Use listed fittings.
   b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.

L. Install conductors with a minimum of 12 inches of slack at each outlet.

M. Where conductors are installed in enclosures for future termination by others, provide a minimum of 5 feet of slack.

N. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

O. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

P. Make wiring connections using specified wiring connectors.
1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
3. Do not remove conductor strands to facilitate insertion into connector.
4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
5. Connections for Aluminum Conductors: Fill connectors with oxide inhibiting compound where not pre-filled by manufacturer.
6. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.

7. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

Q. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
   1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
      a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
      b. For taped connections likely to require re-entering, including motor leads, first apply varnished cambric electrical tape, followed by adequate amount of rubber splicing electrical tape, followed by outer covering of vinyl insulating electrical tape.
   2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
      a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
      b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.
   3. Wet Locations: Use heat shrink tubing.

R. Insulate ends of spare conductors using vinyl insulating electrical tape.

S. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.

T. Color Code Legend: Provide identification label identifying color code for ungrounded conductors at each piece of feeder or branch-circuit distribution equipment.

U. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

V. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

W. Install wire and cable securely, in a neat and workmanlike manner, as specified in NECA 1.

X. Route wire and cable as required to meet project conditions.
   1. Wire and cable routing indicated is approximate unless dimensioned.
   2. Where wire and cable destination is indicated and routing is not shown, determine exact routing and lengths required.

Y. Use wiring methods indicated.

Z. Pull all conductors into raceway at same time.

AA. Use suitable wire pulling lubricant for building wire 4 AWG and larger.

BB. Protect exposed cable from damage.

CC. Support cables above accessible ceiling, using spring metal clips or metal cable ties to support cables from structure or ceiling suspension system. Do not rest cable on ceiling panels.

DD. Use suitable cable fittings and connectors.

EE. Neatly train and lace wiring inside boxes, equipment, and panelboards.

FF. Clean conductor surfaces before installing lugs and connectors.

GG. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.

HH. Use split bolt connectors for copper conductor splices and taps, 6 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.

II. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.

JJ. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

KK. Identify and color code wire and cable under provisions of Section 26 0553. Identify each conductor with its circuit number or other designation indicated.

3.4 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Perform field inspection and testing in accordance with Section 01 4000.

C. Inspect and test in accordance with NETA ATS, except Section 4.

D. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.

E. Correct deficiencies and replace damaged or defective conductors and cables.

F. Perform inspections and tests listed in NETA STD ATS, Section 7.3.2.

END OF SECTION 26 0519

SECTION 26 0526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Grounding and bonding requirements.

B. Conductors for grounding and bonding.

C. Connectors for grounding and bonding.

D. Ground bars.

E. Ground rod electrodes.

F. Ground access wells.

G. Grounding and bonding components.

H. Provide all components necessary to complete the grounding system(s) consisting of:
1. Existing metal underground water pipe.
2. Metal underground water pipe.
3. Metal frame of the building.
4. Metal underground gas piping system.
5. Rod electrodes.

1.2 RELATED REQUIREMENTS

A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
1. Includes oxide inhibiting compound.

B. Section 26 0536 - Cable Trays for Electrical Systems: Additional grounding and bonding requirements for cable tray systems.

C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

D. Section 03 3000 - Cast-in-Place Concrete.

E. Section 26 3100 - Photovoltaic Collectors: Additional grounding and bonding requirements for photovoltaic systems.

F. Section 26 5600 - Exterior Lighting: Additional grounding and bonding requirements for pole-mounted luminaires.

1.3 REFERENCE STANDARDS

A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System; 2012.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; 2007.

D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. NFPA 780 - Standard for the Installation of Lightning Protection Systems; 2017.

G. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
1. Verify exact locations of underground metal water service pipe entrances to building.
2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
3. Notify DEDC, LLC of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.5 PERFORMANCE REQUIREMENTS

A. Grounding System Resistance: 5 ohms.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.

C. Shop Drawings:
1. Indicate proposed arrangement for signal reference grids. Include locations of items to be bonded and methods of connection.

D. Test Reports: Indicate overall resistance to ground and resistance of each electrode.

1.7 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 GROUNDING AND BONDING REQUIREMENTS

A. Do not use products for applications other than as permitted by NFPA 70 and product listing.

B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

D. Grounding System Resistance:
1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by DEDC, LLC. Precipitation within the previous 48 hours does not constitute normally dry conditions.
2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.
3. Between Grounding Electrode System and Major Electrical Equipment Frames, System Neutral, and Derived Neutral Points: Not greater than 0.5 ohms, when tested using "point-to-point" methods.

E. Grounding Electrode System:
1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
    a. Provide continuous grounding electrode conductors without splice or joint.
    b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
2. Metal Underground Water Pipe(s):
    a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet at an accessible location not more than 5 feet from the point of entrance to the building.
    b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.
    c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.
3. Metal In-Ground Support Structure:
    a. Provide connection to metal in-ground support structure that is in direct contact with earth in accordance with NFPA 70.

4. Concrete-Encased Electrode:
   a. Provide connection to concrete-encased electrode consisting of not less than 20 feet of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.
5. Ground Ring:
   a. Provide a ground ring encircling the building or structure consisting of bare copper conductor not less than 2 AWG in direct contact with earth, installed at a depth of not less than 30 inches.
   b. Where location is not indicated, locate ground ring conductor at least 24 inches outside building perimeter foundation.
   c. Provide connection from ground ring conductor to:
      1) Perimeter columns of metal building frame.
6. Ground Rod Electrode(s):
   a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.
   b. Space electrodes not less than 10 feet from each other and any other ground electrode.
   c. Where location is not indicated, locate electrode(s) at least 5 feet outside building perimeter foundation as near as possible to electrical service entrance; where possible, locate in softscape (uncovered) area.
7. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.
8. Ground Bar: Provide ground bar, separate from service equipment enclosure, for common connection point of grounding electrode system bonding jumpers as permitted in NFPA 70. Connect grounding electrode conductor provided for service-supplied system grounding to this ground bar.
   a. Ground Bar Size: 1/4 by 4 by 12 inches unless otherwise indicated or required.
   b. Where ground bar location is not indicated, locate in accessible location as near as possible to service disconnect enclosure.
   c. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.

F. Service-Supplied System Grounding:
1. For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.
2. For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.

G. Separately Derived System Grounding:
1. Separately derived systems include, but are not limited to:
   a. Transformers (except autotransformers such as buck-boost transformers).
2. Provide grounding electrode conductor to connect derived system grounded conductor to nearest effectively grounded metal building frame. Unless otherwise indicated, make connection at neutral (grounded) bus in source enclosure.
3. Provide bonding jumper to connect derived system grounded conductor to nearest metal building frame and nearest metal water piping in the area served by the derived system, where not already used as a grounding electrode for the derived system. Make connection at same location as grounding electrode conductor connection.
4. Outdoor Source: Where the source of the separately derived system is located outside the building or structure supplied, provide connection to grounding electrode at source in accordance with NFPA 70.

5. Provide system bonding jumper to connect system grounded conductor to equipment ground bus. Make connection at same location as grounding electrode conductor connection. Do not make any other connections between neutral (grounded) conductors and ground on load side of separately derived system disconnect.
6. Where the source and first disconnecting means are in separate enclosures, provide supply-side bonding jumper between source and first disconnecting means.

H. Bonding and Equipment Grounding:
1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:
    a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.
    b. Metal gas piping.
8. Provide bonding for metal building frame.
9. Provide bonding for metal siding not effectively bonded through attachment to metal building frame.

I. Communications Systems Grounding and Bonding:
1. Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for any additional buildings or structures in accordance with NFPA 70.
2. Provide bonding jumper in raceway from intersystem bonding termination to each communications room or backboard and provide ground bar for termination.
    a. Bonding Jumper Size: 6 AWG, unless otherwise indicated or required.
    b. Raceway Size: 3/4 inch trade size unless otherwise indicated or required.
    c. Ground Bar Size: 1/4 by 4 by 12 inches unless otherwise indicated or required.
    d. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.

J. Lightning Protection Systems:
1. Do not use grounding electrode dedicated for lightning protection system for component of building grounding electrode system provided under this section.
2. Provide bonding of building grounding electrode system provided under this section and lightning protection grounding electrode system in accordance with NFPA 70 and NFPA 780.

K. Cable Tray Systems: Also comply with Section 26 0536.

L. Photovoltaic Systems: Also comply with Section 26 3100.

M. Pole-Mounted Luminaires: Also comply with Section 26 5600.

2.2 GROUNDING AND BONDING COMPONENTS

A. General Requirements:
1. Provide products listed, classified, and labeled as suitable for the purpose intended.
2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 0526:
1. Use insulated copper conductors unless otherwise indicated.
a. Exceptions:
1) Use bare copper conductors where installed underground in direct contact with earth.
2) Use bare copper conductors where directly encased in concrete (not in raceway).

C. Connectors for Grounding and Bonding:
1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.

D. Ground Bars:
1. Description: Copper rectangular ground bars with mounting brackets and insulators.
2. Size: As indicated.
3. Holes for Connections: As indicated or as required for connections to be made.

E. Ground Rod Electrodes:
1. Comply with NEMA GR 1.
2. Material: Copper-bonded (copper-clad) steel.
3. Size: 3/4 inch diameter by 10 feet length, unless otherwise indicated.

F. Ground Access Wells:
1. Description: Open bottom round or rectangular well with access cover for testing and inspection; suitable for the expected load at the installed location.
2. Size: As required to provide adequate access for testing and inspection, but not less than minimum size requirements specified.
a. Round Wells: Not less than 8 inches in diameter.
b. Rectangular Wells: Not less than 12 by 12 inches.
3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 10 inches.
4. Cover: Factory-identified by permanent means with word "GROUND".
5. Manufacturers:
a. allG Fabrication; _____: www.allgfab.com/#sle.
b. Harger Lightning & Grounding: www.harger.com/#sle.
c. nVent ERICO; _____: www.nvent.com/#sle.
d. Substitutions: See Section 01 6000 - Product Requirements.

G. Oxide Inhibiting Compound: Comply with Section 26 0519.

2.3 MANUFACTURERS

A. Cooper Power Systems, a division of Cooper Industries: www.cooperindustries.com.

B. Substitutions: See Section 01 6000 - Product Requirements.

2.4 ELECTRODES

A. Manufacturers:
1. Cooper Power Systems, a division of Cooper Industries: www.cooperindustries.com.
2. Substitutions: See Section 01 6000 - Product Requirements.

B. Rod Electrodes: Copper-clad steel.
1. Diameter: 3/4 inch.
2. Length: 10 feet.
3. Substitutions: See Section 01 6000 - Product Requirements.

2.5 CONNECTORS AND ACCESSORIES

A. Mechanical Connectors: Bronze.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that work likely to damage grounding and bonding system components has been completed.

B. Verify that field measurements are as indicated.

C. Verify that conditions are satisfactory for installation prior to starting work.

D. Verify existing conditions prior to beginning work.

E. Verify that final backfill and compaction has been completed before driving rod electrodes.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70.
1. Outdoor Installations: Unless otherwise indicated, install with top of rod 6 inches below finished grade.

D. Make grounding and bonding connections using specified connectors.

1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

E. Identify grounding and bonding system components in accordance with Section 26 0553.

F. Install ground electrodes at locations indicated. Install additional rod electrodes as required to achieve specified resistance to ground.

G. Provide grounding electrode conductor and connect to reinforcing steel in foundation footing where indicated. Bond steel together.

H. Provide bonding to meet requirements described in Quality Assurance.

I. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.

3.3 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.13.

D. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.

E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

END OF SECTION 26 0526

SECTION 26 0529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.2 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 26 0533.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.

C. Section 26 0533.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.

D. Section 26 0548 - Vibration and Seismic Controls for Electrical Systems.

E. Section 26 5100 - Interior Lighting: Additional support and attachment requirements for interior luminaires.

F. Conduit and equipment supports.

G. Anchors and fasteners.

1.3 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2015.

D. MFMA-4 - Metal Framing Standards Publication; 2004.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes and arrangement of supports and bases with actual equipment and components to be installed.

2. Coordinate work to provide additional framing and materials required for installation.
3. Coordinate compatibility of support and attachment components with mounting surfaces at installed locations.
4. Coordinate arrangement of supports with ductwork, piping, equipment and other potential conflicts.
5. Notify DEDC, LLC of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
1. Do not install products on or provide attachment to concrete surfaces until concrete has cured; see Section 03 3000.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel/strut framing systems, nonpenetrating rooftop supports, and post-installed concrete/masonry anchors.

1.6 QUALITY ASSURANCE

A. Maintain at project site one copy of each referenced document that prescribes execution requirements.

B. Installer Qualifications for Powder-Actuated Fasteners: Certified by fastener system manufacturer with current operator's license.

C. Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
1. Comply with the following. Where requirements differ, comply with most stringent.
   a. NFPA 70.
   b. Requirements of authorities having jurisdiction.
2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of electrical work.
3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.
4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.

5. Do not use products for applications other than as permitted by NFPA 70 and product listing.
6. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
7. Steel Components: Use corrosion-resistant materials suitable for environment where installed.
    a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
    b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
    c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
    d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Components for Vibration Isolation and/or Seismic Controls: See Section 26 0548.

C. Conduit and Cable Supports: Straps and clamps suitable for conduit or cable to be supported.
1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
2. Conduit Clamps: Bolted type unless otherwise indicated.

D. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.

E. Metal Channel/Strut Framing Systems:
1. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
2. Comply with MFMA-4.
3. Channel Material:
    a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
    b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.

F. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.
1. Minimum Size, Unless Otherwise Indicated or Required:
    a. Equipment Supports: 1/2-inch diameter.
    b. Single Conduit up to 1-inch (27 mm) Trade Size: 1/4-inch diameter.
    c. Single Conduit Larger than 1-inch (27 mm) Trade Size: 3/8-inch diameter.
    d. Trapeze Support for Multiple Conduits: 3/8-inch diameter.
    e. Outlet Boxes: 1/4-inch diameter.
    f. Luminaires: 1/4-inch diameter.

G. Anchors and Fasteners:
1. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.
2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
4. Hollow Masonry: Use toggle bolts.
5. Hollow Stud Walls: Use toggle bolts.
6. Steel: Use beam clamps, machine bolts, or welded threaded studs.
7. Wood: Use wood screws.
8. Plastic and lead anchors are not permitted.
9. Preset Concrete Inserts: Continuous metal channel/strut and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
    a. Manufacturer: Same as manufacturer of metal channel/strut framing system.

b. Comply with MFMA-4.
c. Channel Material: Use galvanized steel.

2.2 MANUFACTURERS

A. Thomas & Betts Corporation: www.tnb.com.

B. Threaded Rod Company: www.threadedrod.com.

C. Substitutions: See Section 01 6000 - Product Requirements.

2.3 MATERIALS

A. Hangers, Supports, Anchors, and Fasteners - General: Corrosion-resistant materials of size and type adequate to carry the loads of equipment and conduit, including weight of wire in conduit.

B. Supports: Fabricated of structural steel or formed steel members; galvanized.

C. Anchors and Fasteners:

D. Formed Steel Channel:
1. Product: Steel "U" shaped with in-turned clamping ridges manufactured by Unitstrut, Power Wtrut, B-Line Strut or Kindorf.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install hangers and supports in accordance with NECA 1.

C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

D. Unless specifically indicated or approved by DEDC, LLC, do not provide support from suspended ceiling support system or ceiling grid.

E. Unless specifically indicated or approved by DEDC, LLC, do not provide support from roof deck.

F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G. Provide required vibration isolation and/or seismic controls; see Section 26 0548.

H. Equipment Support and Attachment:
1. Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.
2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

I. Conduit Support and Attachment: See Section 26 0533.13 for additional requirements.

J. Box Support and Attachment: See Section 26 0533.16 for additional requirements.

K. Interior Luminaire Support and Attachment: See Section 26 5100 for additional requirements.

L. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.

M. Secure fasteners in accordance with manufacturer's recommended torque settings.

N. Remove temporary supports.

3.3 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Inspect support and attachment components for damage and defects.

C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

D. Correct deficiencies and replace damaged or defective support and attachment components.

E. Install hangers and supports as required to adequately and securely support electrical system components, in a neat and workmanlike manner, as specified in NECA 1.
1. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.
2. Do not drill or cut structural members.

F. Rigidly weld support members or use hexagon-head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.

G. Install surface-mounted cabinets and panelboards with minimum of four anchors.

H. In wet and damp locations use steel channel supports to stand cabinets and panelboards 1-5/8" off wall.

I. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

END OF SECTION 26 0529

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SECTION 26 0533.13 - CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Stainless steel rigid metal conduit (RMC).

B. Stainless steel intermediate metal conduit (IMC).

C. Flexible metal conduit (FMC).

D. Liquidtight flexible metal conduit (LFMC).

E. Galvanized steel electrical metallic tubing (EMT).

F. Stainless steel electrical metallic tubing (EMT).

G. Rigid polyvinyl chloride (PVC) conduit.

H. Liquidtight flexible nonmetallic conduit (LFNC).

I. Conduit, fittings and conduit bodies.

1.2 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete encasement of conduits.

B. Section 07 8400 - Firestopping.

C. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Cable assemblies consisting of conductors protected by integral metal armor.

D. Section 26 0526 - Grounding and Bonding for Electrical Systems.
   1. Includes additional requirements for fittings for grounding and bonding.

E. Section 26 0529 - Hangers and Supports for Electrical Systems.

F. Section 26 0533.16 - Boxes for Electrical Systems.

G. Section 26 0548 - Vibration and Seismic Controls for Electrical Systems.

H. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

I. Section 26 2100 - Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conduits.

J. Section 31 2316.13 - Trenching: Excavating, bedding, and backfilling.

1.3 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2015.

B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2015.

C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit (EIMC); 2005.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2013.

F. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2003.

G. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

H. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit; 2018.

I. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2013.

J. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2016.

K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

L. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.

M. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.

N. UL 6A - Electrical Rigid Metal Conduit-Aluminum, Red Brass, and Stainless Steel; Current Edition, Including All Revisions.

O. UL 360 - Liquid-Tight Flexible Steel Conduit; Current Edition, Including All Revisions.

P. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

Q. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.

R. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.

S. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.

T. UL 797A - Electrical Metallic Tubing - Aluminum and Stainless Steel; Current Edition, Including All Revisions.

U. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.

V. UL 2419 - Outline of Investigation for Electrically Conductive Corrosion Resistant Compounds; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
1. Coordinate minimum sizes of conduits with actual type and quantity of conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
2. Coordinate arrangement of conduits with structural members, ductwork, piping, equipment, and other potential conflicts.
3. Verify exact conduit termination locations required for boxes, enclosures, and equipment.
4. Coordinate work to provide roof penetrations that preserve integrity of roofing system and do not void roof warranty.
5. Notify DEDC, LLC of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
1. Do not begin installation of conductors and cables until installation of conduit between termination points is complete.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

C. Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs, and conduits 2-inch (53 mm) trade size and larger.

1.6 QUALITY ASSURANCE

A. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for purpose specified and shown.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

B. Accept conduit on site. Inspect for damage.

C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

PART 2 PRODUCTS

2.1 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, manufacturer's instructions, and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.

C. Underground:
1. Under Slab on Grade: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit (RMC), galvanized steel electrical metallic tubing (EMT), stainless steel electrical metallic tubing (EMT), rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
2. Exterior, Direct-Buried: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, galvanized steel electrical metallic tubing (EMT), stainless steel electrical metallic tubing (EMT), rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
3. Exterior, Embedded Within Concrete: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit (RMC), galvanized steel electrical metallic tubing (EMT), stainless steel electrical metallic tubing (EMT), rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
4. Where rigid polyvinyl chloride (PVC) conduit is provided, transition to galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), or schedule 80 rigid PVC conduit where emerging from underground.

D. Embedded Within Concrete:
1. Within Slab on Grade: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
2. Within Slab Above Ground: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
3. Where galvanized steel electrical metallic tubing (EMT) emerges from concrete into salt air, use corrosion protection tape, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to authorities having jurisdiction to provide supplementary corrosion protection for minimum of 4 inches on either side of where conduit emerges.

E. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

F. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

G. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate

metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

H. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

I. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

J. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).
   1. Locations subject to physical damage include, but are not limited to:
      a. Where exposed below 8 feet, except within electrical and communication rooms or closets.
      b. Where exposed below 20 feet in warehouse areas.

K. Exposed, Exterior, Not Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

L. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

M. Flexible Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit (FMC).
   1. Maximum Length: 6 feet.

N. Flexible Connections to Vibrating Equipment:
   1. Dry Locations: Use flexible metal conduit (FMC).
   2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit (LFMC).
   3. Maximum Length: 6 feet unless otherwise indicated.
   4. Vibrating equipment includes, but is not limited to:
      a. Transformers.
      b. Motors.
      c. Genset.
      d. Mechanical HVAC equipment

O. Fished in Existing Walls, Where Necessary: Use flexible metal conduit (FMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

2.2 CONDUIT - GENERAL REQUIREMENTS

A. Comply with NFPA 70.

B. Electrical Service Conduits: See Section 26 2100 for additional requirements.

C. Fittings for Grounding and Bonding: See Section 26 0526 for additional requirements.

D. Provide conduit, fittings, supports, and accessories required for complete raceway system.

E. Provide products listed, classified, and labeled as suitable for purpose intended.

F. Minimum Conduit Size, Unless Otherwise Indicated:
1. Branch Circuits: 3/4-inch trade size.
2. Branch Circuit Homeruns: 3/4-inch trade size.
3. Control Circuits: 1/2-inch trade size.
4. Flexible Connections to Luminaires: 3/8-inch trade size.
5. Underground, Interior: 3/4-inch trade size.
6. Underground, Exterior: 1-inch trade size.

G. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.3 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Manufacturers:
1. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.com/#sle.
2. Nucor Tubular Products: www.nucortubular.com/#sle.
3. Wheatland Tube, a division of Zekelman Industries: www.wheatland.com/#sle.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

C. Fittings:
1. Manufacturers:
   a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.
   b. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.
2. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.
3. Material: Use steel or malleable iron.
   a. Do not use die cast zinc fittings.
4. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.4 STAINLESS STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC stainless steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6A.

B. Fittings:
1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6A.
2. Material: Use stainless steel with corrosion resistance equivalent to conduit.

3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.5 GALVANIZED STEEL INTERMEDIATE METAL CONDUIT (IMC)

A. Manufacturers:
1. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.com/#sle.
2. Nucor Tubular Products: www.nucortubular.com/#sle.
3. Wheatland Tube, a division of Zekelman Industries: www.wheatland.com/#sle.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.

C. Fittings:
1. Manufacturers:
   a. Bridgeport Fittings, LLC: www.bptfittings.com/#sle.
   b. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.
   c. Substitutions: See Section 01 6000 - Product Requirements.
2. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 1242.
3. Material: Use steel or malleable iron.
4. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

D. Conduit Size: Comply with NFPA 70.
1. Minimum Size: 3/4 inch unless otherwise specified.

E. Outdoor Locations Above Grade: Use rigid steel conduit.

F. In Slab Above Grade:
1. Use rigid steel conduit.
2. Maximum Size Conduit in Slab: 3/4 inch; 1/2 inch for conduits crossing each other.

G. Wet and Damp Locations: Use rigid steel conduit.

H. Dry Locations:
1. Concealed: Use electrical metallic tubing, where permitted by the NEC.
2. Exposed: Use electrical metallic tubing, where permitted by the NEC.

2.6 STAINLESS STEEL INTERMEDIATE METAL CONDUIT (IMC)

A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.

B. Fittings:
1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 1242.

2.7 METAL CONDUIT

A. Manufacturers:
1. Allied Tube & Conduit: www.alliedtube.com.
2. Wheatland Tube Company: www.wheatland.com.
3. Triangle
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Rigid Steel Conduit: ANSI C80.1.

C. Fittings and Conduit Bodies: NEMA FB 1; material to match conduit.

2.8 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Manufacturers:
1. Robroy Industries: www.robroy.com/#sle.
2. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.

C. Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil, 0.040 inch.

D. PVC-Coated Boxes and Fittings:
1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.
2. Nonhazardous Locations: Use boxes and fittings listed and labeled as complying with UL 514A, UL 514B, or UL 6.
3. Material: Use steel or malleable iron.
4. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil, 0.040 inch.

E. PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil, 0.015 inch.

2.9 FLEXIBLE METAL CONDUIT (FMC)

A. Manufacturers:
1. AFC Cable Systems, a division of Atkore International: www.afcweb.com/#sle.
2. Electri-Flex Company: www.electriflex.com/#sle.
3. International Metal Hose: www.metalhose.com/#sle.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: NFPA 70, Type FMC standard-wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems.

C. Fittings:
1. Manufacturers:
a. Bridgeport Fittings, LLC: www.bptfittings.com/#sle.
b. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.
c. Substitutions: See Section 01 6000 - Product Requirements.
2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

3. Material: Use steel or malleable iron.
    a. Do not use die cast zinc fittings.

D. Description: Interlocked steel construction.

E. Fittings: NEMA FB 1.

2.10 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Manufacturers:
1. AFC Cable Systems, a division of Atkore International: www.afcweb.com/#sle.
2. Electri-Flex Company: www.electriflex.com/#sle.
3. International Metal Hose: www.metalhose.com/#sle.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.

C. Fittings:
1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.
    a. Do not use die cast zinc fittings.

D. Description: Interlocked steel construction with PVC jacket.

E. Fittings: NEMA FB 1.

2.11 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:
1. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.com/#sle.
2. Wheatland Tube, a division of Zekelman Industries: www.wheatland.com/#sle.
3. Triangle
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

C. Fittings:
1. Manufacturers:
    a. Bridgeport Fittings, LLC: www.bptfittings.com/#sle.
    b. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.
    c. Substitutions: See Section 01 6000 - Product Requirements.
2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Material: Use steel or malleable iron.
    a. Do not use die cast zinc fittings.
4. Connectors and Couplings: Use compression/gland or set-screw type.
    a. Do not use indenter type connectors and couplings.
5. Damp or Wet Locations, Where Permitted: Use fittings listed for use in wet locations.

6. Embedded Within Concrete, Where Permitted: Use fittings listed as concrete-tight. Fittings that require taping to be concrete-tight are acceptable.

D. Description: ANSI C80.3; galvanized tubing.

E. Fittings and Conduit Bodies: NEMA FB 1; steel or malleable iron compression type.

2.12 STAINLESS STEEL ELECTRICAL METALLIC TUBING (EMT)

A. Description: NFPA 70, Type EMT stainless steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797A.

B. Fittings:
1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Connectors and Couplings: Use compression/gland or set-screw type.

2.13 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. Manufacturers:
1. Cantex Inc: www.cantexinc.com/#sle.
2. JM Eagle: www.jmeagle.com/#sle.
3. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

C. Fittings:
1. Manufacturer: Same as manufacturer of conduit to be connected.
2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.14 ACCESSORIES

A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil, 0.020 inch.

B. Conduit Joint Compound: Corrosion-resistant, electrically conductive compound listed as complying with UL 2419; suitable for use with conduit to be installed.

C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

D. Pull Strings: Use nylon or polyester tape with average breaking strength of not less than 1,250 lbf.

E. Sealing Systems for Concrete Penetrations:
1. Sleeves: Provide water stop ring or cement coating that bonds to concrete to prevent water infiltration.
2. Rate for minimum of 40 psig; suitable for sealing around conduits to be installed.

F. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

G. Duct Bank Spacers: Nonmetallic; designed for maintaining conduit/duct spacing for concrete encasement in open trench installation; suitable for conduit/duct arrangement to be installed.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive conduits.

C. Verify that conditions are satisfactory for installation prior to starting work.

D. Conduit routing is shown on drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install conduit in accordance with NECA 1.

C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.

D. Install intermediate metal conduit (IMC) in accordance with NECA 101.

E. Install PVC-coated galvanized steel rigid metal conduit (RMC) using only tools approved by manufacturer.

F. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.

G. Conduit Routing:
1. Unless dimensioned, conduit routing indicated is diagrammatic.
2. When conduit destination is indicated without specific routing, determine exact routing required.
3. Conceal conduits unless specifically indicated to be exposed.
4. Conduits in the following areas may be exposed, unless otherwise indicated:
    a. Electrical rooms.
    b. Mechanical equipment rooms.
    c. Within joists in areas with no ceiling.
5. Unless otherwise approved, do not route exposed conduits:
    a. Across floors.
    b. Across roofs.
    c. Across top of parapet walls.
    d. Across building exterior surfaces.
6. Conduits installed underground or embedded in concrete may be routed in shortest possible manner unless otherwise indicated. Route other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
7. Arrange conduit to maintain adequate headroom, clearances, and access.
8. Arrange conduit to provide no more than equivalent of four 90-degree bends between pull points.
9. Arrange conduit to provide no more than 150 feet between pull points.
10. Route conduits above water and drain piping where possible.

11. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
12. Maintain minimum clearance of 6 inches between conduits and piping for other systems.
13. Maintain minimum clearance of 12 inches between conduits and hot surfaces. This includes, but is not limited to:
    a. Heaters.
    b. Hot water piping.
    c. Flues.
14. Group parallel conduits in same area on common rack.

H. Conduit Support:
1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction; see Section 26 0529.
2. Provide required vibration isolation and/or seismic controls; see Section 26 0548.
3. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
4. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
5. Use conduit strap to support single surface-mounted conduit.
    a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
6. Use metal channel/strut with accessory conduit clamps to support multiple parallel surface-mounted conduits.
7. Use conduit clamp to support single conduit from beam clamp or threaded rod.
8. Use trapeze hangers assembled from threaded rods and metal channel/strut with accessory conduit clamps to support multiple parallel suspended conduits.
9. Use nonpenetrating rooftop supports to support conduits routed across rooftops, where approved.
10. Use of wire for support of conduits is not permitted.
11. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with most stringent requirements.

I. Connections and Terminations:
1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
3. Use suitable adapters where required to transition from one type of conduit to another.
4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
6. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect conductors.
7. Secure joints and connections to provide mechanical strength and electrical continuity.

J. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.

2. Make penetrations perpendicular to surfaces unless otherwise indicated.
3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
4. Conceal bends for conduit risers emerging above ground.
5. Provide suitable sealing system where conduits penetrate exterior wall below grade.
6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty.
8. Install firestopping to preserve fire resistance rating of partitions and other elements; see Section 07 8400.

K. Underground Installation:
1. Provide trenching and backfilling; see Section 31 2316.13.
2. Minimum Cover, Unless Otherwise Indicated or Required:
   a. Underground, Exterior: 36 inches.
   b. Under Slab on Grade: 12 inches to bottom of slab.
3. Provide underground warning tape along entire conduit length for service entrance where not concrete-encased; see Section 26 0553.

L. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide minimum concrete cover of 3 inches on all sides unless otherwise indicated; see Section 03 3000.

M. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
3. Where conduits are subject to earth movement by settlement or frost.

N. Conduit Sealing:
1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:
   a. Where conduits enter building from outside.
   b. Where service conduits enter building from underground distribution system.
   c. Where conduits enter building from underground.
   d. Where conduits may transport moisture to contact live parts.
2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:
   a. Where conduits pass from outdoors into conditioned interior spaces.
   b. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

O. Provide pull string in each empty conduit and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.

P. Provide grounding and bonding; see Section 26 0526.

3.3 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C. Where coating of PVC-coated galvanized steel rigid metal conduit (RMC) contains cuts or abrasions, repair in accordance with manufacturer's instructions.

D. Correct deficiencies and replace damaged or defective conduits.

3.4 CLEANING

A. Clean interior of conduits to remove moisture and foreign matter.

3.5 PROTECTION

A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

B. Install conduit securely, in a neat and workmanlike manner, as specified in NECA 1.

C. Install steel conduit as specified in NECA 101.

D. Arrange supports to prevent misalignment during wiring installation.

E. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

F. Group related conduits; support using conduit rack. Construct rack using steel channel .

G. Fasten conduit supports to building structure and surfaces under provisions of Section 26 0529.

H. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.

I. Do not attach conduit to ceiling support wires.

J. Arrange conduit to maintain headroom and present neat appearance.

K. Route conduit parallel and perpendicular to walls.

L. Route conduit installed above accessible ceilings parallel and perpendicular to walls.

M. Route conduit in and under slab from point-to-point.

N. Maintain adequate clearance between conduit and piping.

O. Maintain 12 inch clearance between conduit and surfaces with temperatures exceeding 104 degrees F.

P. Cut conduit square using saw or pipecutter; de-burr cut ends.

Q. Bring conduit to shoulder of fittings; fasten securely.

R. Use conduit hubs to fasten conduit to sheet metal boxes in damp and wet locations.

S. Install no more than equivalent of three 90 degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use hydraulic one shot bender to fabricate bends in metal conduit larger than 2 inch size.

T. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.

U. Provide suitable fittings to accommodate expansion and deflection where conduit crosses seismic.

V. Provide suitable pull string in each empty conduit except sleeves and nipples.

W. Use suitable caps to protect installed conduit against entrance of dirt and moisture.

X. Ground and bond conduit under provisions of Section 26 0526.

Y. Identify conduit under provisions of Section 26 0553.

3.6 INTERFACE WITH OTHER PRODUCTS

A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

B. Route conduit through roof openings for piping and ductwork wherever possible. Where separate roofing penetration is required, coordinate location and installation method with roofing installation specified in Section 01700.

END OF SECTION 26 0533.13

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SECTION 26 0533.16 - BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.

B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.

C. Boxes and enclosures for integrated power, data, and audio/video.

D. Floor boxes.

E. Wall and ceiling outlet boxes.

F. Pull and junction boxes.

1.2 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping.

B. Section 08 3100 - Access Doors and Panels: Panels for maintaining access to concealed boxes.

C. Section 26 0526 - Grounding and Bonding for Electrical Systems.

D. Section 26 0529 - Hangers and Supports for Electrical Systems.

E. Section 26 0533.13 - Conduit for Electrical Systems:
   1. Conduit bodies and other fittings.
   2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.

F. Section 26 0548 - Vibration and Seismic Controls for Electrical Systems.

G. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

H. Section 26 2726 - Wiring Devices:
   1. Wall plates.
   2. Floor box service fittings.
   3. Additional requirements for locating boxes for wiring devices.

I. Section 27 1000 - Structured Cabling: Additional requirements for communications systems outlet boxes.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.

C. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

D. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

E. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

H. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

I. UL 508A - Industrial Control Panels; 2013.

J. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
6. Coordinate the work with other trades to preserve insulation integrity.
7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
8. Notify DEDC, LLC of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for underground handhole enclosures, underground handhole enclosures, underground handhole enclosures, and underground handhole enclosures.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

B. Products: Provide products listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 BOXES

A. General Requirements:
1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
3. Provide products listed, classified, and labeled as suitable for the purpose intended.
4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:
1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
3. Use suitable concrete type boxes where flush-mounted in concrete.
4. Use suitable masonry type boxes where flush-mounted in masonry walls.
5. Use raised covers suitable for the type of wall construction and device configuration where required.
6. Use shallow boxes where required by the type of wall construction.
7. Do not use "through-wall" boxes designed for access from both sides of wall.
8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
12. Wall Plates: Comply with Section 26 2726.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:
1. Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
2. NEMA EN 10250 Environment Type, Unless Otherwise Indicated:
a. Indoor Clean, Dry Locations: Type 1, painted steel.
b. Outdoor Locations: Type 3R, painted steel.

3. Junction and Pull Boxes Larger Than 100 cubic inches:
   a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
   a. Back Panels: Painted steel, removable.
5. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.

D. Boxes and Enclosures for Integrated Power, Data, and Audio/Video: Size and configuration as indicated or as required with partitions to separate services; field-connected gangable boxes may be used.

E. Floor Boxes:
1. Description: Floor boxes compatible with floor box service fittings provided in accordance with Section 26 2726; with partitions to separate multiple services; furnished with all components, adapters, and trims required for complete installation.
2. Use cast iron floor boxes within slab on grade.
3. Metallic Floor Boxes: Fully adjustable (with integral means for leveling adjustment prior to and after concrete pour).
4. Manufacturer: Same as manufacturer of floor box service fittings.

2.2 MANUFACTURERS

A. Appleton Electric: www.appletonelec.com.

B. Hoffman

C. Steel City

D. Crouse-Hinds

E. Substitutions: See Section 01 6000 - Product Requirements.

2.3 OUTLET BOXES

A. Sheet Metal Outlet Boxes: 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. Cast Boxes: NEMA FB 1, Type FD, aluminum. Provide gasketed cover by box manufacturer. Provide threaded hubs.

C. Wall Plates for Finished Areas: As specified in Section 26 2726.

2.4 PULL AND JUNCTION BOXES

A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.

B. Surface Mounted Cast Metal Box: NEMA 250, Type 4; flat-flanged, surface mounted junction box:
1. Material: Galvanized cast iron.
2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive boxes.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide separate boxes for emergency power and normal power systems.

E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.

F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.

G. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.

H. Box Locations:
1. Locate boxes to be accessible. Provide access panels in accordance with Section 08 3100 as required where approved by the Architect.
2. Unless dimensioned, box locations indicated are approximate.
3. Locate boxes as required for devices installed under other sections or by others.
    a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 26 2726.
    b. Communications Systems Outlets: Comply with Section 27 1000.
4. Locate boxes so that wall plates do not span different building finishes.
5. Locate boxes so that wall plates do not cross masonry joints.
6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
7. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches horizontal separation unless otherwise indicated.
8. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
    a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.
    b. Do not install flush-mounted boxes with area larger than 16 square inches or such that the total aggregate area of openings exceeds 100 square inches for any 100 square feet of wall area.

9. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 26 0533.13.
10. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:
    a. Concealed above accessible suspended ceilings.
    b. Within joists in areas with no ceiling.
    c. Electrical rooms.
    d. Mechanical equipment rooms.

I. Box Supports:
1. Secure and support boxes in accordance with NFPA 70 and Section 26 0529 using suitable supports and methods approved by the authority having jurisdiction.
2. Provide required seismic controls in accordance with Section 26 0548.
3. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
4. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
5. Use far-side support to secure flush-mounted boxes supported from single stud in hollow stud walls. Repair or replace supports for boxes that permit excessive movement.

J. Install boxes plumb and level.

K. Flush-Mounted Boxes:
1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.
2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.

L. Install boxes as required to preserve insulation integrity.

M. Metallic Floor Boxes: Install box level at the proper elevation to be flush with finished floor.

N. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

O. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

P. Close unused box openings.

Q. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

R. Provide grounding and bonding in accordance with Section 26 0526.

S. Identify boxes in accordance with Section 26 0553.

T. Install boxes securely, in a neat and workmanlike manner, as specified in NECA 1.

U. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and as required by NFPA 70.

V. Set wall mounted boxes at elevations to accommodate mounting heights indicated.

W. Electrical boxes are shown on Drawings in approximate locations unless dimensioned.
1. Adjust box locations up to 10 feet if required to accommodate intended purpose.

X. Orient boxes to accommodate wiring devices oriented as specified in Section 26 2726.

Y. Maintain headroom and present neat mechanical appearance.

Z. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

AA. Install boxes to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

BB. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.

CC. Use flush mounting outlet box in finished areas.

DD. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

EE. Do not install flush mounting box back-to-back in walls; provide minimum 6 inches separation. Provide minimum 24 inches separation in acoustic rated walls.

FF. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

GG. Do not fasten boxes to ceiling support wires.

HH. Support boxes independently of conduit, except cast box that is connected to two rigid metal conduits both supported within 12 inches of box.

II. Use gang box where more than one device is mounted together. Do not use sectional box.

JJ. Use cast outlet box in exterior locations exposed to the weather and wet locations.

KK. Use cast floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations.

3.3 ADJUSTING

A. Adjust flush-mounting outlets to make front flush with finished wall material.

B. Install knockout closures in unused box openings.

3.4 CLEANING

A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

3.5 PROTECTION

A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

B. Clean exposed surfaces and restore finish.

END OF SECTION 26 0533.16

SECTION 26 0548 - VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Vibration isolation requirements.

B. Seismic control requirements.
   1. Includes requirements for seismic qualification of equipment not specified in this section.

C. Vibration-isolated equipment support bases.

D. Vibration isolators.

E. External seismic snubber assemblies.

F. Seismic restraint systems.

1.2 RELATED REQUIREMENTS

A. Section 01 4533 - Code-Required Special Inspections and Procedures.

B. Section 03 3000 - Cast-in-Place Concrete.

C. Section 26 0529 - Hangers and Supports for Electrical Systems.

1.3 DEFINITIONS

A. Electrical Component: Where referenced in this section in regards to seismic controls, applies to any portion of the electrical system subject to seismic evaluation in accordance with applicable codes, including distributed systems (e.g., conduit, cable tray).

B. Seismic Restraint: Structural members or assemblies of members or manufactured elements specifically designed and applied for transmitting seismic forces between components and the seismic force-resisting system of the structure.

1.4 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

B. ASCE 19 - Structural Applications of Steel Cables for Buildings; 2016.

C. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; Most Recent Edition Cited by Referring Code or Reference Standard.

D. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2017.

E. FEMA 413 - Installing Seismic Restraints for Electrical Equipment; 2004.

F. FEMA E-74 - Reducing the Risks of Nonstructural Earthquake Damage; 2012.

G. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. ICC-ES AC156 - Acceptance Criteria for Seismic Certification by Shake-Table Testing of Nonstructural Components; 2010, with Editorial Revision (2015).

I. MFMA-4 - Metal Framing Standards Publication; 2004.

J. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

L. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; 2008.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
1. Coordinate selection and arrangement of vibration isolation and/or seismic control components with the actual equipment to be installed.
2. Coordinate the work with other trades to provide additional framing and materials required for installation.
3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
4. Seismic Controls:
    a. Coordinate the arrangement of seismic restraints with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
    b. Coordinate the work with other trades to accommodate relative positioning of essential and nonessential components in consideration of seismic interaction.
5. Notify DEDC, LLC of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 3000.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Design Documents: Prepare and submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, details, and calculations.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.
1. Vibration Isolators: Include rated load capacities and deflections; include information on color coding or other identification methods for spring element load capacities.

2. Seismic Controls: Include seismic load capacities.

D. Shop Drawings - Vibration Isolation Systems:
1. Include dimensioned plan views and sections indicating proposed arrangement of vibration isolators; indicate equipment weights and static deflections.
2. Vibration-Isolated Equipment Support Bases: Include base weights, including concrete fill where applicable; indicate equipment mounting provisions.

E. Shop Drawings - Seismic Controls:
1. Include dimensioned plan views and sections indicating proposed electrical component locations and distributed system routing, with locations and details of gravity supports and seismic restraints and associated attachments.
2. Identify mounting conditions required for equipment seismic qualification.
3. Identify anchor manufacturer, type, minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
4. Indicate proposed arrangement of distributed system trapeze support groupings.
5. Indicate proposed locations for distributed system flexible fittings and/or connections.
6. Indicate locations of seismic separations where applicable.

F. Manufacturer’s detailed field testing and inspection procedures.

G. Field quality control test reports.

1.7 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Comply with applicable building code.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 VIBRATION ISOLATION REQUIREMENTS

A. Design and provide vibration isolation systems to reduce vibration transmission to supporting structure from vibration-producing electrical equipment and/or electrical connections to vibration-isolated equipment.

B. Comply with applicable general recommendations of ASHRAE (HVACA), where not in conflict with other specified requirements:

C. General Requirements:
1. Select vibration isolators to provide required static deflection.
2. Select vibration isolators for uniform deflection based on distributed operating weight of actual installed equipment.

3. Select seismic type vibration isolators to comply with seismic design requirements, including conditions of equipment seismic certification where applicable.
4. Select vibration isolators for outdoor equipment to comply with wind design requirements.
5. Select vibration-isolated equipment support bases and associated vibration isolators to provide minimum 2-inch operating clearance beneath base unless otherwise indicated.

D. Equipment Isolation:
1. Transformers:
   a. Specified vibration isolators are in addition to any factory-installed internal core and coil assembly vibration isolators unless otherwise indicated.
   b. Wall-Mounted Transformers, Seismic Applications: Use seismic type resilient material isolator mounts.
2. Engine Generators:
   a. Specified vibration isolators are in addition to any factory-installed internal vibration isolators between generator set and integral base unless otherwise indicated; obtain generator set manufacturer approval of applied vibration isolation.
   b. Seismic Applications: Use seismic type restrained spring isolators.
   c. Provide vibration-isolated concrete inertia bases where indicated.
   d. Minimum Static Deflection:
      1) Generators Mounted at Above-Grade Levels: 2 inch deflection unless otherwise indicated.

E. Conduit Isolation:
1. Use flexible conduit or cable for electrical connections to vibration-isolated equipment, including equipment installed under other sections or by others.
   a. Minimum Length: 3 feet unless otherwise indicated.
2. Vibration Isolators:
   a. Provide vibration isolators for conduit supports:
   b. Minimum Static Deflection:
      1) First Three Supports Closest to Isolated Equipment: Same as static deflection of equipment; maximum of 2 inch deflection required.
      2) Remainder of Supports: 0.75 inch deflection unless otherwise indicated.
   c. Suspended Conduits, Seismic Applications: Use seismic type resilient material isolator hangers, seismic type spring isolator hangers, or seismic type combination resilient material/spring isolator hangers.
   d. Use modular seal or approved resilient material where vibration-isolated conduits penetrate building elements (e.g., walls, floors) arranged to prevent vibration transmission to structure.

2.2 SEISMIC CONTROL REQUIREMENTS

A. Design and provide electrical component restraints, supports, and attachments suitable for seismic loads determined in accordance with applicable codes, as well as gravity and operating loads and other structural design considerations of the installed location. Consider wind loads for outdoor electrical components.

B. Seismic Design Criteria: ICC (IBC).

C. Component Importance Factor (Ip): Electrical components essential to life safety to be assigned a component importance factor (Ip) of 1.5 as indicated or as required. This includes but is not limited to:
1. Electrical components required to function for life safety purposes after an earthquake.

2. Electrical components that support or otherwise contain hazardous substances.

D. Seismic Qualification of Equipment:
1. Provide special certification for electrical equipment furnished under other sections and assigned a component importance factor (Ip) of 1.5, certifying that equipment will remain operable following a design level earthquake.
2. Seismic qualification to be by shake table testing in accordance with recognized testing standard procedure, such as ICC-ES AC156, acceptable to authorities having jurisdiction.
3. Notify DEDC, LLC and obtain direction where mounting restrictions required by conditions of seismic certification conflict with specified requirements.
4. Seismically qualified equipment to be furnished with factory-installed labels referencing certificate of compliance and associated mounting restrictions.

E. Seismic Restraints:
1. Provide seismic restraints for electrical components except where exempt according to applicable codes and specified seismic design criteria, as approved by authorities having jurisdiction.
2. Seismic Restraint Exemptions:
   a. Exemptions for Seismic Design Category C:
      1) Electrical components where either of the following apply:
         a) The component importance factor (Ip) is 1.0 and the component is positively attached to the structure.
         b) The component weighs 20 pounds or less or, in the case of a distributed system, 5 pounds per foot or less.
   b. Conduit, Cable Tray, and Raceway Exemptions, All Seismic Design Categories:
      1) Raceways with component importance factor (Ip) of 1.0 where flexible connections are provided between cable tray or raceway and associated components, where cable tray or raceway is positively attached to the structure, and where one of the following apply:
         a) Trapeze supported conduits, cable trays, or raceways with trapeze assemblies using 3/8 inch diameter rod hangers not exceeding 12 inches in length from support point connection to the supporting structure, and the total weight supported by any single trapeze is 100 pounds or less.
         b) Trapeze supported conduits, cable trays, or raceways with trapeze assemblies using 1/2 inch diameter rod hangers not exceeding 12 inches in length from support point connection to the supporting structure, and the total weight supported by any single trapeze is 200 pounds or less.
         c) Trapeze supported conduits, cable trays, or raceways with trapeze assemblies using 1/2 inch diameter rod hangers not exceeding 24 inches in length from support point connection to the supporting structure, and the total weight supported by any single trapeze is 100 pounds or less.
         d) Hanger supported conduits, cable trays, or raceways with individual rod hangers 3/8 inch or 1/2 inch in diameter not exceeding 12 inches in length from support point connection to the supporting structure, and the total weight supported by any single rod is 50 pounds or less.
      2) Conduits less than 2-1/2 inch trade size.
   c. Lighting Exemptions, All Seismic Design Categories:
      1) Suspended luminaires where attachments are designed to accommodate 1.4 times the operating weight acting in both the vertical and horizontal directions and connections to

structure allow for 360 degree range of motion in the horizontal plane; arrange to prevent impact between luminaires and the structure or other nonstructural components.

2) Lay-in luminaires weighing less than 56 pounds secured to ceiling grid and provided with safety wires in accordance with ASTM E580/E580M.

3. Comply with applicable general recommendations of the following, where not in conflict with applicable codes, seismic design criteria, or other specified requirements:
   a. ASHRAE (HVACA).
   b. FEMA 413.
   c. FEMA E-74.
   d. SMACNA (SRM).
4. Seismic restraint capacities to be verified by a Nationally Recognized Testing Laboratory (NRTL) or certified by an independent third-party registered professional engineer acceptable to authorities having jurisdiction.
5. Seismic Type Vibration Isolators:
   a. Comply with seismic design requirements, including conditions of equipment seismic certification where applicable.
6. External Seismic Snubber Assemblies:
   a. Provide quantity and arrangement of external seismic snubber assemblies as required to restrain equipment in all directions (both lateral and vertical).
   b. Do not use external seismic snubber assemblies that restrain equipment only in one or more lateral directions (but not vertical) except where uplift forces are zero or are addressed by other restraints.
7. Seismic Restraint Systems:
   a. Except where otherwise restricted, use of either cable or rigid restraints is permitted.
   b. Use only cable restraints to restrain vibration-isolated electrical components, including distributed systems.
   c. Use only one restraint system type for a given electrical component or distributed system (e.g., conduit, cable tray) run; mixing of cable and rigid restraints on a given component/run is not permitted.
   d. Size restraint elements, including anchorage, to resist seismic loads as necessary to restrain electrical component in all lateral directions; consider bracket geometry in anchor load calculations.
   e. Use rod stiffener clips to attach bracing to hanger rods as required to prevent rod buckling from vertical (upward) compressive load introduced by cable or rigid restraints loaded in tension, in excess of downward tensile load due to supported electrical component weight.
   f. Select hanger rods and associated anchorage as required to accommodate vertical (downward) tensile load introduced by rigid restraints loaded in compression, in addition to downward tensile load due to supported electrical component weight.
   g. Clevis hangers may only be used for attachment of transverse restraints; do not use for attachment of longitudinal restraints.
   h. Where seismic restraints are attached to clevis hangers, provide clevis bolt reinforcement accessory to prevent clevis hanger deformation.
   i. Do not introduce lateral loads on open bar joist chords or the weak axis of beams, or loads in any direction at other than panel points unless approved by project Structural Engineer of Record.

F. Seismic Attachments:

1. Attachments to be bolted, welded, or otherwise positively fastened without consideration of frictional resistance produced by the effects of gravity.
2. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) or qualified evaluation service acceptable to authorities having jurisdiction for compliance with applicable building code, and qualified for seismic applications; concrete anchors to be qualified for installation in both cracked and uncracked concrete.
3. Do not use power-actuated fasteners.
4. Do not use friction clips (devices that rely on mechanically applied friction to resist loads). Beam clamps may be used for supporting sustained loads where provided with restraining straps.
5. Comply with anchor minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
6. Concrete Housekeeping Pads:
   a. Increase size of pad as required to comply with anchor requirements.
   b. Provide pad reinforcement and doweling to ensure integrity of pad and connection and to provide adequate load path from pad to supporting structure.

G. Seismic Interactions:
1. Include provisions to prevent seismic impact between electrical components and other structural or nonstructural components.
2. Include provisions such that failure of a component, either essential or nonessential, does not cause the failure of an essential component.
3. Comply with minimum clearance requirements between electrical equipment, distribution systems, and associated supports and fire protection sprinkler system drops and sprigs.

H. Seismic Relative Displacement Provisions:
1. Use suitable fittings or flexible connections to accommodate:
   a. Relative displacements at connections between components, including distributed systems (e.g., conduit, cable tray); do not exceed load limits for equipment utility connections.
   b. Relative displacements between component supports attached to dissimilar parts of structure that may move differently during an earthquake.
   c. Design displacements at seismic separations.
   d. Anticipated drifts between floors.

2.3 VIBRATION-ISOLATED EQUIPMENT SUPPORT BASES

A. Vibration-Isolated Concrete Inertia Bases:
1. Description: Concrete-filled engineered steel forms with integral mounting provisions for vibration isolators, sized and configured for mounting of equipment.
2. Minimum Base Depth: 6 inches.
3. Minimum Base Mass (Including Concrete): 1.5 times weight of supported equipment.
4. Concrete Reinforcement: Welded or tied reinforcing bars running both ways in a single layer.
5. Concrete: Filled on site with minimum 3000 psi concrete in accordance with Section 03 3000.

2.4 VIBRATION ISOLATORS

A. General Requirements:
1. Resilient Materials for Vibration Isolators: Oil, ozone, and oxidant resistant.
2. Spring Elements for Spring Isolators:

a. Color code or otherwise identify springs to indicate load capacity.
b. Lateral Stability: Minimum lateral stiffness to vertical stiffness ratio of 0.8.
c. Designed to operate in the linear portion of their load versus deflection curve over deflection range of not less than 50 percent above specified deflection.
d. Designed to provide additional travel to solid of not less than 50 percent of rated deflection at rated load.
e. Selected to provide designed deflection of not less than 75 percent of specified deflection.
f. Selected to function without undue stress or overloading.

3. Seismic Snubbing Elements for Seismic Isolators:
   a. Air Gap: Between 0.125 inches and 0.25 inches unless otherwise indicated.
   b. Points of Contact: Cushioned with resilient material, minimum 0.25 inch thick; capable of being visually inspected for damage and replaced.

2.5 EXTERNAL SEISMIC SNUBBER ASSEMBLIES

A. Description: Steel snubbing assemblies designed for external attachment to both equipment and supporting structure that, as part of a complete system, restrain equipment motion in all directions during a seismic event while maintaining vibration isolation during normal operation.

B. Seismic Snubbing Elements:
   1. Air Gap: Between 0.125 inches and 0.25 inches unless otherwise indicated.
   2. Points of Contact: Cushioned with resilient material, minimum 0.25 inch thick; capable of being visually inspected for damage and replaced.

2.6 SEISMIC RESTRAINT SYSTEMS

A. Description: System components and accessories specifically designed for field assembly and attachment of seismic restraints.

B. Cable Restraints:
   1. Comply with ASCE 19.
   2. Cables: Pre-stretched, galvanized steel wire rope with certified break strength.
   3. Cable Connections: Use only swaged end fittings. Cable clips and wedge type end fittings are not permitted in accordance with ASCE 19.
   4. Use protective thimbles for cable loops where potential for cable damage exists.

C. Rigid Restraints: Use MFMA-4 steel channel (strut), steel angle, or steel pipe for structural element; suitable for both compressive and tensile design loads.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 CODE-REQUIRED SPECIAL INSPECTIONS

A. Arrange work to accommodate tests and/or inspections performed by Special Inspection Agency employed by Owner or DEDC, LLC in accordance with Section 01 4533 and statement of special inspections as required by applicable building code.

B. Frequency of Special Inspections: Where special inspections are designated as continuous or periodic, arrange work accordingly.
   1. Continuous Special Inspections: Special Inspection Agency to be present in the area where the work is being performed and observe the work at all times the work is in progress.
   2. Periodic Special Inspections: Special Inspection Agency to be present in the area where work is being performed and observe the work part-time or intermittently and at the completion of the work.

C. Seismic special inspections include, but are not limited to:
   1. Seismically Qualified Equipment: Verification that label, anchorage, and mounting comply with certificate of compliance.
   2. Verification of required clearances between electrical equipment, distribution systems, and associated supports and fire protection sprinkler system drops and sprigs for Seismic Design Categories C, D, E, and F; periodic inspection.

D. Prior to starting work, Contractor to submit written statement of responsibility to authorities having jurisdiction and to Owner acknowledging awareness of special requirements contained in the statement of special inspections.

E. Special Inspection Agency services do not relieve Contractor from performing inspections and testing specified elsewhere.

3.3 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install products in accordance with applicable requirements of NECA 1 (general workmanship).

C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

D. Secure fasteners according to manufacturer's recommended torque settings.

E. Install flexible conduit and cable connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

F. Vibration Isolation Systems:
   1. Vibration-Isolated Equipment Support Bases:
      a. Provide specified minimum clearance beneath base.
   2. Spring Isolators:
      a. Position equipment at operating height; provide temporary blocking as required.
      b. Lift equipment free of isolators prior to lateral repositioning to avoid damage to isolators.
      c. Level equipment by adjusting isolators gradually in sequence to raise equipment uniformly such that excessive weight or stress is not placed on any single isolator.
   3. Isolator Hangers:

a. Use precompressed isolator hangers where required to facilitate installation and prevent damage to equipment utility connection provisions.
b. Locate isolator hangers at top of hanger rods in accordance with manufacturer's instructions.

4. Clean debris from beneath vibration-isolated equipment that could cause short-circuiting of isolation.
5. Use elastomeric grommets for attachments where required to prevent short-circuiting of isolation.
6. Adjust isolators to be free of isolation short circuits during normal operation.
7. Do not overtighten fasteners such that resilient material isolator pads are compressed beyond manufacturer's maximum recommended deflection.

G. Seismic Controls:

1. Provide specified snubbing element air gap; remove any factory-installed spacers, debris or other obstructions.
2. Use only specified components, anchorage, and hardware evaluated by seismic design. Comply with conditions of seismic certification where applicable.
3. Where mounting hole diameter exceeds bolt diameter by more than 0.125 inch, use epoxy grout, elastomeric grommet, or welded washer to reduce clearance to 0.125 inch or less.
4. Equipment with Sheet Metal Housings:
   a. Use Belleville washers to distribute stress over a larger surface area of the sheet metal connection interface as approved by manufacturer.
   b. Attach additional steel as approved by manufacturer where required to transfer loads to structure.
   c. Where mounting surface is irregular, do not shim housing; reinforce housing with additional steel as approved by manufacturer.
5. Concrete Housekeeping Pads:
   a. Size in accordance with seismic design to meet anchor requirements.
   b. Install pad reinforcement and doweling in accordance with seismic design to ensure integrity of pad and associated connection to slab.
6. Seismic Restraint Systems:
   a. Do not attach seismic restraints and gravity supports to dissimilar parts of structure that may move differently during an earthquake.
   b. Install restraints within permissible angles in accordance with seismic design.
   c. Install cable restraints straight between component/run and structural attachment; do not bend around other nonstructural components or structural elements.
   d. Install cable restraints for vibration-isolated components slightly slack to prevent short-circuiting of isolation.
   e. Install hanger rod stiffeners where indicated using only specified clamps; do not weld stiffeners to hanger rod.

3.4 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect vibration isolation and/or seismic control components for damage and defects.

C. Provide services of a manufacturer's authorized representative for vibration isolation systems and seismic controls to observe installation and assist in inspection and testing. Include manufacturer's detailed testing and inspection procedures and field reports with submittals.

D. Vibration Isolation Systems:

1. Verify isolator static deflections.
2. Verify required clearance beneath vibration-isolated equipment support bases.
3. Verify vibration isolation performance during normal operation; investigate sources of isolation short circuits.

E. Seismic Controls:
1. Verify snubbing element air gaps.

F. Correct deficiencies and replace damaged or defective vibration isolation and/or seismic control components.

G. Submit detailed reports indicating inspection and testing results and corrective actions taken.

END OF SECTION 26 0548

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SECTION 26 0553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrical identification requirements.

B. Large Device Identification.

C. Nameplates and Labels.

D. Wire and cable markers.

E. Voltage markers.

F. Underground warning tape.

G. Warning signs and labels.

1.2 RELATED REQUIREMENTS

A. Section 09 9113 - Exterior Painting.

B. Section 09 9123 - Interior Painting.

C. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.

D. Section 26 0536 - Cable Trays for Electrical Systems: Additional identification requirements for cable tray systems.

E. Section 26 0573 - Power System Studies: Arc flash hazard warning labels.

F. Section 26 2726 - Wiring Devices - Lutron: Device and wallplate finishes; factory pre-marked wallplates.

G. Section 27 1000 - Structured Cabling: Identification for communications cabling and devices.

H. Section 27 10 00 - Data & Voice Communications Cabling: Identification for communications cabling and devices.

1.3 REFERENCE STANDARDS

A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs; 2011.

B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2011.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.

B. Sequencing:
1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
2. Do not install identification products until final surface finishes and painting are complete.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.

C. Shop Drawings: Provide schedule of items to be identified indicating proposed designations, materials, legends, and formats.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.7 FIELD CONDITIONS

A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

PART 2 PRODUCTS

2.1 IDENTIFICATION REQUIREMENTS

A. Existing Work: Unless specifically excluded, identify existing elements to remain that are not already identified in accordance with specified requirements.

B. Identification for Equipment:
1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
a. Panelboards:
1) Identify ampere rating.
2) Identify voltage and phase.
3) Identify power source and circuit number. Include location when not within sight of equipment.
4) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.
5) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
6) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Identify spares and spaces.

b. Enclosed switches, circuit breakers, and motor controllers:
   1) Identify voltage and phase.
   2) Identify power source and circuit number. Include location when not within sight of equipment.
   3) Identify load(s) served. Include location when not within sight of equipment.
c. Time Switches:
   1) Identify load(s) served and associated circuits controlled. Include location.
d. Transfer Switches:
   1) Identify voltage and phase.
   2) Identify power source and circuit number for both normal power source and standby power source. Include location when not within sight of equipment.
   3) Identify load(s) served. Include location when not within sight of equipment.
   4) Identify short circuit current rating based on the specific overcurrent protective device type and settings protecting the transfer switch.

2. Service Equipment:
   a. Use identification nameplate to identify each service disconnecting means.
   b. For buildings or structures supplied by more than one service, or any combination of branch circuits, feeders, and services, use identification nameplate or means of identification acceptable to authority having jurisdiction at each service disconnecting means to identify all other services, feeders, and branch circuits supplying that building or structure. Verify format and descriptions with authority having jurisdiction.
3. Emergency System Equipment:
   a. Use identification nameplate or voltage marker to identify emergency system equipment in accordance with NFPA 70.
   b. Use identification nameplate at each piece of service equipment to identify type and location of on-site emergency power sources.
4. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".
5. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.
   a. Service equipment.
   b. Elevator control panels.
6. Arc Flash Hazard Warning Labels: Comply with Section 26 0573.

C. Identification for Conductors and Cables:
1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 0519.
2. Identification for Communications Conductors and Cables: Comply with Section 27 1000.
3. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
   a. At each source and load connection.
   b. Within boxes when more than one circuit is present.
   c. Within equipment enclosures when conductors and cables enter or leave the enclosure.
4. Use wire and cable markers to identify connected grounding electrode system components for grounding electrode conductors.

D. Identification for Raceways:

1. Use voltage markers to identify highest voltage present for accessible conduits at maximum intervals of 20 feet.
2. Use voltage markers, color-coded bands, or factory-painted conduits to identify systems other than normal power system for accessible conduits.
   a. Maximum Intervals: 20 feet.
   b. Color-Coded Bands: Use field-painting or vinyl color coding electrical tape to mark bands 3 inches wide.
      1) Field-Painting: Comply with Section 09 9123 and 09 9113.
      2) Vinyl Color Coding Electrical Tape: Comply with Section 26 0519.
   c. Color Code:
3. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify circuits enclosed for accessible conduits at wall penetrations, at floor penetrations, at roof penetrations, and at equipment terminations when source is not within sight.
4. Use underground warning tape to identify underground raceways.

E. Identification for Cable Tray: Comply with Section 26 0536.

F. Identification for Boxes:
1. Use voltage markers to identify highest voltage present.
2. Use voltage markers or color coded boxes to identify systems other than normal power system.
   a. Color-Coded Boxes: Field-painted in accordance with Section 09 9123 and 09 9113 per the same color code used for raceways.
3. Use identification labels or handwritten text using indelible marker to identify circuits enclosed.
   a. For exposed boxes in public areas, use only identification labels.

G. Identification for Devices:
1. Identification for Communications Devices: Comply with Section 27 10 00.
2. Wiring Device and Wallplate Finishes: Comply with Section 26 2726.
3. Use identification label to identify fire alarm system devices.
4. Use identification label to identify serving branch circuit for all receptacles.
   a. For receptacles in public areas or in areas as directed by Architect, provide identification on inside surface of wallplate.

2.2 MANUFACTURERS

A. Brady Corporation: www.bradycorp.com.

B. Substitutions: See Section 01 6000 - Product Requirements.

2.3 LARGE DEVICE IDENTIFICATION

A. Identify all disconnect switches, pull boxes, junction boxes (larger than 4" X 4") in unfinished areas with Brady voltage markers, catalog #B-498, series #44xxx (xxx indicates last 3 numbers of model number which vary based on voltage, size, etc. Contractor shall coordinate this information prior to ordering). Sizes for each label shall be as large as possible, style "A", "B" or "C" as the device permits.

B. Identify all disconnect switches, pull boxes, junction boxes (larger than 4" X 4") finished with black engraved lamicoid self-adhesive labels, 1" X 4". The label shall state the power feed, circuit or section number, and the equipment identification number that the large device serves.

2.4 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:
1. Manufacturers:
   a. Brimar Industries, Inc: www.brimar.com/#sle.
   b. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.
   c. Seton Identification Products: www.seton.com/#sle.
   d. Substitutions: See Section 01 6000 - Product Requirements.
2. Materials:
   a. Indoor Clean, Dry Locations: Use plastic nameplates.
   b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
3. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.
4. Stainless Steel Nameplates: Minimum thickness of 1/32 inch; engraved or laser-etched text.
5. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch; engraved or laser-etched text.
6. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.

B. Identification Labels:
1. Manufacturers:
   a. Brady Corporation: www.bradyid.com/#sle.
   b. Brother International Corporation: www.brother-usa.com/#sle.
   c. Panduit Corp: www.panduit.com/#sle.
   d. Substitutions: See Section 01 6000 - Product Requirements.
2. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
   a. Use only for indoor locations.
3. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

C. Format for Equipment Identification:
1. Minimum Size: 1 inch by 2.5 inches.
2. Legend:
   a. Equipment designation or other approved description.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height:
   a. Equipment Designation: 1/2 inch.
5. Color:
   a. Normal Power System: White text on black background.

D. Format for General Information and Operating Instructions:
1. Minimum Size: 1 inch by 2.5 inches.
2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 1/4 inch.
5. Color: Black text on white background unless otherwise indicated.

a. Exceptions:
1) Provide white text on red background for general information or operational instructions for emergency systems.

E. Format for Receptacle Identification:
1. Minimum Size: 3/8 inch by 1.5 inches.
2. Legend: Power source and circuit number or other designation indicated.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch.
5. Color: Black text on clear background.

F. Format for Control Device Identification:
1. Minimum Size: 3/8 inch by 1.5 inches.
2. Legend: Load controlled or other designation indicated.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch.
5. Color: Black text on clear background.

G. Format for Fire Alarm Device Identification:
1. Minimum Size: 3/8 inch by 1.5 inches.
2. Legend: Designation indicated and device zone or address.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch.
5. Color: Red text on white background.

H. Nameplates: Engraved three-layer laminated plastic, black letters on white background, 2" by 6" in size

I. Locations:
1. Each electrical distribution and control equipment enclosure.
2. Disconnect Switches
3. Panelboards.

J. Letter Size:
1. Use 1/8 inch letters for identifying individual equipment and loads.

K. Labels: Embossed adhesive tape, with 3/16 inch (5 mm) white letters on black background. Use only for identification of individual wall switches and receptacles, and control device stations.

2.5 WIRE AND CABLE MARKERS

A. Manufacturers:
1. Brady Bradysleeve Catalog #B-320 PVC.
2. Substitutions: See Section 01 6000 - Product Requirements.

B. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.

C. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.

D. Legend: Power source and circuit number or other designation indicated.

E. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.

F. Minimum Text Height: 1/8 inch.

G. Color: Black text on white background unless otherwise indicated.

H. Locations: Each conductor at pull boxes, junction boxes, and Termination or connection points including each load connection.

I. Legend:
1. Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.

2.6 VOLTAGE MARKERS

A. Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth, or vinyl snap-around type markers.

B. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.

C. Minimum Size:
1. Markers for Conduits: As recommended by manufacturer for conduit size to be identified.
2. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches.
3. Markers for Junction Boxes: 1/2 by 2 1/4 inches.

D. Legend:
1. Markers for Voltage Identification: Highest voltage present.
2. Markers for System Identification:
   a. Emergency Power System: Text "EMERGENCY".

E. Color: Black text on orange background unless otherwise indicated.

F. Location: Furnish markers for each conduit longer than 6 feet.

G. Spacing: 20 feet on center.

2.7 UNDERGROUND WARNING TAPE

A. Manufacturers:
1. Brady Corporation: www.bradyid.com/#sle.
2. Brimar Industries, Inc: www.brimar.com/#sle.
3. Seton Identification Products: www.seton.com/#sle.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Materials: Use foil-backed detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.

C. Foil-backed Detectable Type Tape: 3 inches wide, with minimum thickness of 5 mil, unless otherwise required for proper detection.

D. Legend: Type of service, continuously repeated over full length of tape.

E. Color:
1. Tape for Buried Power Lines: Black text on red background.
2. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

2.8 WARNING SIGNS AND LABELS

A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

B. Warning Signs:
1. Materials:
   a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.
3. Minimum Size: 7 by 10 inches unless otherwise indicated.

C. Warning Labels:
1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
3. Minimum Size: 2 by 4 inches unless otherwise indicated.

PART 3 EXECUTION

3.1 PREPARATION

A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

B. Degrease and clean surfaces to receive nameplates and labels.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
1. Surface-Mounted Equipment: Enclosure front.
2. Flush-Mounted Equipment: Inside of equipment door.
3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
4. Elevated Equipment: Legible from the floor or working platform.
5. Branch Devices: Adjacent to device.
6. Interior Components: Legible from the point of access.
7. Conduits: Legible from the floor.
8. Boxes: Outside face of cover.
9. Conductors and Cables: Legible from the point of access.
10. Devices: Outside face of cover.

C. Install identification products centered, level, and parallel with lines of item being identified.

D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.

E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.

F. Install underground warning tape above buried lines with one tape per trench at 3 inches below finished grade.

G. Secure rigid signs using stainless steel screws.

H. Mark all handwritten text, where permitted, to be neat and legible.

3.3 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION 26 0553

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SECTION 26 0573 - POWER SYSTEM STUDIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Short-circuit study.

B. Protective device coordination study.

C. Arc flash and shock risk assessment.
   1. Includes arc flash hazard warning labels.

D. Criteria for the selection and adjustment of equipment and associated protective devices not specified in this section, as determined by studies to be performed.

E. Flash Hazard Study

1.2 RELATED REQUIREMENTS

A. Section 26 0553 - Identification for Electrical Systems: Additional requirements for arc flash hazard warning labels.

B. Section 26 2416 - Panelboards.

C. Section 26 2813 - Fuses.

1.3 REFERENCE STANDARDS

A. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2011.

B. IEEE 141 - IEEE Recommended Practice for Electrical Power Distribution for Industrial Plants; 1993 (Reaffirmed 1999).

C. IEEE 242 - IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems; 2001, with Errata (2003).

D. IEEE 399 - IEEE Recommended Practice for Industrial and Commercial Power Systems Analysis; 1997.

E. IEEE 551 - IEEE Recommended Practice for Calculating Short-Circuit Currents in Industrial and Commercial Power Systems; 2006.

F. IEEE 1584 - IEEE Guide for Performing Arc Flash Hazard Calculations; 2018.

G. NEMA MG 00001 - Motors and Generators; 2024.

H. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.

I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. NFPA 70E - Standard for Electrical Safety in the Workplace; 2017.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
1. Coordinate the work to provide equipment and associated protective devices complying with criteria for selection and adjustment, as determined by studies to be performed.
2. Notify DEDC, LLC of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
1. Submit study reports prior to or concurrent with product submittals.
2. Do not order equipment until matching study reports and product submittals have both been evaluated by DEDC, LLC.
3. Verify naming convention for equipment identification prior to creation of final drawings, reports, and arc flash hazard warning labels (where applicable).

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Study preparer's qualifications.

C. Study reports, stamped or sealed and signed by study preparer.

D. Product Data: In addition to submittal requirements specified in other sections, include manufacturer's standard catalog pages and data sheets for equipment and protective devices indicating information relevant to studies.
1. Include characteristic time-current trip curves for protective devices.
2. Include impedance data for busway.
3. Include impedance data for engine generators.
4. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
5. Identify modifications made in accordance with studies that:
   a. Can be made at no additional cost to Owner.
   b. As submitted will involve a change to the contract sum.

E. Arc Flash Hazard Warning Label Samples: One of each type and legend specified.

F. Site-specific arc flash hazard warning labels.

G. Certification that field adjustable protective devices have been set in accordance with requirements of studies.

H. Project Record Documents: Revise studies as required to reflect as-built conditions.
1. Include hard copies with operation and maintenance data submittals.
2. Include computer software files used to prepare studies with file name(s) cross-referenced to specific pieces of equipment and systems.

1.6 POWER SYSTEM STUDIES

A. Scope of Studies:
1. Perform analysis of new electrical distribution system as indicated on drawings.
2. Except where study descriptions below indicate exclusions, analyze system at each bus from primary protective devices of utility source down to each piece of equipment involved, including parts of system affecting calculations being performed (e.g. fault current contribution from motors).
3. Include in analysis alternate sources and operating modes (including known future configurations) to determine worst case conditions.
   a. Known Operating Modes:
      1) Utility as source.
      2) Generator as source.

B. General Study Requirements:
1. Comply with NFPA 70.
2. Perform studies utilizing computer software complying with specified requirements; manual calculations are not permitted.

C. Data Collection:
1. Compile information on project-specific characteristics of actual installed equipment, protective devices, feeders, etc. as necessary to develop single-line diagram of electrical distribution system and associated input data for use in system modeling.
   a. Utility Source Data: Include primary voltage, maximum and minimum three-phase and line-to-ground fault currents, impedance, X/R ratio, and primary protective device information.
      1) Obtain up-to-date information from Utility Company.
      2) Utility Company: JERSEY CENTRAL POWER & LIGHT.
         a) Point of Contact: TONY MENIO.
         b) Phone: 732-942-2837.
   b. Generators: Include manufacturer/model, kW and voltage ratings, and impedance.
   c. Motors: Include manufacturer/model, type (e.g. induction, synchronous), horsepower rating, voltage rating, full load amps, and locked rotor current or NEMA MG 00001 code letter designation.
   d. Transformers: Include primary and secondary voltage ratings, kVA rating, winding configuration, percent impedance, and X/R ratio.
   e. Protective Devices:
      1) Circuit Breakers: Include manufacturer/model, type (e.g. thermal magnetic, electronic trip), frame size, trip rating, voltage rating, interrupting rating, available field-adjustable trip response settings, and features (e.g. zone selective interlocking).
      2) Fuses: Include manufacturer/model, type/class (e.g. Class J), size/rating, and speed (e.g. time delay, fast acting).
   f. Protective Relays: Include manufacturer/model, type, settings, current/potential transformer ratio, and associated protective device.
   g. Conductors: Include feeder size, material (e.g. copper, aluminum), insulation type, voltage rating, number per phase, raceway type, and actual length.

D. Short-Circuit Study:
1. Comply with IEEE 551 and applicable portions of IEEE 141, IEEE 242, and IEEE 399.
2. For purposes of determining equipment short circuit current ratings, consider conditions that may result in maximum available fault current, including but not limited to:

a. Maximum utility fault currents.
b. Maximum motor contribution.
c. Known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).

3. For each bus location, calculate the maximum available three-phase bolted symmetrical and asymmetrical fault currents. For grounded systems, also calculate the maximum available line-to-ground bolted fault currents.

E. Protective Device Coordination Study:
1. Comply with applicable portions of IEEE 242 and IEEE 399.
2. Analyze alternate scenarios considering known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).
3. Analyze protective devices and associated settings for suitable margins between time-current curves to provide adequate protection for equipment and conductors while achieving full selective coordination.

F. Arc Flash and Shock Risk Assessment:
1. Comply with NFPA 70E.
2. Perform incident energy and arc flash boundary calculations in accordance with IEEE 1584 (as referenced in NFPA 70E Annex D), where applicable.
a. Where reasonable, study preparer may assume a maximum clearing time of two seconds in accordance with IEEE 1584, provided that the conditions are such that a worker's egress from an arc flash event would not be inhibited.
3. Analyze alternate scenarios considering conditions that may result in maximum incident energy, including but not limited to:
a. Maximum and minimum utility fault currents.
b. Maximum and minimum motor contribution.
c. Known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).

G. Study Reports:
1. General Requirements:
a. Identify date of study and study preparer.
b. Identify study methodology and software product(s) used.
c. Identify scope of studies, assumptions made, implications of possible alternate scenarios, and any exclusions from studies.
d. Identify base used for per unit values.
e. Include single-line diagram and associated input data used for studies; identify buses on single-line diagram as referenced in reports, and indicate bus voltage.
f. Include conclusions and recommendations.
2. Short-Circuit Study:
a. For each scenario, identify at each bus location:
1) Calculated maximum available symmetrical and asymmetrical fault currents (both three-phase and line-to-ground where applicable).
2) Fault point X/R ratio.
3) Associated equipment short circuit current ratings.
b. Identify locations where the available fault current exceeds the equipment short circuit current rating, along with recommendations.

3. Protective Device Coordination Study:
    a. For each scenario, include time-current coordination curves plotted on log-log scale graphs.
    b. For each graph include (where applicable):
        1) Partial single-line diagram identifying the portion of the system illustrated.
        2) Protective Devices: Time-current curves with applicable tolerance bands for each protective device in series back to the source, plotted up to the maximum available fault current at the associated bus.
        3) Conductors: Damage curves.
        4) Transformers: Inrush points and damage curves.
        5) Generators: Full load current, overload curves, decrement curves, and short circuit withstand points.
        6) Motors: Full load current, starting curves, and damage curves.
        7) Capacitors: Full load current and damage curves.
    c. For each protective device, identify fixed and adjustable characteristics with available ranges and recommended settings.
        1) Circuit Breakers: Include long time pickup and delay, short time pickup and delay, and instantaneous pickup.
        2) Include ground fault pickup and delay.
        3) Include fuse ratings.
        4) Protective Relays: Include current/potential transformer ratios, tap, time dial, and instantaneous pickup.
    d. Identify cases where either full selective coordination or adequate protection is not achieved, along with recommendations.
4. Arc Flash and Shock Risk Assessment:
    a. For the worst case for each scenario, identify at each bus location:
        1) Calculated incident energy and associated working distance.
        2) Calculated arc flash boundary.
        3) Bolted fault current.
        4) Arcing fault current.
        5) Clearing time.
        6) Arc gap distance.
    b. For purposes of producing arc flash hazard warning labels, summarize the maximum incident energy and associated data reflecting the worst case condition of all scenarios at each bus location.

1.7 QUALITY ASSURANCE

A. Study Preparer Qualifications: Professional electrical engineer licensed in Pennsylvania and with minimum five years experience in preparation of studies of similar type and complexity using specified computer software.
    1. Study preparer may be employed by manufacturer of electrical distribution equipment.

B. Computer Software for Study Preparation: Use the latest edition of commercially available software utilizing specified methodologies.
    1. Products:
        a. SKM Systems Analysis, Inc: www.skm.com/#sle.
        b. Substitutions: See Section 01 6000 - Product Requirements.

PART 2 PRODUCTS

2.1 ARC FLASH HAZARD WARNING LABELS

A. Provide warning labels complying with ANSI Z535.4 to identify arc flash hazards for each work location analyzed by the arc flash and shock risk assessment.
   1. Materials: Comply with Section 26 0553.
   2. Minimum Size: 4 by 6 inches.
   3. Legend: Provide custom legend in accordance with NFPA 70E based on equipment-specific data as determined by arc flash and shock risk assessment.
      a. Include orange header that reads "WARNING" unless otherwise indicated.
      b. Include the text "Arc Flash and Shock Hazard; Appropriate PPE Required" or approved equivalent.
      c. Include the following information:
         1) Arc flash boundary.
         2) Available incident energy and corresponding working distance.
         3) Nominal system voltage.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install arc flash warning labels in accordance with Section 26 0553.

3.2 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Adjust equipment and protective devices for compliance with studies and recommended settings.

D. Notify DEDC, LLC of any conflicts with or deviations from studies. Obtain direction before proceeding.

3.3 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. See Section 01 7900 - Demonstration and Training, for additional requirements.

END OF SECTION 26 0573

SECTION 26 0583 - WIRING CONNECTIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrical connections to equipment.

1.2 RELATED REQUIREMENTS

A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables.

B. Section 26 0533.13 - Conduit for Electrical Systems.

C. Section 26 0533.16 - Boxes for Electrical Systems.

D. Section 26 2726 - Wiring Devices.

E. Section 26 2816.16 - Enclosed Switches.

1.3 REFERENCE STANDARDS

A. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2015).

B. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2016.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
1. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
2. Determine connection locations and requirements.

B. Sequencing:
1. Install rough-in of electrical connections before installation of equipment is required.
2. Make electrical connections before required start-up of equipment.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide wiring device manufacturer’s catalog information showing dimensions, configurations, and construction.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

PART 2 PRODUCTS

2.1 MATERIALS

A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
   1. Colors: Comply with NEMA WD 1.
   2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
   3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

B. Disconnect Switches: As specified in Section 26 2816.16 and in individual equipment sections.

C. Wiring Devices: As specified in Section 26 2726.

D. Flexible Conduit: As specified in Section 26 0533.13.

E. Wire and Cable: As specified in Section 26 0519.

F. Boxes: As specified in Section 26 0533.16.

2.2 EQUIPMENT CONNECTIONS

A. VRF UNITS

B. Unit heaters

C. DOAS Unit

D. Kitchen Exhaust Hoods

E. Kitchen Exhaust Fans

F. NO/CO systems

G. Electric Hot Water heaters

H. All electrical systems

I. All mechanical equipment stand-alone control equipment

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.2 ELECTRICAL CONNECTIONS

A. Make electrical connections in accordance with equipment manufacturer's instructions.

B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.

C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.

D. Provide receptacle outlet to accommodate connection with attachment plug.

E. Provide cord and cap where field-supplied attachment plug is required.

F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.

H. Install terminal block jumpers to complete equipment wiring requirements.

I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

END OF SECTION 26 0583

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SECTION 26 0923 - DISTRIBUTED DIGITAL LIGHTING CONTROL SYSTEM

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Digital Lighting Controls
2. Related Sections:
   a. Section [265100 - Interior Lighting] Luminaires
   b. Drawings and general provision of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections apply to this Section
   c. Electrical Sections, including wiring devices, apply to the work of this Section.
3. Control Intent – Control Intent includes, but is not limited to:
   a. Defaults and initial calibration settings for such items as time delay, sensitivity, fade rates, etc.
   b. Initial sensor and switching zones
   c. Initial time switch settings

1.2 REFERENCES

A. American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE) (www.ansi.org <http://www.ansi.org> and www.ieee.org)

B. International Electrotechnical Commission (IEC) (www.iec.ch <http://www.iec.ch>)

C. International Organization for Standardization (ISO) (www.iso.ch <http://www.iso.ch>):

D. National Electrical Manufacturers Association (NEMA) (www.nema.org <http://www.nema.org>)

E. WD1 (R2005) - General Color Requirements for Wiring Devices.

F. Underwriters Laboratories, Inc. (UL) (www.ul.com <http://www.ul.com>):
1. 916 – Energy Management Equipment

1.3 SYSTEM DESCRIPTION & OPERATION

A. The Lighting Control and Automation system as defined under this section covers the following equipment:
1. Lighting Management local network – Free topology, plug-in wiring system (Cat 5e) for power and data to room devices.
2. Digital Room Controllers – Self-configuring, digitally addressable one, two or three relay plenum-rated controllers for on/off control. Selected models include 0-10 volt or line voltage forward phase control dimming outputs and integral current monitoring capabilities.
3. Digital Fixture Controllers – Self-configuring, digitally addressable one relay fixture-integrated controllers for on/off/0-10V dimming control.
4. Digital Occupancy Sensors – Self-configuring, digitally addressable, calibrated occupancy sensors with LCD display and two-way active infrared (IR) communications.

5. Digital Switches – Self-configuring, digitally addressable pushbutton on/off, dimming, and scene switches with two-way active infrared (IR) communications.
6. Digital Daylighting Sensors – Single-zone closed loop, multi-zone open loop and single-zone dual-loop daylighting sensors with two-way active infrared (IR) communications for daylight harvesting using switching, bi-level, tri-level or dimming control.
7. Configuration Tools – Handheld remote for room configuration and relay panel programming provides two way infrared (IR) communications to digital devices and allows complete configuration and reconfiguration of the device / room from up to 30 feet away.
8. RGBW Controllers - used to control color changing lighting fixtures and providing led light shows for DMX lighting networks.

1.4 LIGHTING CONTROL APPLICATIONS

A. Unless relevant provisions of the applicable local energy codes are more stringent, provide a minimum application of lighting controls as follows:
   1. Space Control Requirements – Provide occupancy/vacancy sensors with Manual- or Partial-ON functionality in all spaces as shown on plan drawings.
   2. Daylit Areas – Provide daylight-responsive automatic control in all spaces (conditioned or unconditioned) where daylight contribution is available as defined by relevant local building energy code:
      a. Daytime setpoints for total ambient illumination (combined daylight and electric light) levels that initiate dimming shall be programmed in compliance with relevant local building energy codes.
      b. Multiple-level switched daylight harvesting controls may be utilized for areas marked on drawings.
      c. Provide smooth and continuous daylight dimming for areas marked on drawings. Daylighting control system may be designed to turn off electric lighting when daylight is at or above required lighting levels, only if system functions to turn lamps back on at dimmed level, rather than turning full-on prior to dimming.
      d. Conference, meeting, training, auditoriums, and multipurpose rooms shall have controls that allow for independent control of each local control zone. Rooms larger than 300 square feet shall instead have at least four preset lighting scenes unless otherwise specified. Occupancy / vacancy sensors shall be provided to turn off all lighting in the space. Spaces with up to four moveable walls shall include controls that can be reconfigured when the room is partitioned.
   3. RGBW Lighting Fixtures - Provide RGBW controller with local controls for turning on/off lighting shows in configurations as shown on plans.

1.5 SUBMITTALS

A. Submittals Package: Submit the shop drawings, and the product data specified below at the same time as a package.

B. Shop Drawings:
   1. Composite wiring and/or schematic diagram of each control circuit as proposed to be installed.
   2. Show exact location of all digital devices, including at minimum sensors, load controllers, and switches for each area on reflected ceiling plans. (Contractor must provide AutoCAD format reflected ceiling plans.)
   3. Provide room/area details including products and sequence of operation for each room or area. Illustrate typical acceptable room/area connection topologies.

4. Product Data: Catalog sheets, specifications and installation instructions.

1.6 QUALITY ASSURANCE

A. Manufacturer: Minimum 10 Years Experience in Manufacture of Lighting Controls

1.7 PROJECT CONDITIONS

A. Do not install equipment until following conditions can be maintained in spaces to receive equipment:
1. Ambient temperature: 0° to 40° C (32° to 104° F).
2. Relative humidity: Maximum 90 percent, non-condensing.

1.8 WARRANTY

A. Provide a five year limited manufacturer's warranty on all room control devices and panels.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer:
1. Leviton
a. System: GreenMAX DRC
2. Or approved equal

2.2 DIGITAL LIGHTING CONTROLS

A. Furnish the Company's system which accommodates the square-footage coverage requirements for each area controlled, utilizing room controllers, digital occupancy sensors, switches, daylighting sensors and accessories which suit the lighting and electrical system parameters.

2.3 LOCAL NETWORK (ROOM NETWORK)

A. The local network is a free topology lighting control physical connection and communication protocol designed to control a small area of a building.

B. Features of the local network include:
1. Automatic configuration and binding of occupancy sensors, switches and lighting loads to the most energy-efficient sequence of operation based upon the device attached.
2. Simple replacement of any device in the local network with a standard off the shelf unit without requiring significant commissioning, configuration or setup.
3. Configuration to change the automatic configuration, including binding and load parameters without tools, using only the buttons on the digital devices in the local network.
4. Two-way infrared communications for control by handheld remotes, and configuration by a handheld tool including adjusting load parameters, sensor configuration and binding, within a line of sight of up to 30 feet from a sensor, wall switch or IR receiver.

5. Digital room devices connect to the local network using pre-terminated Cat 5e cables with RJ-45 connectors, which provide both data and power to room devices. Systems that utilize RJ-45 patch cords but do not provide serial communication data from individual end devices are not acceptable.
6. If manufacturer's pre-terminated Cat5e cables are not used for the installation, the contractor is responsible for testing each cable following installation and supplying manufacturer with test results.

2.4 DIGITAL LOAD CONTROLLERS (ROOM AND FIXTURE CONTROLLERS)

A. Digital controllers for lighting loads automatically bind the room loads to the connected devices in the space without commissioning or the use of any tools. Room load controllers shall be provided to match the room lighting load control requirements. The controllers will be simple to install, and will not have dip switches or potentiometers, or require special configuration for standard Plug n' Go applications. The control units will include the following features:

1. Automatic room configuration to the most energy-efficient sequence of operation based upon the devices in the room.
2. Simple replacement – Using the default automatic configuration capabilities, a room controller may be replaced with an off-the-shelf.
3. Multiple room controllers connected together in a local network must automatically arbitrate with each other, without requiring any configuration or setup, so that individual load numbers are sequentially assigned using each controller's device ID's from highest to lowest.
4. Device Status LEDs to indicate:
    a. Device has power
    b. Quick installation features including:
        1) Standard junction box mounting
        2) Quick low voltage connections using standard RJ-45 patch cable
    c. Based on individual configuration, each load shall be capable of the following behavior on power up following the loss of normal power:
        1) Turn on to 100%
        2) Turn off
        3) Turn on to last level
    d. Each load shall at a minimum be configurable to operate in the following sequences based on occupancy:
        1) Auto-on/Auto-off (Follow on and off)
        2) Manual-on/Auto-off (Follow off only)
    e. The polarity of each load output shall be reversible, via digital configuration, so that on is off and off is on.
    f. UL 2043 plenum rated
    g. Manual override and LED indication for each load
    h. Dual voltage (120/277 VAC, 60 Hz), or 347 VAC, 60 Hz (selected models only). 120/277 volt models rated for 20A total load, derating to 16A required for some dimmed loads (forward phase dimming); 347 volt models rated for 15A total load.
    i. Zero cross circuitry for each load
    j. All digital parameter data programmed into an individual room controller or plug load controller shall be retained in non-volatile FLASH memory within the controller itself. Memory shall have an expected life of no less than 10 years.
5. On/Off Room Controllers shall include:
    a. One, two or three relay configuration

b. Efficient 150 mA switching power supply
c. Three RJ-45 local network ports with integral strain relief and dust cover

6. On/Off/Dimming enhanced Room Controllers shall include:
   a. Real time current monitoring
   b. Multiple relay configurations
      1) One, two or three relays
   c. Efficient 250 mA switching power supply
   d. Four RJ-45 Lighting Management local network ports with integral strain relief and dust cover
   e. One dimming output per relay
      1) 0-10V Dimming - Where indicated, one 0-10 volt analog output per relay for control of compatible ballasts and LED drivers. The 0-10 volt output shall automatically open upon loss of power to the Room Controller to assure full light output from the controlled lighting.
      2) Line Voltage, Forward Phase Dimming - Where indicated, one forward phase control line voltage dimming output per relay for control of compatible two-wire or three-wire ballasts, LED drivers, MLV, forward phase compatible ELV, neon/cold cathode and incandescent loads.
      3) Each dimming output channel shall have an independently configurable minimum and maximum calibration trim level to set the dimming range to match the true dynamic range of the connected ballast or driver.
      4) The LED level indicators on bound dimming switches shall utilize this new maximum and minimum trim.
      5) Each dimming output channel shall have an independently configurable minimum and maximum trim level to set the dynamic range of the output within the new 0-100% dimming range defined by the minimum and maximum calibration trim.
      6) Calibration and trim levels must be set per output channel.
      7) Devices that set calibration or trim levels per controller are not acceptable.
      8) All configuration shall be digital. Devices that set calibration or trim levels per output channel via trim pots or dip-switches are not acceptable.
   f. Each load shall have an independently configurable preset on level for Normal Hours and After Hours events to allow different dimmed levels to be established at the start of both Normal Hours and After Hours events.
   g. Fade rates for dimming loads shall be specific to bound switch buttons, and the load shall maintain a default value for any bound buttons that do not specify a unique value.
   h. The following dimming attributes may be changed or selected using a wireless configuration tool:
      1) Establish preset level for each load from 0-100%
      2) Set high and low trim for each load
      3) Set lamp burn in time for each load up to 100 hours
   i. Override button for each load provides the following functions:
      1) Press and release for on/off control
      2) Press and hold for dimming control
7. Fixture Controllers shall include:
   a. A form factor and product ratings to allow various OEM fixture manufacturers to mount the device inside the ballast/driver cavity of standard-sized fluorescent or LED general lighting fixtures.
   b. One 3A 120/277V rated mechanically held relay.
   c. Programmable behavior on power up following the loss of normal power:

1) Turn on to 100%
2) Turn off
3) Turn on to last level

d. Requirement for 7 mA of 24VDC operating power from the DLM local network.
   1) The Fixture Controller does not require a connection to a neutral conductor to operate, and unlike other types of Load Controllers it does not contribute power to the Lighting Management local network to drive accessory devices.

e. 0-10V dimming capability via a single 0-10 volt analog output from the device for control of compatible ballasts and LED drivers. The 0-10 volt output shall automatically open upon loss of power to the Fixture Controller.

f. Terminals to connect an RJ-45 adaptor with 24" leads, mountable in a ½" KO, for connection to the Lighting Management local network.
   1) The adaptor leads are insulated for use in a fixture cavity, and the lead length allows the OEM fixture manufacturer flexibility to position the Fixture Controller and the RJ45 jack in the best locations on each fixture.

g. A complete set of dimming features described above in the section detailing On/Off/Dimming Enhanced Room Controllers (subsection C.5 onward).

2.5 DIGITAL WALL OR CEILING MOUNTED OCCUPANCY SENSOR

A. Wall or ceiling mounted (to suit installation) passive infrared (PIR), ultrasonic or dual technology digital (passive infrared and ultrasonic) occupancy sensor.

B. Digital Occupancy Sensors shall provide graphic LCD display for digital calibration and electronic documentation. Features include the following:
   1. Digital calibration and pushbutton configuration for the following variables:
      a. Sensitivity – 0-100% in 10% increments
      b. Time delay – 1-30 minutes in 1 minute increments
      c. Test mode – Five second time delay
      d. Detection technology – PIR, Ultrasonic or Dual Technology activation and/or re-activation.
      e. Walk-through mode
      f. Load parameters including Auto/Manual-ON, blink warning, and daylight enable/disable when photosensors are included in the DLM local network.
      g. Programmable control functionality including:
         1) Each sensor may be programmed to control specific loads within a local network.
         2) Sensor shall be capable of activating one of 16 user-definable lighting scenes.
         3) Adjustable retrigger time period for manual-on loads. Load will retrigger (turn on) automatically within a configurable period of time (default 10 seconds) after turning off.
         4) On dual technology sensors, independently configurable trigger modes are available for both Normal (NH) and After Hours (AH) time periods. The retrigger mode can be programmed to use the following technologies:
         5) Ultrasonic and Passive Infrared
         6) Ultrasonic or Passive Infrared
         7) Ultrasonic only
         8) Passive Infrared only
         9) Independently configurable sensitivity settings for passive infrared and ultrasonic technologies (on dual technology sensors) for both Normal (NH) and After Hour (AH) time periods.

h. One or two RJ-45 port(s) for connection to Lighting Management local network.
i. Two-way infrared (IR) transceiver to allow remote programming through handheld commissioning tool and control by remote personal controls.
j. Device Status LEDs, which may be disabled for selected applications, including:
   1) PIR detection
   2) Ultrasonic detection
   3) Configuration mode
   4) Load binding
k. Assignment of occupancy sensor to a specific load within the room without wiring or special tools.
l. Manual override of controlled loads.
m. All digital parameter data programmed into an individual occupancy sensor shall be retained in non-volatile FLASH memory within the sensor itself. Memory shall have an expected life of no less than 10 years.

2. Units shall not have any dip switches or potentiometers for field settings.
3. Multiple occupancy sensors may be installed in a room by simply connecting them to the free topology lighting management local network. No additional configuration will be required.

2.6 DIGITAL WALL SWITCH OCCUPANCY SENSORS

A. Wallbox mounted passive infrared PIR or dual technology (passive infrared and ultrasonic) digital occupancy sensor with 1 or 2 switch buttons.

B. Digital Occupancy Sensors shall provide scrolling LCD display for digital calibration and electronic documentation. Features include the following:
1. Digital calibration and pushbutton configuration for the following variables:
   a. Sensitivity – 0-100% in 10% increments
   b. Time delay – 1-30 minutes in 1 minute increments
   c. Test mode – Five second time delay
   d. Detection technology – PIR, Dual Technology activation and/or re-activation.
   e. Walk-through mode
   f. Load parameters including Auto/Manual-ON, blink warning, and daylight enable/disable when photosensors are included in the DLM local network.
   g. Programmable control functionality including:
      1) Each sensor may be programmed to control specific loads within a local network.
      2) Sensor shall be capable of activating one of 16 user-definable lighting scenes.
      3) Adjustable retrigger time period for manual-on loads. Load will retrigger (turn on) automatically during the configurable period of time (default 10 seconds) after turning off.
      4) On dual technology sensors, independently configurable trigger modes are available for both Normal (NH) and After Hours (AH) time periods. The retrigger mode can be programmed to use the following technologies:
         a) Ultrasonic and Passive Infrared
         b) Ultrasonic or Passive Infrared
         c) Ultrasonic only
         d) Passive Infrared only
   h. Independently configurable sensitivity settings for passive infrared and ultrasonic technologies (on dual technology sensors) for both Normal (NH) and After Hour (AH) time periods.

i. Two RJ-45 ports for connection to Lighting Management local network.
j. Two-way infrared (IR) transceiver to allow remote programming through handheld configuration tool and control by remote personal controls.
k. Device Status LEDs including
    1) PIR detection
    2) Ultrasonic detection
    3) Configuration mode
    4) Load binding
l. Assignment of any occupancy sensor to a specific load within the room without wiring or special tools.
m. Assignment of local buttons to specific loads within the room without wiring or special tools
n. Manual override of controlled loads
o. All digital parameter data programmed into an individual wall switch sensor shall be retained in non-volatile FLASH memory within the wall switch sensor itself. Memory shall have an expected life of no less than 10 years.

2. Units shall not have any dip switches or potentiometers for field settings.
3. Multiple occupancy sensors may be installed in a room by simply connecting them to the free topology lightning management local network. No additional configuration will be required.
4. Two-button wall switch occupancy sensors, when connected to a single relay dimming room or fixture controller, shall operate in the following sequence as a factory default:
    a. Left button
        1) Press and release - Turn load on
        2) Press and hold - Raise dimming load
    b. Right button
        1) Press and release - Turn load off
        2) Press and hold - Lower dimming load
5. Low voltage momentary pushbuttons shall include the following features:
    a. Load/Scene Status LED on each switch button with the following characteristics:
        1) Bi-level LED
        2) Dim locator level indicates power to switch
        3) Bright status level indicates that load or scene is active
    b. The following button attributes may be changed or selected using a wireless configuration tool:
        1) Load and Scene button function may be reconfigured for individual buttons (from Load to Scene, and vice versa).
        2) Individual button function may be configured to Toggle, On only or Off only.
        3) Individual scenes may be locked to prevent unauthorized change.
        4) Fade Up and Fade Down times for individual scenes may be adjusted from 0 seconds to 18 hours.
        5) Ramp rate may be adjusted for each dimmer switch.
        6) Switch buttons may be bound to any load on any load controller or relay panel and are not load type dependent; each button may be bound to multiple loads.

2.7 DIGITAL WALL SWITCHES

A. Low voltage momentary pushbutton switches in 1, 2, 3, 4, 5 and 8 button configuration. Wall switches shall include the following features:
    1. Two-way infrared (IR) transceiver for use with personal and configuration remote controls.

2. Removable buttons for field replacement with engraved buttons and/or alternate color buttons. Button replacement may be completed without removing the switch from the wall.
3. Configuration LED on each switch that blinks to indicate data transmission.
4. Load/Scene Status LED on each switch button with the following characteristics:
    a. Bi-level LED
    b. Dim locator level indicates power to switch
    c. Bright status level indicates that load or scene is active
    d. Dimming switches shall include seven bi-level LEDs to indicate load levels using 14 steps.
    e. Programmable control functionality including:
        1) Button priority may be configured to any BACnet priority level, from 1-16, corresponding to networked operation allowing local actions to utilize life safety priority
        2) Scene patterns may be saved to any button other than dimming rockers. Once set, buttons may be digitally locked to prevent overwriting of the preset levels.
    f. All digital parameter data programmed into an individual wall switch shall be retained in non-volatile FLASH memory within the wall switch itself. Memory shall have an expected life of no less than 10 years.
5. Two RJ-45 ports for connection to Lighting Management local network.
6. Multiple digital wall switches may be installed in a room by simply connecting them to the free topology lighting management local network. No additional configuration shall be required to achieve multi-way switching.
7. The following switch attributes may be changed or selected using a wireless configuration tool:
8. Load and Scene button function may be reconfigured for individual buttons (from Load to Scene, and vice versa).
    a. Individual button function may be configured to Toggle, On only or Off only.
    b. Individual scenes may be locked to prevent unauthorized change.
    c. Fade Up and Fade Down times for individual scenes may be adjusted from 0 seconds to 18 hours.
    d. Ramp rate may be adjusted for each dimmer switch.
    e. Switch buttons may be bound to any load on any load controller or relay panel and are not load type dependant; each button may be bound to multiple loads.

2.8 DIGITAL DAYLIGHTING SENSORS

A. Digital daylighting sensors shall work with load controllers and relay panels to provide automatic switching, bi-level, or tri-level or dimming daylight harvesting capabilities for any load type connected to the controller or panel. Daylighting sensors shall be interchangeable without the need for rewiring.
    1. Closed loop sensors measure the ambient light in the space and control a single lighting zone.
    2. Open loop sensors measure incoming daylight in the space, and are capable of controlling up to three lighting zones.
    3. Dual loop sensors measure both ambient and incoming daylight in the space to insure that proper light levels are maintained as changes to reflective materials are made in a single zone.
    4. Digital daylighting sensors shall include the following features:
        a. The sensor's internal photodiode shall only measure lightwaves within the visible spectrum. The photodiode's spectral response curve shall closely match the entire photopic curve. The photodiode shall not measure energy in either the ultraviolet or infrared spectrums. The photocell shall have a sensitivity of less than 5% for any wavelengths less than 400 nanometers or greater than 700 nanometers.

b. Sensor light level range shall be from 1-6,553 footcandles (fc).
c. The capability of ON/OFF, bi-level or tri-level switching, or dimming, for each controlled zone, depending on the selection of load controller(s) and load binding to controller(s).
d. For switching daylight harvesting, the photosensor shall provide a field-selectable deadband, or a separation, between the “ON Setpoint” and the “OFF Setpoint” that will prevent the lights from cycling excessively after they turn off.
e. For dimming daylight harvesting, the photosensor shall provide the option, when the daylight contribution is sufficient, of turning lights off or dimming lights to a field-selectable minimum level.
f. Photosensors shall have a digital, independently configurable fade rate for both increasing and decreasing light level in units of percent per second.
g. Photosensors shall provide adjustable cut-off time. Cut-off time is defined by the number of selected minutes the load is at the minimum output before the load turns off. Selectable range between 0-240 minutes including option to never cut-off.
h. Optional wall switch override shall allow occupants to reduce lighting level to increase energy savings or, if permitted by system administrator, raise lighting levels for a selectable period of time or cycle of occupancy.
i. Integral infrared (IR) transceiver for configuration and/or commissioning with a handheld configuration tool, to transmit detected light level to wireless configuration tool, and for communication with personal remote controls.
j. Configuration LED status light on device that blinks to indicate data transmission.
k. Status LED indicates test mode, override mode and load binding.
l. Recessed switch on device to turn controlled load(s) ON and OFF.
m. One RJ-45 port for connection to DLM local network.
n. A choice of accessories to accommodate multiple mounting methods and building materials. The photosensors may be mounted on a ceiling tile, skylight light well, suspended lighting fixture or backbox. Standard tube photosensors accommodate mounting materials from 0-0.62” thickness. Extended tube photosensors accommodate mounting materials from 0.62”-1.25” thickness. Mounting brackets are compatible with J boxes and wall mounting. Photosensor to be mounted on included bracket below skylight well.
o. Any load or group of loads in the room can be assigned to a daylighting zone
p. Each load within a daylighting zone can be individually enabled or disabled for discrete control (load independence).
q. All digital parameter data programmed into a photosensor shall be retained in non-volatile FLASH memory within the photosensor itself. Memory shall have an expected life of no less than 10 years.

5. Closed loop digital photosensors shall include the following additional features:
   a. An internal photodiode that measures light in a 100-degree angle, cutting off the unwanted light from bright sources outside of this cone.
   b. Automatic self-calibration, initiated from the photosensor, a wireless configuration tool or a PC with appropriate software.
   c. Automatically establishes application-specific setpoints following self-calibration. For switching operation, an adequate deadband between the ON and OFF setpoints shall prevent the lights from cycling; for dimming operation a sliding setpoint control algorithm with separate Day and Night setpoints shall prevent abrupt ramping of loads.
6. Open loop digital photosensors shall include the following additional features:
   a. An internal photodiode that measures light in a 60-degree angle (cutting off the unwanted light from the interior of the room).

b. Automatically establishes application-specific setpoints following manual calibration using a wireless configuration tool or a PC with appropriate software. For switching operation, an adequate deadband between the ON and OFF setpoints for each zone shall prevent the lights from cycling; for dimming operation, a proportional control algorithm shall maintain the design lighting level in each zone.
c. Each of the three discrete daylight zones can include any non overlapping group of loads in the room.

2.9 HANDHELD AND COMPUTER CONFIGURATION TOOLS

A. A wireless configuration tool facilitates optional customization of lighting management local networks using two-way infrared communications, while PC software connects to each local network via a USB interface.

B. Features and functionality of the wireless configuration tool shall include but not be limited to:
1. Two-way infrared (IR) communication with lighting management IR-enabled devices within a range of approximately 30 feet.
2. High visibility organic LED (OLED) display, pushbutton user interface and menu-driven operation.
3. Must be able to read and modify parameters for load controllers and relay panels, occupancy sensors, wall switches, daylighting sensors, network bridges, and identify Lighting Management devices by type and serial number.
4. Save up to eight occupancy sensor setting profiles, and apply profiles to selected sensors.
5. Temporarily adjust light level of any load(s) on the local network, and incorporate those levels in scene setting. Set room mode for testing of Normal Hours (NH) and After Hours (AH) parameter settings.
6. Adjust or fine-tune daylighting settings established during auto-configuration, and input light level data to complete configuration of open loop daylighting controls.
7. Set room mode for testing of Normal Hours (NH) and After Hours (AH) parameter settings.
8. Verify status of building level network devices.

2.10 RGBW LED LIGHTING CONTROLLERS

A. Acceptable Manufacturer:
1. ColorKinetics
   a. System: Iplayer3
2. Or approved Equal

B. Parts:
1. Provide all hardware components, lighting control devices, wiring devices and power packs as required for 100% complete system functionality.

2.11 PROGRAMMING, CONFIGURATION AND DOCUMENTATION SOFTWARE

A. PC-native application for optional programming of detailed technician-level parameter information for all Lighting Management products, including all parameters not accessible via BACnet and the handled IR configuration tool. Software must be capable of accessing room-level parameter information locally within the room when connected via the optional USB programming adapter, or globally for many segment networks simultaneously utilizing standard BACnet/IP communication.

B. Additional parameters exposed through this method include but are not limited to:

1. Occupancy sensor detection LED disable for performance and other aesthetic spaces where blinking LEDs present a distraction.
2. Six occupancy sensor action behaviors for each controlled load, separately configurable for normal hours and after hours modes. Modes include: No Action, Follow Off Only, Follow On Only, Follow On and Off, Follow On Only with Override Time Delay, Follow Off Only with Blink Warn Grace Time, Follow On and Off with Blink Warn Grace Time.
3. Separate fade time adjustments per load for both normal and after hours from 0 - 4 hours.
4. Configurable occupancy sensor re-trigger grace period from 0 - 4 minutes separate for both normal hours and after hours.
5. Separate normal hours and after hours per-load button mode with modes including: Do nothing, on only, off only, on and off.
6. Load control polarity reversal so that on events turn loads off and vice versa.
7. Per-load DR (demand response) shed level in units of percent.
8. Load output pulse mode in increments of 1second.
9. Fade trip point for each load for normal hours and after hours that establishes the dimmer command level at which a switched load closes its relay to allow for staggered On of switched loads in response to a dimmer.
10. Generation of reports at the whole file, partial file, or room level. Reports include but are not limited to:
    a. Device list report: All devices in a project listed by type.
    b. Load binding report: All load controller bindings showing interaction with sensors, switches, and daylighting.
    c. Room summary report: Device manifest for each room, aggregated by common BOM, showing basic sequence of operations.
    d. Device parameter report: Per-room lists of all configured parameters accessible via hand held IR programmer for use with O&M documentation.
    e. Scene report: All project scene pattern values not left at defaults (i.e. 1 = all loads 100%, 2 = all loads 75%, 3 = all loads 50%, 4 = all loads 25%, 5-16 = same as scene 1).
    f. Occupancy sensor report: Basic settings including time delay and sensitivity(ies) for all occupancy sensors.

PART 3 EXECUTION

3.1 PRE-INSTALLATION MEETING

A. A factory authorized manufacturer's representative shall provide the electrical contractor a functional overview of the lighting control system prior to installation. The contractor shall schedule the pre-installation site visit after receipt of approved submittals to review the following:
1. Confirm the location and mounting of all digital devices, with special attention to placement of occupancy and daylighting sensors.
2. Review the specifications for low voltage control wiring and termination.
3. Discuss the functionality and configuration of all products, including sequences of operation, per design requirements.
4. Discuss requirements for integration with other trades.

3.2 CONTRACTOR INSTALLATION AND SERVICES

A. Contractor to install all devices and wiring in a professional manner. All line voltage connections to be tagged to indicate circuit and switched legs.

B. Contractor to install all room/area devices using manufacturer's factory-tested Cat 5e cable with pre-terminated RJ-45 connectors. If pre-terminated cable is not used for room/area wiring, the contractor is responsible for testing each field-terminated cable following installation, and shall supply the lighting controls manufactuerer with test results.

C. Install the work of this Section in accordance with manufacturer's printed instructions unless otherwise indicated. Before start up, contractor shall test all devices to ensure proper communication.

D. Calibrate all LED color changing lighting controllers and lighting control devices after installation. Provide lighting show settings in controller to the owner's satisfaction. Provide all lighting control software as required to make LED color changing control systems 100% complete and operational.

E. Calibrate all sensor time delays and sensitivity to guarantee proper detection of occupants and energy savings.
   1. Adjust time delay so that controlled area remains lighted while occupied.
   2. Provide written or computer-generated documentation on the configuration of the system including room by room description including:
      a. Sensor parameters, time delays, sensitivities, and daylighting setpoints.
      b. Sequence of operation, (e.g. manual ON, Auto OFF. etc.)
      c. Load Parameters (e.g. blink warning, etc.)
   3. Post start-up tuning – After 30 days from occupancy contractor shall adjust sensor time delays and sensitivities to meet the Owner's requirements. Provide a detailed report to the Architect / Owner of post start-up activity.

3.3 FACTORY SERVICES

A. Upon completion of the installation, the manufacturer's factory authorized representative shall start up and verify a complete fully functional system.

B. Upon completion of the system start up, the factory-authorized technician shall provide the proper training to the owner's personnel on the adjustment and maintenance of the system.

C. Upon completion of the RGBW LED lighting and RGBW controller installation, the lighting control manufacturer's factory authorized representative shall start up and verify complete fully functional system. System shall be setup with no less than 10 color shows installed in controller as coordinated with owner in field.

D. Upon completion of the RGBW LED lighting and RGBW controller system start up, the factory-authorized technician shall provide the proper training to the owner's personnel on the adjustment and maintenance of the system.

END OF SECTION 26 0923

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SECTION 26 2100 - LOW-VOLTAGE ELECTRICAL SERVICE ENTRANCE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrical service requirements.

1.2 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Materials and installation requirements for cast-in-place concrete equipment pads.

B. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables.

C. Section 26 0526 - Grounding and Bonding for Electrical Systems.

D. Section 26 0529 - Hangers and Supports for Electrical Systems.

E. Section 26 0533.13 - Conduit for Electrical Systems.

F. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

G. Section 26 2416 - Panelboards: Service entrance equipment.

H. Section 26 2816.16 - Enclosed Switches: Service entrance equipment.

I. Section 26 3213 - Engine Generators: Emergency/standby power systems for interconnection with normal utility electrical supply.

J. Section 26 3600 - Transfer Switches: Service entrance equipment.

K. Section 26 4300 - Surge Protective Devices: Service entrance surge protective devices.

L. Section 31 2316.13 - Trenching: Excavating, bedding, and backfilling.

1.3 DEFINITIONS

A. Service Point: The point of connection between the facilities of the serving utility and the premises wiring as defined in NFPA 70, and as designated by the Utility Company.

1.4 REFERENCE STANDARDS

A. IEEE C2 - National Electrical Safety Code; 2017.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.5 ADMINISTRATIVE REQUIREMENTS

A. No later than two weeks following date of the Agreement, notify Utility Company of anticipated date of service.

B. Coordination:
1. Verify the following with Utility Company representative:
a. Utility Company requirements, including division of responsibility.
b. Exact location and details of utility point of connection.
c. Utility easement requirements.
d. Utility Company charges associated with providing service.
2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for electrical service and associated equipment.
3. Coordinate arrangement of service entrance equipment with the dimensions and clearance requirements of the actual equipment to be installed.
4. Coordinate the work with other installers to provide communication lines required for Utility Company meters.
5. Notify DEDC, LLC of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

C. Arrange for Utility Company to provide temporary and permanent electrical service. Prepare and submit documentation required by Utility Company.

D. Utility Company charges associated with providing temporary and permanent service to be paid by Contractor..

E. Preinstallation Meeting: Convene one month prior to commencing work of this section to review service requirements and details with Utility Company representative.

F. Scheduling:
1. Where work of this section involves interruption of existing electrical service, arrange service interruption with Owner.
2. Arrange for inspections necessary to obtain Utility Company approval of installation.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product. Include ratings, configurations, standard wiring diagrams, outline and support point dimensions, finishes, weights, service condition requirements, and installed features.

C. Shop Drawings: Include dimensioned plan views and sections indicating locations and arrangement of Utility Company and service entrance equipment, metering provisions, required clearances, and proposed service routing.
1. Obtain Utility company approval of shop drawings prior to submittal.

D. Drawings prepared by Utility Company.

E. Project Record Documents: Record actual locations of equipment and installed service routing.

1.7 QUALITY ASSURANCE

A. Comply with the following:
1. IEEE C2 (National Electrical Safety Code).
2. NFPA 70 (National Electrical Code).
3. The requirements of the Utility Company.
4. The requirements of the local authorities having jurisdiction.

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

B. Store products indoors in a clean, dry space having a uniform temperature to prevent condensation (including outdoor rated products which are not weatherproof until completely and properly installed). Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle products carefully to avoid damage to internal components, enclosure, and finish.

PART 2 PRODUCTS

2.1 ELECTRICAL SERVICE REQUIREMENTS

A. Provide new electrical service consisting of all required conduits, conductors, equipment, metering provisions, supports, accessories, etc. as necessary for connection between Utility Company point of supply and service entrance equipment.

B. Electrical Service Characteristics: As indicated on drawings.

C. Utility Company: MET-ED.

D. Division of Responsibility: As indicated on drawings.

E. Products Furnished by Contractor: Comply with Utility Company requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that ratings and configurations of service entrance equipment are consistent with the indicated requirements.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Verify and mark locations of existing underground utilities.

3.3 INSTALLATION

A. Install products in accordance with manufacturer's instructions and Utility Company requirements.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances and required maintenance access.

D. Provide required trenching and backfilling in accordance with Section 31 2316.13.

E. Construct cast-in-place concrete pads for utility equipment in accordance with Utility Company requirements and Section 03 3000.

F. Provide required support and attachment components in accordance with Section 26 0529.

G. Provide grounding and bonding for service entrance equipment in accordance with Section 26 0526.

H. Identify service entrance equipment, including main service disconnect(s) in accordance with Section 26 0553.

3.4 PROTECTION

A. Protect installed equipment from subsequent construction operations.

END OF SECTION 26 2100

SECTION 26 2200 - LOW-VOLTAGE TRANSFORMERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. General purpose transformers.

B. K-factor transformers rated for nonlinear loads.

C. Buck-boost transformers.

D. Shielded transformers.

E. Small power centers.

1.2 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 26 0526 - Grounding and Bonding for Electrical Systems.

C. Section 26 0529 - Hangers and Supports for Electrical Systems.

D. Section 26 0533.13 - Conduit for Electrical Systems: Flexible conduit connections.

E. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.3 REFERENCE STANDARDS

A. 10 CFR 431, Subpart K - Energy Efficiency Program for Certain Commercial and Industrial Equipment - Distribution Transformers; Current Edition.

B. IEEE C57.94 - IEEE Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type Distribution and Power Transformers; 2015.

C. IEEE C57.96 - IEEE Standard Guide for Loading Dry-Type Distribution and Power Transformers; 2013.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

E. NECA 409 - Standard for Installing and Maintaining Dry-Type Transformers; 2015.

F. NEMA ST 20 - Dry-Type Transformers for General Applications; 2014.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 506 - Standard for Specialty Transformers; Current Edition, Including All Revisions.

I. UL 1561 - Standard for Dry-Type General Purpose and Power Transformers; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide outline and support point dimensions of enclosures and accessories, unit weight, voltage, kVA, and impedance ratings and characteristics, tap configurations, insulation system type, and rated temperature rise.

C. Test Reports: Indicate loss data, efficiency at 25, 50, 75 and 100 percent rated load, and sound level.

D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

E. Project Record Documents: Record actual locations of transformers.

1.5 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to transformer internal components, enclosure, and finish.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Eaton Electrical/Cutler-Hammer: www.eatonelectrical.com.

B. GE Industrial: www.geindustrial.com.

C. Square D: www.squared.com.

D. Substitutions: See Section 01 6000 - Product Requirements.

2.2 TRANSFORMERS - GENERAL REQUIREMENTS

A. Description: Factory-assembled, dry type transformers for 60 Hz operation designed and manufactured in accordance with NEMA ST 20 and listed, classified, and labeled as suitable for the purpose intended.

B. Unless noted otherwise, transformer ratings indicated are for continuous loading according to IEEE C57.96 under the following service conditions:
   1. Altitude: Less than 3,300 feet.
   2. Ambient Temperature:
      a. Greater than 10 kVA: Not exceeding 104 degrees F.
      b. Less than 10 kVA: Not exceeding 77 degrees F.

C. Core: High grade, non-aging silicon steel with high magnetic permeability and low hysteresis and eddy current losses. Keep magnetic flux densities substantially below saturation point, even at 10 percent primary overvoltage. Tightly clamp core laminations to prevent plate movement and maintain consistent pressure throughout core length.

D. Impregnate core and coil assembly with non-hydroscopic thermo-setting varnish to effectively seal out moisture and other contaminants.

E. Basic Impulse Level: 10 kV.

F. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.

G. Isolate core and coil from enclosure using vibration-absorbing mounts.

H. Nameplate: Include transformer connection data, ratings, wiring diagrams, and overload capacity based on rated winding temperature rise.

2.3 GENERAL PURPOSE TRANSFORMERS

A. Description: Self-cooled, two winding transformers listed and labeled as complying with UL 506 or UL 1561; ratings as indicated on the drawings.

B. Insulation System and Allowable Average Winding Temperature Rise:
   1. Less than 15 kVA: Class 180 degrees C insulation system with 115 degrees C average winding temperature rise.
   2. 15 kVA and Larger: Class 220 degrees C insulation system with 150 degrees C average winding temperature rise.

C. Coil Conductors: Continuous aluminum windings with terminations brazed or welded.

D. Winding Taps:
   1. Less than 3 kVA: None.
   2. 3 kVA through 15 kVA: Two 5 percent full capacity primary taps below rated voltage.
   3. 15 kVA through 300 kVA: Two 2.5 percent full capacity primary taps above and four 2.5 percent full capacity primary taps below rated voltage.
   4. 500 kVA and Larger: Two 2.5 percent full capacity primary taps above and two 2.5 percent full capacity primary taps below rated voltage.

E. Energy Efficiency: Comply with 10 CFR 431, Subpart K.

F. Energy Efficiency: Standard efficiency complying with NEMA TP 1.

G. Sound Levels: Standard sound levels complying with NEMA ST 20

H. Mounting Provisions:

1. Less than 15 kVA: Suitable for wall mounting.
2. 15 kVA through 75 kVA: Suitable for wall, floor, or trapeze mounting.
3. Larger than 75 kVA: Suitable for floor mounting.

I. Transformer Enclosure: Comply with NEMA ST 20.
1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
2. Construction: Steel.
   a. Less than 15 kVA: Totally enclosed, non-ventilated.
   b. 15 kVA and Larger: Ventilated.
3. Finish: Manufacturer's standard grey, suitable for outdoor installations.
4. Provide lifting eyes or brackets.

J. Primary Voltage: 208 volts, 3 phase.

K. Secondary Voltage: 480/277 volts, 3 phase.

L. Mounting:
1. Larger than 75 kVA: Suitable for floor mounting.

M. Energy Efficient Per NEMA TP-1

PART 3 EXECUTION

3.1 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install transformers in accordance with NECA 409 and IEEE C57.94.

D. Use flexible conduit, under the provisions of Section 26 0533.13, 2 feet minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.

E. Arrange equipment to provide minimum clearances as specified on transformer nameplate and in accordance with manufacturer's instructions and NFPA 70.

F. Install transformers plumb and level.

G. Transformer Support:
1. Provide required support and attachment in accordance with Section 26 0529, where not furnished by transformer manufacturer.
2. Use integral transformer flanges, accessory brackets furnished by manufacturer, or field-fabricated supports to support wall-mounted transformers.
3. Unless otherwise indicated, mount floor-mounted transformers on properly sized 3 inch high concrete pad constructed in accordance with Section 03 3000.
4. Use trapeze hangers assembled from threaded rods and metal channel (strut) to support suspended transformers. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

H. Set transformers plumb and level.

I. Use flexible conduit, under the provisions of Section 26 0534, 2 feet minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.

J. Mount floor-mounted transformers on vibration isolating pads suitable for isolating the transformer noise from the building structure.

K. Provide grounding and bonding in accordance with Section 26 0526.

L. Remove shipping braces and adjust bolts that attach the core and coil mounting bracket to the enclosure according to manufacturer's recommendations in order to reduce audible noise transmission.

M. Where not factory-installed, install lugs sized as required for termination of conductors as indicated.

N. Install transformer identification nameplate in accordance with Section 26 0553.

3.2 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA STD ATS, except Section 4.

C. Perform inspections and tests listed in NETA STD ATS, Section 7.2.1.1. In addition to the basic requirements of Section 7.2, include the following:
1. Perform turns ratio tests at all tap positions.
2. Verification that as-left tap connections are as specified.
3. Perform excitation-current tests on each phase.
4. Measure the resistance of each winding at each tap connection.
5. Overpotential test on all high- and low-voltage windings-to-ground.

3.3 ADJUSTING

A. Measure primary and secondary voltages and make appropriate tap adjustments.

B. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

END OF SECTION 26 2200

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SECTION 26 2416 - PANELBOARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Power distribution panelboards.

B. Lighting and appliance panelboards.

C. Overcurrent protective devices for panelboards.

1.2 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 26 0526 - Grounding and Bonding for Electrical Systems.

C. Section 26 0529 - Hangers and Supports for Electrical Systems.

D. Section 26 0548 - Vibration and Seismic Controls for Electrical Systems.
1. Includes requirements for the seismic qualification of equipment specified in this section.

E. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

F. Section 26 2813 - Fuses: Fuses for fusible switches and spare fuse cabinets.

1.3 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e (Amended 2017).

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2015.

D. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

E. NEMA PB 1 - Panelboards; 2011.

F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; 2013.

G. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

K. UL 67 - Panelboards; Current Edition, Including All Revisions.

L. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

M. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

N. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

O. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.

P. UL 1699 - Arc-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
4. Notify DEDC, LLC of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.

C. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
1. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
2. Include documentation of listed series ratings upon request.
3. Identify mounting conditions required for equipment seismic qualification.

D. Manufacturer's equipment seismic qualification certification.

E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

1.8 FIELD CONDITIONS

A. Maintain ambient temperature within the following limits during and after installation of panelboards:
1. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Eaton Corporation: www.eaton.com/#sle.

B. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.

C. Substitutions: See Section 01 6000 - Product Requirements.

D. Source Limitations: Furnish panelboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.2 PANELBOARDS - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Seismic Qualification: Provide panelboards and associated components suitable for application under the seismic design criteria specified in Section 26 0548 where required. Include certification of compliance with submittals.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
1. Altitude: Less than 6,600 feet.
2. Ambient Temperature:
a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

D. Short Circuit Current Rating:
   1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
   2. Listed series ratings are acceptable, except where not permitted by motor contribution according to NFPA 70.
   3. Label equipment utilizing series ratings as required by NFPA 70.

E. Panelboards Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.

F. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

G. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

H. Bussing: Sized in accordance with UL 67 temperature rise requirements.
   1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
   2. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

I. Conductor Terminations: Suitable for use with the conductors to be installed.

J. Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1.
      b. Outdoor Locations: Type 3R.
   2. Boxes: Galvanized steel unless otherwise indicated.
      a. Provide wiring gutters sized to accommodate the conductors to be installed.
      b. Provide painted steel boxes for surface-mounted panelboards where indicated, finish to match fronts.
   3. Fronts:
      a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
      b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
      c. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.
   4. Lockable Doors: All locks keyed alike unless otherwise indicated.

K. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

L. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.
   1. Where electronic circuit breakers equipped with integral ground fault protection are used, provide separate neutral current sensor where applicable.

M. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.

N. Load centers are not acceptable.

2.3 OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers:
1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
2. Interrupting Capacity:
   a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated.
   b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
   c. Series Rated Systems: Provide circuit breakers listed in combination with upstream devices to provide interrupting rating not less than the short circuit current rating indicated.
3. Conductor Terminations:
   a. Provide mechanical lugs unless otherwise indicated.
   b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
   a. Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger.
   b. Provide interchangeable trip units where indicated.
5. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
   a. Provide the following field-adjustable trip response settings:
      1) Long time pickup, adjustable by replacing interchangeable trip unit or by setting dial.
      2) Long time delay.
      3) Short time pickup and delay.
      4) Instantaneous pickup.
6. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
7. Provide the following circuit breaker types where indicated:
   a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
   b. Ground Fault Equipment Protection Circuit Breakers: Designed to trip at 30 mA for protection of equipment.
   c. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Combination type listed as complying with UL 1699.
   d. 100 Percent Rated Circuit Breakers: Listed for application within the panelboard where installed at 100 percent of the continuous current rating.
8. Do not use tandem circuit breakers.
9. Do not use handle ties in lieu of multi-pole circuit breakers.
10. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.
11. Provide the following features and accessories where indicated or where required to complete installation:
    a. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
    b. Handle Pad-Lock Provision: For locking circuit breaker handle in OFF position.

2.4 SOURCE QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Factory test panelboards according to NEMA PB 1.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive panelboards.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.

D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

E. Provide required support and attachment in accordance with Section 26 0529.

F. Provide required seismic controls in accordance with Section 26 0548.

G. Install panelboards plumb.

H. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.

I. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.

J. Mount floor-mounted power distribution panelboards on properly sized 3 inch high concrete pad constructed in accordance with Section 03 3000.

K. Provide grounding and bonding in accordance with Section 26 0526.

L. Install all field-installed branch devices, components, and accessories.

M. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

N. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.

O. Set field-adjustable ground fault protection pickup and time delay settings as indicated.

P. Install panelboards in accordance with NEMA PB 1.1 and NECA 1.

Q. Install panelboards plumb. Install recessed panelboards flush with wall finishes.

R. Height: 6 feet to top of panelboard; install panelboards taller than 6 feet with bottom no more than 4 inches above floor.

S. Provide filler plates to cover unused spaces in panelboards.

T. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads where indicated. Also provide for the following:
1. Fire detection and alarm circuits.
2. Communications equipment circuits.
3. Intrusion detection and access control system circuits.
4. Video surveillance system circuits.

U. Identify panelboards in accordance with Section 26 0553.

V. Provide computer-generated circuit directory for each lighting and appliance panelboard and each power distribution panelboard provided with a door, clearly and specifically indicating the loads served. Identify spares and spaces.

W. Provide identification nameplate for each panelboard in accordance with Section 26 0553.

X. Provide arc flash warning labels in accordance with NFPA 70.

Y. Provide spare conduits out of each recessed panelboard to an accessible location above ceiling. Identify each as SPARE.

Z. Ground and bond panelboard enclosure according to Section 26 0526.

3.3 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Perform field inspection and testing in accordance with Section 01 4000.

C. Inspect and test in accordance with NETA ATS, except Section 4.

D. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than 225 amperes. Tests listed as optional are not required.

E. Test GFCI circuit breakers to verify proper operation.

F. Test AFCI circuit breakers to verify proper operation.

G. Test shunt trips to verify proper operation.

H. Correct deficiencies and replace damaged or defective panelboards or associated components.

I. Perform inspections and tests listed in NETA STD ATS, Section 7.5 for switches, Section 7.6 for circuit breakers.

3.4 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of panelboard fronts.

C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

3.5 CLEANING

A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION 26 2416

SECTION 26 2416.23 - PANELBOARDS - SCHNEIDER ELECTRIC SQUARE D I-LINE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Circuit breaker power distribution panelboards.

B. Circuit breaker combination power distribution/lighting panelboards.

1.2 Related Requirements

A. Section 26 0160.13 - Maintenance Services for Electrical Distribution Equipment - Schneider Electric EcoCare.

B. Section 26 0160.23 - Digital Modeling and Monitoring Services - Schneider Electric Digital Twin.

C. Section 26 0573.10 - Power System Studies - Schneider Electric.

D. Section 26 0913.83 - Condition Monitoring Services - Schneider Electric Square D EcoStruxure Asset Advisor.

1.3 Reference Standards

A. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2011.

B. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

C. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e (Amended 2017).

D. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. ICC-ES AC156 - Acceptance Criteria for Seismic Certification by Shake-Table Testing of Nonstructural Components; 2010, with Editorial Revision (2015).

F. ISO 9001 - Quality management systems -- Requirements; 2015.

G. ISO 14001 - Environmental Management Systems — Requirements with Guidance for Use; 2015, with Amendment (2024).

H. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

I. NEMA PB 1 - Panelboards; 2011.

J. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; 2013.

K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

L. NFPA 70E - Standard for Electrical Safety in the Workplace; 2017.

M. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

N. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

O. UL 67 - Panelboards; Current Edition, Including All Revisions.

P. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

Q. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.

1.4 Administrative Requirements

A. Digital Model Support:
1. Contractor to provide required support for digital first/digital continuity approach employed for all project stages from design through commissioning to operation and maintenance.
2. Electrical system design and analysis software was used to model, design, and analyze facility electrical power network. Digitized network model will be made available to Contractor to enable end-to-end life cycle management of various project assets.
   a. Basis of Design: ETAP by Operation Technology, Inc: www.etap.com/#sle.
3. Alternate digital tools proposed must be fully compatible with digitized network operational model provided, with ability to import and integrate design project file and libraries supplied by specifier, and upgradeable to digital twin to facilitate integrated and unified model from design and analysis to operation and maintenance.
4. Resulting digital twin technologies will help predict outcomes of operation and maintenance activities with model-driven applications for predictive simulation, operator training simulator/simulation before operation integration with electrical power management and control or SCADA software.
5. See Sections 26 0160.23, 26 0573.10, and 26 0913.83 for additional requirements.

1.5 Submittals

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Provide sufficient information to determine compliance with Contract Documents. Identify submittal data with specific equipment tags and/or service descriptions to which they pertain. Identify specific model numbers, options, and features of equipment proposed.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, surge protective devices, components, and accessories.

D. Seismic Qualification Certification:
1. Certificate of compliance.
2. Dimensioned equipment outline drawings identifying center of gravity and mounting/anchoring provisions.

3. Details and installation requirements of equipment anchorage devices on which certification is based.

E. Manufacturer's qualification statement.

F. Specimen Warranty: Statement of standard warranty.

G. Executed warranty.

1.6 Quality Assurance

A. Manufacturer Qualifications:
1. Firm engaged in manufacture of specified products of types and sizes required, and whose products have been in satisfactory use in similar service for minimum of 50 years.
2. Certified in accordance with ISO 9001 with applicable quality assurance system regularly reviewed and audited by third-party registrar. Develop and control manufacturing, inspection, and testing procedures under guidelines of quality assurance system.
3. Service, repair, and technical support services available 24 hours per day, 7 days per week from manufacturer or their representative.
4. Certified in accordance with ISO 14001, with product environmental profiles (PEPs) for specified products.

1.7 Delivery, Storage, And Handling

A. See Section 01 7419 - Construction Waste Management and Disposal for packaging waste requirements.

B. See Section 01 7419 - Construction Waste Management and Disposal for packaging waste requirements.

C. Prior to delivery to project site, verify suitable storage space is available to store materials in well-ventilated area protected from weather, moisture, soiling, extreme temperatures, humidity, and corrosive atmospheres.

D. Protect materials during delivery and storage and maintain within manufacturer's written storage requirements. At minimum, store indoors in clean, dry space with uniform temperature to prevent condensation and protect electronics from potential damage from electrical and magnetic energy.

E. Deliver materials to project site in supplier's or manufacturer's original wrappings and containers, labeled with supplier's or manufacturer's name, material or product brand name, and equipment tag number or service name as identified in Contract Documents.

F. Inspect products and report concealed damage or violation of delivery, storage, and handling requirements to Engineer.

1.8 Field Conditions

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.9 Warranty

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide manufacturer warranty for defects in material and workmanship for 12 months from date of commissioning or 18 months from date of shipment, whichever comes first. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.1 Manufacturers

A. Schneider Electric; Square D I-Line Panelboard and I-Line Combo Panelboard; www.se.com/#sle.

B. Substitutions: See Section 01 6000 - Product Requirements.

C. Source Limitations: Furnish products produced by same manufacturer as other electrical distribution equipment for project and obtained from single supplier.

2.2 Panelboards - General Requirements

A. Comply with NEMA PB 1; listed and labeled as complying with UL 67.

B. Seismic Qualification:
1. Provide independent third-party testing for compliance with ICC (IBC)/ASCE 7, certifying that equipment will remain operable following design level earthquake.
2. Perform shake table testing in accordance with ICC-ES AC156, using importance factor (Ip) of 1.5.

C. Short Circuit Current Rating: Where not specified, provide panelboards with listed short circuit current rating as determined by short-circuit study.
1. Listed circuit breaker/circuit breaker and fuse/circuit breaker combinations for series-connected interrupting ratings are acceptable; label equipment utilizing series ratings in accordance with NFPA 70.

D. Provide panelboards marked for use as service equipment where required for application.

E. Markings and Labeling:
1. Provide identification and warning labels/nameplates exterior to equipment resistant to weather, UV, and intended installation environment.
2. Provide engraved nameplate identifying project-specific equipment tag and service description.
3. Provide warning labels/nameplates complying with ANSI Z535.4 at access locations to advise personnel of possible hazards in accordance with listing, NFPA 70, NFPA 70E, and other applicable standards.
4. Provide nameplates containing system information and catalog number or factory order number.
5. Display interior wiring diagram, neutral wiring diagram, and short circuit current rating on interior or in booklet format.

F. Surge Protective Device (SPD):
1. See Section 26 4313 for additional information.
2. Factory installed, integrated within panelboard.
3. Listed as complying with UL 1449.
4. Surge Current Rating:
   a. Service Entrance Locations: Not less than 240 kA per phase.

5. Provide surge counter, visible display, and circuit breaker disconnect.
6. Connect to each phase bus; locate close to main incoming lugs or main circuit breaker.
7. Products:
    a. Schneider Electric SurgeLogic IMA series.
    b. Substitutions: See Section 01 6000 - Product Requirements.

2.3 Circuit Breaker Panelboards

A. Circuit Breaker Combination Power Distribution/Lighting Panelboards:
1. Basis of Design: Schneider Electric; Square D I-Line Combo Panelboard; www.se.com/#sle.
2. Interiors:
    a. Maximum voltage ratings of 600 VAC and 250 VDC.
    b. Continuous main current ratings up to 1,200 A for main lugs or main circuit breaker.
    c. Short circuit current ratings up to 200 kA.
    d. Horizontally Oriented Power Distribution Section: Provide three flat bus bars stacked and aligned vertically with glass reinforced polyester insulators laminated between phases to provide support and phase isolation for entire bus length.
    e. Lighting Sections:
        1) Provide one or more continuous bus bar(s) per phase.
        2) 240 VAC and 48 VDC Maximum Lighting Sections: Provide branch circuit connectors suitable for both plug-on and bolt-on branch circuit breakers.
        3) 480Y/277 VAC and 600Y/347 VAC Maximum Lighting Sections: Provide branch circuit connectors suitable for bolt-on branch circuit breakers.
        4) Insulate current carrying parts from ground and phase-to-phase using high dielectric strength thermoplastic.
    f. Bussing:
        1) Provide fully rated bussing up to 800 A for copper and up to 400 A for aluminum; provide tapered bussing for higher ratings through 1,200 A.
        2) Determine bus current ratings in accordance with UL 67 heat-rise tests.
        3) Provide sequentially phased branch distribution.
        4) Bus Material: Plated copper.
    g. Neutral:
        1) Provide solid neutral with full-capacity bonding strap for service entrance applications.
    h. Ground:
        1) Provide solidly bonded copper equipment ground bar.
        2) Provide additional copper isolated/insulated ground bar where indicated.
    i. Provide interior leveling provisions for flush mounting applications.
    j. Provide interior trim of dead-front construction to shield user from energized parts.
    k. Main Lugs and Main Circuit Breaker Interiors: Field convertible for top or bottom incoming feed.
3. Products:
    a. Schneider Electric Square D I-Line Combo Panelboard.
    b. Substitutions: See Section 01 6000 - Product Requirements.

B. Enclosures:
1. Comply with UL 50 and UL 50E.
2. Key all lock assemblies alike.
3. Type 1 Enclosures:

a. Boxes:
   1) Hot zinc dipped galvanized steel; unpainted galvannealed steel is not acceptable.
   2) Provide removable blank end walls and interior mounting studs; provide interior support bracket for interior installation.
   3) Standard Enclosure Widths: 26 inches, 32 inches, 42 inches, and 44 inches as required by application.
b. Trim Fronts:
   1) Finish: ANSI 49 gray enamel paint electrodeposited onto cleaned, phosphatized steel.
   2) Provide four-piece fronts, surface or flush mount as indicated.
      a) Doors:
         (1) Provide rounded corners and edges, free of burrs.
         (2) Mount clear plastic directory cardholder on inside of door.
         (3) Provide cylindrical tumbler-type lock or sliding vault locks with 3-point latching.

C. Molded Case Circuit Breakers:
1. Description: Quick-make, quick-break circuit breakers with over-center, trip-free toggle mechanism; ratings, configurations, and features/accessories as indicated on drawings.
2. Comply with FS W-C-375; listed labeled as complying with UL 489.
3. Interrupting Capacity: As required to provide short circuit current rating indicated.
4. Multi-Pole Circuit Breakers: Provide common tripping for all poles.
5. Thermal Magnetic Circuit Breakers:
   a. Provide permanent trip unit with thermal and magnetic trip elements in each pole.
   b. Thermal Elements: True RMS-sensing, factory calibrated to operate in 104 degrees F ambient temperature.
6. Power Distribution Main and Branch Circuit Breakers:
   a. Group-Mounted Branch Circuit Breakers:
      1) Utilize jaw-type line side circuit breaker connections, without requiring additional external hardware.
      2) Hold circuit breakers in position with self-contained bracket secured to mounting pan by fasteners.
      3) Support mounting of circuit breakers of different frame sizes across from each other.
      4) Unless otherwise indicated, equip unused spaces for future devices, including connectors and mounting hardware.
   b. Available nominal current ratings up to 1,200 A.
   c. Trip Units:
      1) Up to 400 A: Thermal magnetic.
      2) Above 400 A: Electronic trip.
   d. Electronic Trip Units:
      1) Basic Electronic Trip Units: Provide adjustable trip current.
      2) Where indicated on drawings, provide electronic trip units with field-adjustable long-time and instantaneous protection settings.
      3) Provide current transformers combining iron-core sensors for self-powered electronics and air-core, Rogowski coil sensors for measurement accuracy.
   e. Provide push-to-trip button for maintenance and testing purposes.
   f. Indicate rated ampacity on circuit breaker handle and faceplate.
   g. Circuit Breakers with Permanent Trip Units: Listed for reverse connection without restrictive line or load markings; suitable for mounting in any position.

h. Frame Sizes Above 125 A: Provide single magnetic trip adjustment on front of circuit breaker to simultaneously select desired trip level of all poles.
i. Provide escutcheon with international I/O markings in addition to standard ON/OFF markings.
j. Lugs:
1) Listed to accept solid or stranded copper and aluminum conductors.
2) Listed to accept 75 degree C rated wire.
3) Bolt lug body in place; snap-in designs are not acceptable.
k. Listed for use with the following accessories:
1) Shunt trip.
2) Undervoltage trip.
3) Ground fault shunt trip.
4) Auxiliary switch.
5) Alarm switch.
6) Mechanical lug kits.
7) Compression lug kits.
8) Handle Locking Provisions: For locking handle in ON or OFF position.
l. Products:
1) Schneider Electric; PowerPacT series.
2) Substitutions: See Section 01 6000 - Product Requirements.

D. Internal Intelligent Units; I-Line Enable:
1. Metering:
a. Mount within panelboard, bus-connected, without use of box extension.
b. Utilize power quality meter to provide power metering for mains.
c. Power Quality Meters:
1) Capable of monitoring for network management, energy cost allocation, power quality analysis, asset management, operational efficiency, and compliance reporting.
2) Products:
a) Schneider Electric; PowerLogic PM8244 Meter.
b) Substitutions: See Section 01 6000 - Product Requirements.
d. Support external data connection to monitoring software or application as stand-alone meter.
e. Support communication via Modbus RTU, Modbus TCP/IP, BACnet MS/TP, BACnet/IP, or HTTP/web access.

E. Electrical Power Management System Capabilities:
1. Provide communications connectivity and functionality to support electrical power management system (EPMS), including but not limited to:
a. Communications connectivity via Ethernet network and protocols of EPMS and related equipment, either through communications gateway or integral interface.
b. Compliance with recognized cybersecurity requirements.
c. Breaker aging modeling for electronic trip circuit breakers.
d. Remote EPMS capability for equipment configuration, electrical power monitoring, power quality monitoring, compliance, and correction; alarm monitoring with event log.
e. Continuous thermal monitoring capabilities, including alarming, notification, and visualization.
2. Provide factory-tested native software compatibility, including the following:
a. Capability for pre-engineered, interactive graphical display screens to view and analyze real-time device data.

b. Pre-mapping of registers to standard measurement names without need for additional configuration or internal device registers.
c. Automatic collection and logging of device data by EPMS software without additional configuration.

PART 3 EXECUTION

3.1 Examination

A. Examine equipment exterior and interior for damage, including but not limited to, structure, moisture, and mildew.

B. Examine for conditions detrimental to completion of work.

3.2 Installation

A. Install equipment in accordance with manufacturer's written instructions.

B. Install panelboards in accordance with NECA 1 and NEMA PB 1.1.

C. Maintain proper phasing for multi-wire branch circuits.

3.3 Field Quality Control

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Manufacturer Services: Provide services of manufacturer's field representative to perform functional testing, commissioning, and first parameter adjusting.
1. Include necessary material, equipment, labor, and technical supervision.
2. Replace damaged or malfunctioning equipment and report discrepancies or installation issues.

C. Inspect complete installation for physical damage, proper alignment, anchorage, and grounding.

D. Measure steady state load currents at each panelboard feeder; rearrange circuits in panelboard to balance phase loads within 20 percent of each other.

E. Inspect tightness of bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver in accordance with manufacturer's written specifications.

3.4 Protection

A. Protect installed panelboards from subsequent construction operations.

3.5 Maintenance

A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements relating to maintenance service.

B. See Section 26 0160.13 for additional information.

C. Provide to Owner, as alternate to base bid, separate contract for switchgear service plan for two years from date of Substantial Completion including, but not limited to, dedicated customer success management team, priority remote and on-site (within 100 miles of service location) expert support, discounted service rates, continuous monitoring and alarming, online training.

END OF SECTION 26 2416.23

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SECTION 26 2726 - WIRING DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wall switches.

B. Receptacles.

C. Wall plates.

1.2 RELATED REQUIREMENTS

A. Section 26 0533.16 - Boxes for Electrical Systems.

B. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.3 REFERENCE STANDARDS

A. FS W-C-596 - Connector, Electrical, Power, General Specification for; 2017h.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.

D. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2015).

E. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2016.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.

H. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.

I. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

J. UL 1310 - Class 2 Power Units; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.

4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
5. Notify DEDC, LLC of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

B. Sequencing:
1. Do not install wiring devices until final surface finishes and painting are complete.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

1.7 DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

B. Products: Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Arrow-Hart, a brand of Cooper Wiring Devices: www.cooperindustries.com

B. Leviton Manufacturing, Inc: www.leviton.com.

C. P & SNone - N/A.

D. Bryant

E. Hubbell

2.2 WIRING DEVICE APPLICATIONS

A. Provide wiring devices suitable for intended use and with ratings adequate for load served.

B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.

C. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.

D. Provide tamper resistant receptacles for receptacles installed in dwelling units.

E. Provide GFCI protection for receptacles installed within 6 feet of sinks.

F. Provide GFCI protection for receptacles installed in kitchens.

G. Provide GFCI protection for receptacles serving electric drinking fountains.

H. Unless noted otherwise, do not use combination switch/receptacle devices.

I. For flush floor service fittings, use tile rings for installations in tile floors.

J. For flush floor service fittings, use carpet flanges for installations in carpeted floors.

2.3 WIRING DEVICE FINISHES

A. Provide wiring device finishes as described below unless otherwise indicated.

B. Wiring Devices, Unless Otherwise Indicated: Gray withNone - N/A stainless steel wall plate.

C. Wiring Devices Installed in Wet or Damp Locations: Gray with specified weatherproof cover.

D. Wiring Devices Connected to Emergency Power: Redwith red metal faceplate.

2.4 ALL WIRING DEVICES

A. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

B. Finishes: As coordinated with architect.

2.5 WALL SWITCHES

A. Wall Switches: Extra Heavy Duty Industrial Series, AC only general-use snap switch, complying with NEMA WD 6 and WD 1.
   1. Body and Handle: Gray plastic with toggle handle.
   2. Ratings:
      a. Voltage: 120 volts, AC.
      b. Current: 20 amperes.

B. Switch Types: Single pole, 3-way, and 4-way.

2.6 RECEPTACLES

A. Manufacturers:
   1. Hubbell Incorporated: www.hubbell.com/#sle.
   2. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.
   3. Lutron Electronics Company, Inc; Designer Style: www.lutron.com/#sle.

4. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.
5. Substitutions: See Section 01 6000 - Product Requirements.

B. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498and where applicable FS W-C-596; types as indicated on the drawings.
1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
2. NEMA configurations specified are according to NEMA WD 6.

C. Convenience Receptacles:
1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.

D. GFCI Receptacles:
1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
   a. Provide test and reset buttons of same color as device.
2. Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
3. Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations.

E. USB Charging Devices:
1. USB Charging Devices - General Requirements: Listed as complying with UL 1310.
   a. Charging Capacity - Two-Port Devices: 2.1 A, minimum.
2. USB Charging/Tamper Resistant Receptacle Combination Devices: Two-port (Type A) USB charging device and receptacle, commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; rectangular decorator style.

F. Receptacles: Extra Heavy Duty Industrial Series, complying with NEMA WD 6 and WD 1.
1. Device Body: plastic.
2. Configuration: NEMA WD 6, type as specified and indicated.

G. Convenience Receptacles: Type 5-20R.

H. Single Convenience Receptacles.

I. Duplex Convenience Receptacles.

J. GFCI Receptacles: 5-20R Duplex Convenience receptacle with integral ground fault circuit interrupter to meet regulatory requirements.

2.7 WALL PLATES

A. Wall Plates: Comply with UL 514D.
1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
2. Size: Standard.
3. Screws: Metal with slotted heads finished to match wall plate finish.

B. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.

C. Weatherproof Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

D. Decorative Cover Plates: , Smooth stainless steel.

E. Surface Mounted Device Wall Plates: Stamped steel.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that wall openings are neatly cut and will be completely covered by wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

F. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Perform work in a neat and workmanlike manner in accordance with NECA 1, including mounting heights specified in that standard unless otherwise indicated.

C. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of wiring devices provided under this section.
   1. Mounting Heights: As indicated on the drawings.
   2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
   3. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
   4. Locate wall switches on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify DEDC, LLC to obtain direction prior to proceeding with work.
   5. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.

D. Install wiring devices in accordance with manufacturer's instructions.

E. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

F. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.

G. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.

H. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

I. Provide GFCI receptacles with integral GFCI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.

J. Install securely, in a neat and workmanlike manner, as specified in NECA 1.

K. Install wiring devices plumb and level with mounting yoke held rigidly in place.

L. Install wall switches with OFF position down.

M. Do not share neutral conductor on branch circuits utilizing wall dimmers.

N. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.

O. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

P. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

Q. Identify wiring devices in accordance with Section 26 0553.

R. Connect wiring device grounding terminal to outlet box with bonding jumper.

S. Install decorative plates on switch, receptacle, and blank outlets in finished areas.

T. Connect wiring devices by wrapping conductor around screw terminal.

U. Install galvanized steel cover plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted switches & outlets.

3.4 INTERFACE WITH OTHER PRODUCTS

A. Coordinate locations of outlet boxes provided under Section 26 0537 to obtain mounting heights specified.

B. Install wall switch 48 inches above finished floor.

C. Install convenience receptacle 18 inches above finished floor.

D. Install convenience receptacle 6 inches above counter.

E. Install telephone jack 18 inches above finished floor.

F. Install telephone jack for side-reach wall telephone to position top of telephone at 54 inches above finished floor.

G. Install telephone jack for forward-reach wall telephone to position top of telephone at 48 inches above finished floor.

3.5 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect each wiring device for damage and defects.

C. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.

D. Operate each wall switch with circuit energized and verify proper operation.

E. Test each receptacle to verify operation and proper polarity.

F. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.

G. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.6 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

3.7 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION 26 2726

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SECTION 26 2813 - FUSES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fuses.

1.2 REFERENCE STANDARDS

A. NEMA FU 1 - Low Voltage Cartridge Fuses; 2012.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. UL 248-1 - Low-Voltage Fuses - Part 1: General Requirements; Current Edition, Including All Revisions.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
1. Coordinate fuse clips furnished in equipment provided under other sections for compatibility with indicated fuses.
   a. Fusible Enclosed Switches: See Section 26 2816.16.
   b. Fusible Switches for Enclosed Motor Controllers: See Section 26 2913.
2. Coordinate fuse requirements according to manufacturer's recommendations and nameplate data for actual equipment to be installed.
3. Notify DEDC, LLC of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard data sheets including voltage and current ratings, interrupting ratings, time-current curves, and current limitation curves.

C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 6000 - Product Requirements, for additional provisions.
2. Extra Fuses: One set(s) of three for each type and size installed.
3. Fuse Pullers: One set(s) compatible with each type and size installed.

1.5 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Bussmann, a division of Eaton Corporation; _____: www.cooperindustries.com/#sle.

B. Substitutions: See Section 01 6000 - Product Requirements.

2.2 FUSES

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.

C. Provide fuses of the same type, rating, and manufacturer within the same switch.

D. Comply with UL 248-1.

E. Unless otherwise indicated, provide cartridge type fuses complying with NEMA FU 1, Class and ratings as indicated.

F. Voltage Rating: Suitable for circuit voltage.

G. Power Load Feeder Switches: Class RK1 (time delay).

H. Motor Load Feeder Switches: Class RK1 (time delay).

2.3 CLASS RK1 (TIME DELAY) FUSES

A. Manufacturers:
1. Bussman, Ferraz-Shawmut.
2. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.1 INSTALLATION

A. Do not install fuses until circuits are ready to be energized.

B. Install fuses with label oriented such that manufacturer, type, and size are easily read.

END OF SECTION 26 2813

SECTION 26 2816.16 - ENCLOSED SWITCHES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Enclosed safety switches.

B. Fusible switches.

C. Nonfusible switches.

1.2 RELATED REQUIREMENTS

A. Section 26 0526 - Grounding and Bonding for Electrical Systems.

B. Section 26 0529 - Hangers and Supports for Electrical Systems.

C. Section 26 0548 - Vibration and Seismic Controls for Electrical Systems.

D. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

E. Section 26 2813 - Fuses.

F. Section 26 2913 - Enclosed Controllers: Manual motor controllers.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

C. NEMA FU 1 - Low Voltage Cartridge Fuses; National Electrical Manufacturers Association; 2002 (R2007).

D. NEMA BS 31047 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013 (Reaffirmed 2023).

E. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

H. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

I. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
4. Notify DEDC, LLC of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.

C. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
1. Identify mounting conditions required for equipment seismic qualification.

D. Manufacturer's equipment seismic qualification certification.

E. Field Quality Control Test Reports.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

1.8 FIELD CONDITIONS

A. Maintain ambient temperature between -22 degrees F and 104 degrees F during and after installation of enclosed switches.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Eaton Corporation: www.eaton.com/#sle.

B. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.

C. Siemens: www.sea.siemens.com.

D. Substitutions: See Section 01 6000 - Product Requirements.

E. Source Limitations: Furnish enclosed switches and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.2 ENCLOSED SAFETY SWITCHES

A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Seismic Qualification: Provide enclosed safety switches suitable for application under the seismic design criteria specified in Section 26 0548 where required. Include certification of compliance with submittals.

D. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
1. Altitude: Less than 6,600 feet.
2. Ambient Temperature: Between -22 degrees F and 104 degrees F.

E. Horsepower Rating: Suitable for connected load.

F. Voltage Rating: Suitable for circuit voltage.

G. Short Circuit Current Rating:
1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

H. Provide with switch blade contact position that is visible when the cover is open.

I. Fuse Clips for Fusible Switches: As required to accept fuses indicated.
1. Where NEMA Class R fuses are installed, provide rejection feature to prevent installation of fuses other than Class R.

J. Conductor Terminations: Suitable for use with the conductors to be installed.

K. Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.

L. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.

M. Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.
1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
   a. Indoor Clean, Dry Locations: Type 1.
   b. Outdoor Locations: Type 3R.
2. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.

N. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

O. Heavy Duty Switches:
1. Comply with NEMA BS 31047.
2. Conductor Terminations:
   a. Provide mechanical lugs unless otherwise indicated.
   b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.
   a. Provide means for locking handle in the ON position where indicated.

2.3 COMPONENTS

A. Fusible Switch Assemblies: NEMA KS 1, Type HD enclosed load interrupter knife switch.
1. Externally operable handle interlocked to prevent opening front cover with switch in ON position.
2. Handle lockable in OFF position.
3. Fuse clips: Designed to accommodate NEMA FU1, Class R fuses. Provide rejection clips to reject all other than Class R fuses.
4. Fuse extenders where indicated on contract drawings.

B. Nonfusible Switch Assemblies: NEMA KS 1, Type HD enclosed load interrupter knife switch.
1. Externally operable handle interlocked to prevent opening front cover with switch in ON position.
2. Handle lockable in OFF position.
3. Electrical interlocks, break before switch opens and close after switch closes, where indicated on contract drawings.

C. Enclosures: NEMA KS 1.
1. Interior Dry Locations: Type 1.
2. Exterior Locations: Type 3R.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive enclosed safety switches.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required support and attachment in accordance with Section 26 0529.

E. Provide required seismic controls in accordance with Section 26 0548.

F. Install enclosed switches plumb.

G. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.

H. Provide grounding and bonding in accordance with Section 26 0526.

I. Provide fuses complying with Section 26 2813 for fusible switches as indicated or as required by equipment manufacturer's recommendations.

J. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

K. Identify enclosed switches in accordance with Section 26 0553.

L. Provide identification nameplate for each enclosed switch in accordance with Section 26 0553.

M. Provide arc flash warning labels in accordance with NFPA 70.

N. Install fuses in fusible disconnect switches.

O. Apply adhesive tag on inside door of each fused switch indicating NEMA fuse class and size installed.

3.3 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.

D. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

3.4 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.5 CLEANING

A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION 26 2816.16

SECTION 26 2913 - ENCLOSED CONTROLLERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Enclosed NEMA controllers for low-voltage (600 V and less) applications:
   1. Manual motor starters.
   2. Motor-starting switches without overload protection.

B. Overcurrent protective devices for motor controllers, including overload relays.

C. Control accessories:
   1. Auxiliary contacts.
   2. Pilot devices.
   3. Control and timing relays.
   4. Control power transformers.

1.2 RELATED REQUIREMENTS

A. Section 26 0526 - Grounding and Bonding for Electrical Systems.

B. Section 26 0529 - Hangers and Supports for Electrical Systems.

C. Section 26 0548 - Vibration and Seismic Controls for Electrical Systems.
   1. Includes requirements for the seismic qualification of equipment specified in this section.

1.3 REFERENCE STANDARDS

A. IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers; 2016.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

D. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2000, with Errata (2008).

E. NEMA IA 10039 - Control Circuit and Pilot Devices; 2025.

F. NEMA IA 10030 - Industrial Control and Systems: Enclosures; 2024.

G. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 60947-1 - Low-Voltage Switchgear and Controlgear - Part 1: General Rules; Current Edition, Including All Revisions.

J. UL 60947-4-1 - Low-Voltage Switchgear and Controlgear - Part 4-1: Contactors and Motor-starters - Electromechanical Contactors and Motor-starters; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
2. Coordinate the work to provide motor controllers and associated overload relays suitable for use with the actual motors to be installed.
3. Coordinate the work to provide controllers and associated wiring suitable for interface with control devices to be installed.
4. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
5. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
6. Notify DEDC, LLC of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for motor controllers, enclosures, overcurrent protective devices, and other installed components and accessories.
1. Include characteristic trip curves for each type and rating of overcurrent protective device upon request.

C. Shop Drawings: Indicate dimensions, voltage, controller sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
1. Identify mounting conditions required for equipment seismic qualification.

D. Manufacturer's equipment seismic qualification certification.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to internal components, enclosure, and finish.

1.8 FIELD CONDITIONS

A. Maintain field conditions within required service conditions during and after installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. ABB/GE: www.electrification.us.abb.com/#sle.

B. Eaton Corporation: www.eaton.com/#sle.

C. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.

D. Substitutions: See Section 01 6000 - Product Requirements.

E. Source Limitations: Furnish enclosed motor controllers and associated components produced by a single manufacturer and obtained from a single supplier.

2.2 ENCLOSED CONTROLLERS

A. Provide enclosed controller assemblies consisting of all required components, control power transformers, instrumentation and control wiring, accessories, etc. as necessary for a complete operating system.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Description: Enclosed controllers complying with NEMA ICS 2, and listed and labeled as complying with UL 60947-1 and UL 60947-4-1; ratings, configurations and features as indicated on the drawings.

D. Seismic Qualification: Provide controllers and associated components suitable for application under the seismic design criteria specified in Section 26 0548 where required. Include certification of compliance with submittals.

E. Service Conditions:
1. Provide controllers and associated components suitable for operation under the following service conditions without derating:
   a. Altitude:
      1) Class 1 Km Equipment (devices utilizing power semiconductors, e.g. variable frequency controllers): Less than 3,300 feet.
      2) Class 2 Km Equipment (electromagnetic and manual devices): Less than 6,600 feet.
   b. Ambient Temperature: Between 32 degrees F and 104 degrees F.
2. Provide controllers and associated components suitable for operation at indicated ratings under the service conditions at the installed location.

F. Short Circuit Current Rating:
1. Provide controllers with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

G. Conductor Terminations: Suitable for use with the conductors to be installed.

H. Enclosures:

1. Comply with NEMA IA 10030.
2. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
   a. Indoor Clean, Dry Locations: Type 1 or Type 12.
   b. Outdoor Locations: Type 3R or Type 4.
3. Finish: Manufacturer's standard unless otherwise indicated.

I. Instrument Transformers:
1. Comply with IEEE C57.13.
2. Select suitable ratio, burden, and accuracy as required for connected devices.
3. Current Transformers: Connect secondaries to shorting terminal blocks.
4. Potential Transformers: Include primary and secondary fuses with disconnecting means.

J. Manual Motor Starters:
1. Description: NEMA ICS 2, Class A manually-operated motor controllers with overload relay(s).
2. Configuration: Non-reversing unless otherwise indicated.
3. Fractional-Horsepower Manual Motor Starters:
   a. Furnish with toggle operator.
   b. Overload Relays: Bimetallic or melting alloy thermal type.
   c. Provide means for locking operator in the OFF position.
   d. Furnish Red ON indicating light where not within sight of equipment.
4. Integral-Horsepower Manual Motor Starters:
   a. Furnish with toggle or pushbutton operator.
   b. Overload Relays: Bimetallic or melting alloy thermal type.
   c. Provide means for locking operator in the OFF position.
   d. Furnish Red ON indicating light where not within sight of equipment.
   e. Provide auxiliary contact where indicated; normally open (NO) or normally closed (NC) as indicated or as required.

K. Motor-Starting Switches: Horsepower-rated switches without overload protection; toggle operator.

2.3 OVERCURRENT PROTECTIVE DEVICES

A. Overload Relays:
1. Provide overload relays and, where applicable, associated current elements/heaters, selected according to actual installed motor nameplate data, in accordance with manufacturer's recommendations and NFPA 70; include consideration for motor service factor and ambient temperature correction, where applicable.
2. Inverse-Time Trip Class Rating: Class 20 unless otherwise indicated or required.
3. Trip-free operation.
4. Visible trip indication.
5. Resettable.
   a. Employ manual reset unless otherwise indicated.
   b. Do not employ automatic reset with two-wire control.
6. Bimetallic Thermal Overload Relays:
   a. Interchangeable current elements/heaters.
   b. Adjustable trip; plus/minus 10 percent of nominal, minimum.
   c. Trip test function.

7. Melting Alloy Thermal Overload Relays:
   a. Interchangeable current elements/heaters.

2.4 CONTROL ACCESSORIES

A. Auxiliary Contacts:
   1. Comply with NEMA IA 10039.
   2. Provide number and type of contacts indicated or required to perform necessary functions, including holding (seal-in) circuit and interlocking, plus one normally open (NO) and one normally closed (NC) spare contact for each magnetic motor starter, minimum.

B. Pilot Devices:
   1. Comply with NEMA IA 10039; heavy-duty type.
   2. Pushbuttons: Unless otherwise indicated, provide momentary, non-illuminated type with flush button operator; normally open or normally closed as indicated or as required.
   3. Selector Switches: Unless otherwise indicated, provide maintained, non-illuminated type with knob operator; number of switch positions as indicated or as required.
   4. Indicating Lights: Push-to-test type unless otherwise indicated.
   5. Provide LED lamp source for indicating lights and illuminated devices.

C. Control and Timing Relays:
   1. Comply with NEMA IA 10039.
   2. Provide number and type of relays indicated or required to perform necessary functions.

D. Control Power Transformers:
   1. Size to accommodate burden of contactor coil(s) and all connected auxiliary devices, plus 100VA spare capacity.
   2. Include primary and secondary fuses.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that ratings of enclosed controllers are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive enclosed controllers.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install controllers in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required support and attachment in accordance with Section 26 0529.

E. Install enclosed controllers plumb and level.

F. Provide grounding and bonding in accordance with Section 26 0526.

G. Install all field-installed devices, components, and accessories.

H. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

I. Set field-adjustable controllers and associated components according to installed motor requirements, in accordance with manufacturer's recommendations and NFPA 70.

J. Set field-adjustable circuit breaker tripping function settings as indicated.

3.3 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Motor Starters: Perform inspections and tests listed in NETA ATS, Section 7.16.1.1. Tests listed as optional are not required.

D. Correct deficiencies and replace damaged or defective enclosed controllers or associated components.

3.4 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.5 CLEANING

A. Clean dirt and debris from controller enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

3.6 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. See Section 01 7900 - Demonstration and Training, for additional requirements.

3.7 PROTECTION

A. Protect installed enclosed controllers from subsequent construction operations.

END OF SECTION 26 2913

SECTION 26 3213 - ENGINE GENERATOR

PART 1 GENERAL

1.1 SUMMARY

A. This section includes the following items from a single supplier:
1. Engine Generator Set.
2. Enclosure
3. Custom sub-base fuel tank
4. Related Accessories as specified
   a. Related Requirements
      1) It is the intent of this specification to secure an engine-driven generator set that has been prototype tested, factory built, production-tested, and site-tested together with all accessories necessary for a complete installation as shown on the plans and drawings and specified herein.
      2) Any exceptions to the published specifications shall be subject to the approval of the engineer and submitted minimum 10 days prior to the closing of the bid with a line by line summary description of all the items of compliance, any items that have been are omitted or have been taken exception to, and a complete description of all deviations.
      3) It is the intent of this specification to secure a generator set system that has been tested during design verification, in production, and at the final job site. The generator set will be a commercial design and will be complete with all of the necessary accessories for complete installation as shown on the plans, drawings, and specifications herein. The equipment supplied shall meet the requirements of the National Electrical Code and applicable local codes and regulations.
      4) All equipment shall be new and of current production by an international, power system manufacturer of generators, transfer switches, and paralleling switchgear. The manufacturer shall be a supplier of a complete and coordinated system. There will be single-source responsibility for warranty, parts, and service through a factory-authorized representative with factory-trained technicians.

1.2 SUBMITTALS

A. Action Submittals
1. Product Data
2. The submittal shall include prototype test certification and specification sheets showing all standard and optional accessories to be supplied; schematic wiring diagrams, dimension drawings, and interconnection diagrams identifying by terminal number each required interconnection between the generator set, the transfer switch, and the remote annunciator panel if it is included elsewhere in these specifications.
3. Shop Drawings
   a. Informational Submittal
      1) Certificates

2) The generator set shall be listed to UL 2200 or submitted to an independent third party certification process to verify compliance as installed.
3) Test and Evaluation Reports
4) Manufacturer's Instruction
5) Source Quality Control Submittals
6) Field or Site Quality Control
7) Manufacturer's Report

b. Closeout Submittal
1) Maintenance Contracts
2) Operation And Maintenance Data
3) Warranty Documentation
4) Record Documentation

c. Maintenance Material Submittals

1.3 Quality Assurance

A. Regulatory Agency
1. The generator set shall conform to the requirements of the following codes and standards:
a. CSA C22.2, No. 14-M91 Industrial Control Equipment.
b. EN50082-2, Electromagnetic Compatibility-Generic Immunity Requirements, Part 2: Industrial.
c. EN55011, Limits and Methods of Measurement of Radio Interference Characteristics of Industrial, Scientific and Medical Equipment.
d. IEC8528 part 4, Control Systems for Generator Sets.
e. IEC Std 61000-2 and 61000-3 for susceptibility, 61000-6 radiated and conducted electromagnetic emissions.
f. IEEE446 Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications.
g. NFPA 70, National Electrical Code, Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702.
h. NFPA 110, Emergency and Standby Power Systems. The generator set shall meet all requirements for Level 1 systems. Level 1 prototype tests required by this standard shall have been performed on a complete and functional unit. Component level type tests will not substitute for this requirement.
1) Qualifications
a) The equipment shall be produced by a manufacturer who is ISO 9001 certified for the design, development, production and service of its complete product line.
(1) The power system shall be produced by a manufacturer who has produced this type of equipment for a period of at least 10 years and who maintains a service organization available twenty-four hours a day throughout the year.
(2) Manufacturers
(3) The power system shall be furnished by a single manufacturer who shall be responsible for the design, coordination, and testing of the complete system. The entire system shall be installed as shown on the plans, drawings, and specifications herein.
(4) Suppliers
(5) Testing Agencies
(6) Licensed Professional

(7) Preconstruction testing

1.4 Field or Site Conditions

A. Ambient Conditions
1. Engine- generator set shall operate in the following conditions without any damage to the unit or its loads.
   a. Ambient Temperature: 77 °F
   b. Altitude : 305 ft
   c. Relative Humidity: 95%
   d. Existing Conditions

1.5 Warranty

A. Manufacturer's Warranty
1. The generator set shall include a standard warranty covering one (5) year or 10,000 hours, whichever occurs first, to guarantee against defective material and workmanship in accordance with the manufacturer's published warranty from the date of initial startup.
2. The generator set manufacturer and its distributor shall maintain a 24-hour parts and service organization. This organization shall regularly engage in maintenance contract programs to perform preventive maintenance and service on equipment similar to that specified. A service agreement shall be available and shall include system operation under simulated operating conditions; adjustment to the generator set, transfer switch, and switchgear controls as required, and certification in the owner's maintenance log of repairs made and functional tests performed on all systems.

PART 2 PRODUCTS

2.1 Equipment

A. Manufacturer:
1. The generator set shall be a Kohler model 400REOZJD with a 5M4028 alternator or approved equal by:
2. Caterpillar
3. MTU

B. Equipment
1. The generator set shall provide 500 kVA and 400 kW when operating at 480Y/277 volts, 60 Hz, 0.80 power factor. The generator set shall be capable of a 130°C Standby rating while operating in an ambient condition of less than or equal to 77 °F and a maximum elevation of 500 ft. above sea level. The standby rating shall be available for the duration of the outage.
2. Engine
   a. The minimum 13.5 liter displacement engine shall deliver a minimum of 617HP at a governed engine speed of 1800 rpm, and shall be equipped with the following:
      1) Electronic isochronous governor capable of 0.25% steady-state frequency regulation
      2) 12-volt positive-engagement solenoid shift-starting motor
      3) 130-ampere automatic battery charging alternator with a solid-state voltage regulation

4) Positive displacement, full-pressure lubrication oil pump, cartridge oil filters, dipstick, and oil drain
5) Dry-type replaceable air cleaner elements for normal applications
6) The turbocharged engine shall be fueled by natural gas and shall be a aftercooled.
7) The engine shall have a minimum of 4 cylinders and be liquid-cooled
   a) The engine shall be EPA certified from the factory
   b) The generator must accept rated load in one-step.

3. Cooling System
   a. The engine shall be liquid-cooled by a closed loop, unit mounted radiator rated to operate the generator set at full load at an ambient temperature of 50 degrees C (122 degrees F). The radiator fan and other rotating engine parts shall be guarded against accidental contact.
4. Standard Air Cleaner
   a. The air cleaner shall provide engine air filtration which meets the engine manufacturer's specifications under typical operating conditions.
   b. Battery
      1) Each generator set requires 2 batteries which must meet the engine manufactures' specifications for the ambient conditions specified in Part 1 Project Conditions and shall comply with the NFPA requirements for engine cranking cycles. Battery shall be rated according to SAE Standards J-537 with a minimum cold cranking amp of 925 amps and a minimum reserve capacity of 185 Minutes at 80F. The battery plates shall be constructed of a Calcium-Lead alloy to provide long waterless operation and extended battery life. The battery elements must be anchor-locked with full-frame grids and tight-packed commercial plates to resist the effects of vibration. The battery must contain a handle to aid in lifting and the case must be constructed of polypropylene to resist breakage and extend service life. Removable cell covers shall be provided to allow for checking of electrolyte specific gravity.
      2) Battery rack and battery cables capable of holding the manufacturer's recommended batteries shall be supplied.
5. Housing
   a. The generator set shall be supplied with a Level 2 Critical Enclosure, providing a sound level of 75 dB(A) while the generator is operating at 100% load at 7 meters (23 feet) using acoustic insulation and acoustic-lined inlet hoods, and constructed from high strength, low alloy 14 gauge galvanized steel. The acoustic insulation used shall meet UL 94 HF1 flammability classification. The enclosure shall be manufactured from bolted panels to facilitate service, future modifications, or field replacement. The enclosure shall use external vertical air inlet and outlet hoods with 90 degree angles to discharge air up and reduce noise. The enclosure shall have an integral rodent guard and skid end caps and shall have bracing to meet 241 kph (150 mph) wind loading.
   b. The enclosure components and skid shall be cleaned with a two-stage alkaline cleaning process to remove grease, grit, and grime from parts. Components shall then be subjected to a Zirconium-based conversion coating process to prepare the metal for electro-coat (e-coat) adhesion. All enclosure parts shall receive a 100% epoxy primer electro-coat (e-coat) with high-edge protection. Following the e-coat process, the parts shall be finish coated with powder baked paint for superior finish, durability, and appearance with a Power Armor TM industrial finish that provides heavy duty durability in harsh conditions, and is fade-, scratch- and corrosion-resistant.
   c. The enclosure must surpass a 3,000 hour salt spray corrosion test per ASTM B-1117.
   d. Enclosures will be finished in the manufacturer's standard color.

e. The enclosures shall allow the generator set to operate at full load in an ambient temperature of 50°C with no additional derating of the electrical output of the generator set.
f. Enclosures shall be equipped with sufficient side and end doors to allow access for operation, inspection, and service of the unit and all options. Minimum requirements are two doors per side. When the generator set controller faces the rear of the generator set, an additional rear facing door is required. Access to the controller and main line circuit breaker shall meet the requirements of the National Electric Code.
g. Doors shall be fitted with hinges, hardware, and the doors shall be removable.
h. Doors shall be equipped with lockable latches. Locks shall be keyed alike. Door locks shall be recessed to minimize potential of damage to door/enclosure.
i. A duct between the radiator and air outlet shall be provided to prevent re-circulation of hot air.
j. The complete exhaust system shall be internal to the enclosure.
k. The critical silencer shall be fitted with a tailpipe.

6. Fuel oil storage
   a. Custom Double Wall Secondary Containment Sub-base Fuel Tank
      1) The generator set shall be supplied with a sub-base fuel tank of sufficient capacity to hold 2297 gallons of diesel fuel, which equates to 72 hours of fuel at 100% load.
      2) The tank shall be provided with 3 ports, one (1) on each side of the baffles located inside of the fuel tank for fuel cleaning operations. The ports shall be located to be easily accessible from the top.
7. Controller
   a. Advanced Power Management 603 (APM603) Generator Set Controller
      1) The generator set controller shall be a microprocessor-based control system that will provide automatic starting, system monitoring, and protection. The controller system shall also provide local monitoring and remote monitoring. The control system shall be capable of PC based updating of all necessary parameters, firmware, and software.
      2) The controller shall be mounted on the generator set and shall have integral vibration isolation. The controller shall be prototype and reliability tested to ensure operation in the conditions encountered.
         a) Codes and Standards
            (1) The generator set controller shall meet NFPA 110 Level 1 requirements and shall include an integral alarm horn as required by NFPA.
            (2) The controller shall meet NFPA 99 and NEC requirements.
            (3) The controller shall be UL 508 listed.
         b) Applicability
            (1) The controller shall be a standard offering in the manufacturer's controller product line.
            (2) The controller shall support 12-volt and 24volt starting systems.
            (3) The controller's environmental specification shall be: -40°C to 70°C operating temperature range and 5-95% humidity, non-condensing.
            (4) The controller shall mount on the generator or remotely within 40 feet with viewable access.
         c) Controller Buttons, Display and Components
            (1) The generator set controller shall include the following features and functions:
            (2) Push button Master Control buttons. The buttons shall be tactile-feel membrane with an indicator light to initiate the following functions:

(3) Run Mode: When in the run mode the generator set shall start as directed by the operator.
(4) Off/Reset Mode: When in the Off/Reset mode the generator set shall stop, the reset shall reset all faults, allowing for the restarting of the generator set after a shutdown.
(5) Auto Mode: When in Auto the mode the generator set shall be ready to accept a signal from a remote device.
(6) Emergency Stop Switch. The remote stop switch shall be red in color with a "mushroom" type head. Depressing the stop button will immediately stop the generator set and lockout the generator set for any automatic remote starting.
(7) Push Button/Rotary Selector dial. This dial shall be used for selection of all Menus and sub-menus. Rotating the dial moves you through the menus, pushing the dial selects the menu and function/features in that menu. Pushing the button selects the feature/function and sub-menus.
(8) Digital Display. The digital display shall be alphanumeric, with 2 lines of data and approximately 24 charters. The display shall have back lighting for ease of operator use in high and low light conditions. The display shall display status of all faults and warnings. The display shall also display any engine faults. While the generator set is running, the display shall scroll all-important information across the screen for ease of operator use. The scroll can be stopped by pushing the rotary dial. The display shall fall asleep when the generator set is not running and will wake-up when the generator set starts, or the rotary dial is depressed.
(9) Fault Light. The controller shall have an annunciator fault light that glows red for faults and yellow for warnings. These faults and warnings shall be displayed in the digital display. The fault light will also glow yellow when not in AUTO.
(10) Alarm Horn. The controller shall provide an alarm horn that sounds when any faults or warnings are present. The horn shall also sound when the controller is not in the AUTO mode.
(11) Alarm Silence/Lamp Test Button. When this button is depressed, it shall test all controller lamps. This button will also silence the alarm horn when the unit is not AUTO.
(12) USB Connection. The controller shall have a USB connection on the face of the controller. This connection shall allow for updating of all software and firmware. This port shall also allow for all servicing of generator set parameters, fault diagnostics and viewing of all controller information via use a laptop computer.
(13) Dedicated user inputs. The controller shall have dedicated inputs for remote emergency stop switch, remote 2-wire star for transfer switch and auxiliary shutdown.
(14) The controller shall have auto resettable circuit protection integral on the circuit board.

d) System Controller Monitoring and Status Features and Functions
(1) The generator controller shall display and monitor the following engine and alternator functions and allow adjustments of certain parameters at the controller:
(2) Overview menu
(3) Active shutdowns and warnings shall be displayed if present and without the need of operator interface
(4) Engine runtime with total hours
(5) Average line to line voltage

(6) Coolant temperature
(7) Fuel level or pressure
(8) Oil pressure
(9) Battery voltage
(10) Software version
(11) Frequency
(12) Average current
(13) Engine metering menu.
(14) Engine speed
(15) Oil pressure
(16) Coolant temperature
(17) Battery voltage
(18) Generator metering menu.
(19) Total power in VA
(20) Total power in W
(21) Rated power % used
(22) Voltage L-L and L-N for all phases
(23) Current L1, L2, L3
(24) Frequency
(25) Generator set information.
(26) Generator set model number
(27) Generator set serial number
(28) Controller set number
(29) Generator set run time.
(30) Engine run time total hours
(31) Engine loaded total hours
(32) Number of engine starts
(33) Total energy in kW
(34) Generator set system
(35) System voltage
(36) System frequency 50/60Hz
(37) System phase, single/three phase
(38) Power rating kW
(39) Amperage rating
(40) Power type standby/prime
(41) Measurement units, metric/English units adjustable
(42) Alarm silence, always or auto only
(43) Generator set calibration, the following are adjustable at the controller.
(44) Voltage L-L and L-N all phases
(45) Current L1, L2, L3
(46) Reset all calibrations
(47) Voltage regulation, +/-0.5% regulation, the following is adjustable at the controller.
(48) Voltage Adjustable +/- 10%
(49) Digital and Analog Inputs and outputs
(50) Displays settings and status

(51) Event Log
(52) Stores event history, up to 1000 events

e) Controller Engine control features and functions
(1) Automatic restart - the controller has automatic restart feature that initiates the start routine and re-crank after a failed start attempt.
(2) Cyclic cranking - the controller shall have programmable cyclic cranking
(3) Engine starting aid - the controller shall have the capability of providing control for an optional engine starting aid.
(4) The control system shall include time delays for engine start and cool down.
(5) The control system shall interface with the engine ECM and display engine fault codes and warnings. The ECM shall also include sender failure monitoring to help distinguish between failed senders and actual failure conditions.
(6) The controller shall monitor and display engine governor functions with include steady state and transient frequency monitoring

f) Controller Alternator control features and functions
(1) Integrated hybrid voltage regulator. The system shall have integral microprocessor-based voltage regulator system that provides +/- 5% voltage regulation, no-load to full load with three phase sensing. The system is prototype tested and control variation of voltage to frequency. The voltage regulator shall be adjustable at the controller with maximum +/- 10% adjustable of nominal voltage.
(2) AC output voltage regulator adjustment. The system shall allow for adjustment of the integral voltage regulator with maximum of +/- 10% adjustment of the system voltage.
(3) Alternator thermal overload protection. The system shall have integral alternator overload and short circuit protection matched to each alternator for the particular voltage and phase configuration.
(4) Power metering. The controller digitally displays power metering of kW and kVA.

g) Other control features and functions
(1) Event logging. The controller keeps a record of up to 1000 events, for warning and shutdown faults. This fault information becomes a stored record of systems events and can be reset.
(2) Historical data logging. The controller total number of generator set successful start shall be recorded and displayed.
(3) Programmable access. The control system shall include a USB port that gives service technicians the ability to provide software and firmware upgrades. The system shall also be capable of allowing setting of all critical parameters using the service software and a laptop computer. All parameters and setting should be capable to being stored on a laptop for future upgrades of printing for analysis.

h) Generator Set Warning, Shutdown Alarm and Status
(1) The generator set shall have alarms and status indication lamps that show non-automatic status and warning and shutdown conditions. The controller shall indicate with a warning lamp and or alarm and on the digital display screen any shutdown, warning or engine fault condition that exists in the generator set system. The following alarms and shutdowns shall exist as a minimum:
(2) Engine functions
(3) ECM communication loss (shutdown)
(4) ECM diagnostics (alarm & shutdown)

(5) Engine overspeed (shutdown)
(6) Engine start aid active
(7) Engine under speed (shutdown)
(8) High DC battery voltage (alarm)
(9) High coolant temperature (alarm & shutdown)
(10) Low DC battery voltage (alarm)
(11) Low coolant level (shutdown)
(12) Low coolant temperature (alarm)
(13) Low cranking voltage (alarm)
(14) Low engine oil level (alarm & shutdown)
(15) Low fuel pressure (alarm)
(16) Low oil pressure (alarm & shutdown)
(17) No coolant temperature signal (shutdown)
(18) No oil pressure signal (shutdown)
(19) Overcrank (shutdown)
(20) Speed sensor fault (alarm)
(21) Generator functions
(22) AC sensing loss over & under current (alarm & shutdown)
(23) Alternator protection (shutdown)
(24) Ground fault input (alarm)
(25) kW overload (shutdown)
(26) Locked rotor (shutdown)
(27) Over-frequency (shutdown)
(28) Over AC voltage (shutdown)
(29) Under-frequency (shutdown)
(30) Under AC voltage (shutdown)
(31) Emergency stop (shutdown)
(32) Other General functions
(33) Battery charger fault (alarm)
(34) Common fault (shutdown)
(35) Common warning (alarm)
(36) Master switch not in auto (alarm)
(37) Generator running
(38) Input/output fault (alarm)
(39) The generator set controller shall also be capable of meeting all necessary NFPA 110 level 1 requirements that include several of the above along with; EPS supplying load, Master switch “not in auto”, and contacts for local and remote common alarm.

i) Communications
(1) If the generator set engine is equipped with an ECM (engine control module), the controller shall communicate with the ECM for control, monitoring, diagnosis, and meet SAE J1939 standards
(2) Kohler proprietary RBUS communication shall be available or equal.
(3) A RBUS shall be able to monitor and alter parameters and start or stop a generator.
(4) The controller shall have the capability to communicate to a personal computer (IBM or compatible) and appropriate application software

(5) A variety of connections shall be available based on requirements:
(6) A single control connection to a PC via USB
(7) Internet connection via Ethernet
(8) Generator and transfer switch controls shall be equipped with communications modules capable of connecting to the same communication network.

C. Generator Overcurrent and Fault Protection
1. The generator shall be provided with a factory installed, 100% rated line circuit breaker rated at 600.00 amperes that is UL489 listed. Line circuit breakers shall be sized for the rated ampacity of the loads served by the breaker per the NEC.
2. The circuit breaker(s) shall incorporate an electronic trip device with the following characteristics:
   a. Adjustable long time delay
   b. Adjustable short time delay [As applicable]
   c. Instantaneous
      1) Load side lugs shall be provided from the factory. The line circuit breaker shall include auxiliary contacts, shunt trip, under voltage trip, alarm switch, and overcurrent switch functionality. Load side breaker connections made at the factory shall be separated from field connections.
      2) The shunt trip device shall be connected to trip the generator breaker when the generator-set is shut down by other protective devices.
      3) Barriers to provide segregation of wiring from an emergency source to emergency loads from all other wiring and equipment, if required by the NEC, shall be provided.

D. Alternator
1. The alternator shall be 4-pole, rotating field, brushless, 2/3-pitch, with 4 bus bar provision for external connections, self-ventilated, with drip-proof construction and amortisseur rotor windings, and skewed for smooth voltage waveform. The ratings shall meet the NEMA standard (MG1-32.40) temperature rise limits. The insulation shall be class H per UL1446 and the varnish shall be a vacuum pressure impregnated, fungus resistant epoxy. Temperature rise of the rotor and stator shall be limited to 130°C Standby. The PMG based excitation system shall be of brushless construction controlled by a digital, three phase sensing, solid- state, voltage regulator. The AVR shall be capable of proper operation under severe nonlinear loads and provide individual adjustments for voltage range, stability and volts-per-hertz operations. The AVR shall be protected from the environment by conformal coating. The waveform harmonic distortion shall not exceed 5% total RMS measured line-to-line at full rated load. The TIF factor shall not exceed 50.
2. The alternator shall have a maintenance-free sealed bearing, designed for 40000 hour B10 life. The alternator shall be directly connected to the flywheel housing with a semi-flexible coupling between the rotor and the flywheel.
3. The generator shall be inherently capable of sustaining at least 300% of rated current for at least 10 seconds under a 3-phase symmetrical short circuit without the addition of separate current-support devices.
4. Motor starting performance and voltage dip determinations shall be based on the complete generator set. The generator set shall be capable of supplying 960 LRKVA for starting motor loads with a maximum instantaneous voltage dip of 35%, as measured by a digital RMS transient recorder in accordance with IEEE Standard 115. Motor starting performance and voltage dip determination that does not account for all components affecting total voltage dip, i.e., engine, alternator, voltage regulator, and governor will not be acceptable. As such, the generator set shall be prototype tested to optimize and determine performance as a generator set system.

5. Vibration Isolation
    a. Vibration isolators shall be provided between the engine-alternator and heavy-duty steel base.

2.2 Accessories

A. The generator set shall be supplied with a 10-ampere automatic float/equalize battery charger capable of charging battery, with the following features:
1. Automatic 3-stage float to equalization charge
2. Voltage regulation of 1% from no to full load over 10% AC input line voltage variations
3. Battery charging current Ammeter and battery voltage voltmeter with 5% full-scale accuracy
4. LED lamp for power ON indication
5. Current limited during engine cranking, short circuit, and reverse polarity conditions
6. Temperature compensated for ambient temperatures for -40°C to 60°C
7. Alarm circuit board featuring alarm contacts for low battery voltage, high battery voltage, and battery charger malfunction.
8. UL 1012 Listed
9. CSA Certified

B. Battery rack and battery cables capable of holding the manufacturer's recommended battery shall be supplied.

C. The generator set shall be supplied with a means to manually adjust the speed of the generator.

D. The generator set shall be furnished with rodent guards to prevent rodent intrusion and protect internal components.

E. The generator shall be equipped with a crankcase vent. The fumes coming from the vent (Blow-by) will need to be contained with the solids being separated and collected while the gases are being released back into the engine.

F. Block Heater - The block heater shall be thermostatically controlled, 1500 watt, with isolating valves, to maintain manufacturers recommended engine coolant temperature to meet the start-up requirements of NFPA 99 and NFPA 110, Level 1.

G. The exhaust piping shall be gas proof, seamless, stainless steel, flexible exhaust bellows and includes the flex exhaust tube and the mounting hardware.

H. Supply flexible fuel lines to provide a flexible connection between the engine fuel fittings and the fuel supply tank piping and for the fuel return lines from the injector pump per engine manufacturer’s recommendations. Flex line shall have a protective steel wire braid to protect the hose from abrasion.

I. The generator set shall be supplied with a common failure relay to provide means of signaling fault and/or shutdown conditions.
1. The common failure relay shall remotely signal auxiliary faults, emergency stop, high engine temperature, low oil pressure, over crank, and over speed via one single-pole, double-throw relay with 10 amps at 120 VAC contacts.
2. The relay contacts shall be gold flashed to allow use of low current draw devices (100ma @ 28VDC min.).
3. Once energized the relay shall remain latched until the system is reset by the main controller switch.

J. The generator set shall be provided with a run relay which shall provide a three-pole, double-throw relay with 10-amp/ 250 VAC contacts to indicate that the generator is running. The run relay dry contacts can be used for energizing or de-energizing customer devices while the generator is running (e.g. louvers, indicator lamps, etc.)

K. Remote annunciator panel - The remote annunciator shall meet NFPA 110, Level 1 requirements and enable remote viewing of the generator status. The panel shall be connected to the generator controller via either network communication wires or via hard wired connections. Options shall be available to provide ATS source availability, contactor position, and loaded or unloaded test for up to four transfer switches. The panel shall have the capability to be either flush- mounted or surface-mounted. The annunciator shall meet UL508 requirements.

L. The generator set shall be provided with an 100W alternator strip heater.

M. The generator set shall be provided with the basic electrical package option, which includes:
1. 30A terminal strip
2. DC light switch
3. 20A, 240V receptacle
4. 20A, 120V GFCI receptacle

2.3 Source Quality Control

A. Non-Conforming Work
1. To ensure that the equipment has been designed and built to the highest reliability and quality standards, the manufacturer and/or local representative shall be responsible for three separate tests: design prototype tests, final production tests, and site tests.
   a. Design Prototype Tests. Components of the emergency system, such as the engine/generator set, transfer switch, and accessories, shall not be subjected to prototype tests because the tests are potentially damaging. Rather, similar design prototypes and preproduction models shall be subject to the following tests:
   b. Maximum power (kW)
      1) Maximum motor starting (kVA) at 35% instantaneous voltage dip.
      2) Alternator temperature rise by embedded thermocouple and/or by resistance method per NEMA MG1-32.6.
      3) Governor speed regulation under steady-state and transient conditions.
      4) Voltage regulation and generator transient response.
      5) Harmonic analysis, voltage waveform deviation, and telephone influence factor.
      6) Three-phase short circuit tests.
      7) Alternator cooling air flow.
      8) Torsional analysis to verify that the generator set is free of harmful torsional stresses.
      9) Endurance testing.
         a) Final Production Tests. Each generator set shall be tested under varying loads with guards and exhaust system in place. Tests shall include:
            (1) Single-step load pickup
            (2) Safety shutdown device testing
            (3) Rated Power @ 0.8 PF
            (4) Maximum power
            (5) Upon request, a witness test, or a certified test record sent prior to shipment.

(6) Site Tests. The manufacturer's distribution representative shall perform an installation check, startup, and building load test. The engineer, regular operators, and the maintenance staff shall be notified of the time and date of the site test. The tests shall include:

(7) Fuel, lubricating oil, and antifreeze shall be checked for conformity to the manufacturer's recommendations, under the environmental conditions present and expected.

(8) Accessories that normally function while the set is standing by shall be checked prior to cranking the engine. These shall include: block heaters, battery chargers, alternator strip heaters, remote annunciators, etc.

(9) Generator set startup under test mode to check for exhaust leaks, path of exhaust gases outside the building, cooling air flow, movement during starting and stopping, vibration during operation, normal and emergency line-to-line voltage and frequency, and phase rotation.

(10) Automatic start by means of a simulated power outage to test remote-automatic starting, transfer of the load, and automatic shutdown. Prior to this test, all transfer switch timers shall be adjusted for proper system coordination. Engine coolant temperature, oil pressure, and battery charge level along with generator set voltage, amperes, and frequency shall be monitored throughout the test.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of generator sets and auxiliary equipment are consistent with the indicated requirements.

C. Verify that rough-ins for field connections are in the proper locations.

D. Verify that mounting surfaces are ready to receive equipment.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Provide required support and attachment in accordance with Section 26 0529.

D. Provide required vibration isolation and/or seismic controls in accordance with Section 26 0548.

E. Use manufacturer's recommended oil and coolant, suitable for the worst case ambient temperatures.

F. Provide grounding and bonding in accordance with Section 26 0526.

G. Identify system wiring and components in accordance with Section 26 0553.

3.3 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Provide services of a manufacturer's authorized representative to prepare and start systems and perform inspection and testing. Include manufacturer's detailed testing procedures and field reports with closeout documents.

C. Notify Owner and DEDC, LLC at least two weeks prior to scheduled inspections and tests.

D. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.

E. Provide all equipment, tools, and supplies required to accomplish inspection and testing, including load bank and fuel.

F. Preliminary inspection and testing to include, at a minimum:
1. Inspect each system component for damage and defects.
2. Verify tightness of mechanical and electrical connections are according to manufacturer's recommended torque settings.
3. Check for proper oil and coolant levels.

G. Prepare and start system in accordance with manufacturer's instructions.

H. Perform acceptance test in accordance with NFPA 110.

I. Inspection and testing to include, at a minimum:
1. Verify compliance with starting and load acceptance requirements.
2. Verify voltage and frequency; make required adjustments as necessary.
3. Verify phase sequence.
4. Verify control system operation, including safety shutdowns.
5. Verify operation of auxiliary equipment and accessories (e.g. battery charger, heaters, etc.).
6. Perform load tests in accordance with NFPA 110 (1.5 hour building load test followed by 2 hour full load test).

J. Provide field emissions testing where necessary for certification.

K. Sound Level Tests: Measure sound levels for compliance with specified requirements. Identify and report ambient noise conditions.

L. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

M. Submit detailed reports indicating inspection and testing results and corrective actions taken.

3.4 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to a clean finish.

3.5 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. See Section 01 7900 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate proper operation of system to Owner, and correct deficiencies or make adjustments as directed.

D. Training: Train Owner's personnel on operation, adjustment, and maintenance of system.
1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
2. Provide minimum of four hours of training for two (2) representatives of the fire department.
3. Instructor: Manufacturer's authorized representative.
4. Location: At project site.

E. After successful acceptance test and just prior to Substantial Completion, replace air, oil, and fuel filters and fill fuel storage tank.

3.6 PROTECTION

A. Protect installed engine generator system from subsequent construction operations.

3.7 MAINTENANCE

A. See Section 01 7000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

B. Provide to Owner at no extra cost, a separate maintenance contract for the service and maintenance of engine generator system for two years from date of Substantial Completion of project; Include a complete description of preventive maintenance, systematic examination, adjustment, inspection, and testing, with a detailed schedule.

C. Conduct site visit at least once every three months to perform inspection, testing, and preventive maintenance. Submit report to Owner indicating maintenance performed along with evaluations and recommendations.

D. Provide trouble call-back service upon notification by Owner:
1. Provide on-site response within 4 hours of notification.
2. Include allowance for call-back service during normal working hours at no extra cost to Owner.
3. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

E. Maintain an on-site log listing the date and time of each inspection and call-back visit, the condition of the system, nature of the trouble, correction performed, and parts replaced.

END OF SECTION 26 3213

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SECTION 26 3223 - AUTOMATIC TRANSFER SWITCH

PART 1 GENERAL

1.1 SUMMARY

A. This section includes the following items from a single supplier:
1. Automatic transfer switch
2. Related Accessories as specified
3. Related Requirements
   a. It is the intent of this specification to secure an automatic transfer switch that has been prototype tested, factory built, production-tested, and site-tested together with all accessories necessary for a complete installation as shown on the plans and drawings and specified herein.
   b. Any exceptions to the published specifications shall be subject to the approval of the engineer and submitted minimum 10 days prior to the closing of the bid with a line by line summary description of all the items of compliance, any items that have been are omitted or have been taken exception to, and a complete description of all deviations.
   c. It is the intent of this specification to secure an automatic transfer switch that has been tested during design verification, in production, and at the final job site. The automatic transfer switch will be a commercial design and will be complete with all of the necessary accessories for complete installation as shown on the plans, drawings, and specifications herein. The equipment supplied shall meet the requirements of the National Electrical Code and applicable local codes and regulations.
   d. All equipment shall be new and of current production by an international, power system manufacturer of generators, transfer switches, and paralleling switchgear. The manufacturer shall be a supplier of a complete and coordinated system. There will be single-source responsibility for warranty, parts, and service through a factory-authorized representative with factory-trained technicians.

1.2 SUBMITTALS

A. Action Submittals
1. Product Data
   a. The submittal shall include specification sheets showing all standard and optional accessories to be supplied; schematic wiring diagrams, dimension drawings, and interconnection diagrams identifying by terminal number each required interconnection between the generator set, the transfer switch, and the remote annunciator panel if it is included elsewhere in these specifications.
      1) Shop Drawings
2. Informational Submittal
   a. Certificates
   b. Test and Evaluation Reports
   c. Manufacturer's Instruction
   d. Source Quality Control Submittals
   e. Field or Site Quality Control

f. Manufacturer's Report
3. Closeout Submittals
   a. Maintenance Contracts
   b. Operation And Maintenance Data
   c. Warranty Documentation
   d. Record Documentation
   e. Software
4. Maintenance Material Submittals
   a. Literature

1.3 QUALITY ASSURANCE

A. Regulatory Agency
1. The automatic transfer switch shall conform to the requirements of the following codes and standards:
   a. UL 1008 - Standard for Transfer Switch Equipment
   b. IEC 947-6-1 Low-voltage Switchgear and Control gear; Multifunction equipment; Automatic Transfer Switching EquipmentEN55011, Limits and Methods of Measurement of Radio Interference Characteristics of Industrial, Scientific and Medical Equipment.
   c. NFPA 70 - National Electrical Code
   d. NFPA 99 - Essential Electrical Systems for Health Care Facilities
   e. NFPA 110 - Emergency and Standby Power Systems
   f. IEEE Standard 446 - IEEE Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
   g. NEMA Standard ICS 10-2005, Electromechanical AC Transfer Switch Equipment.
   h. EN61000-4-4 Fast Transient Immunity Severity Level 4
   i. EN61000-4-5 Surge Immunity Class 4 (voltage sensing and programmable inputs only)
   j. IEEE 472 (ANSI C37.90A) Ring Wave Test
   k. IEC Specifications for EMI/EMC Immunity (CISPR 11, IEC 1000-4-2, IEC 1000-4-3, IEC 1000-4-4, IEC 1000-4-5, IEC 1000-4-6, IEC 1000-4-8, IEC 1000-4-11)
   l. CSA C22.2 No. 178 certification
   m. Qualifications
      1) The automatic transfer switch shall be produced by a manufacturer who is ISO 9001 certified for the design, development, production and service of its complete product line.
      2) A manufacturer who has produced this type of equipment for a period of at least 10 years and who maintains a service organization available twenty-four hours a day throughout the year shall produce the automatic transfer switch.
   n. Manufacturers
      1) The automatic transfer switch shall be furnished by a single manufacturer who shall be responsible for the design, coordination, and testing of the complete system. The entire system shall be installed as shown on the plans, drawings, and specifications herein.
         a) The manufacturer shall maintain a national service organization of employing personnel located throughout the contiguous United States. The Service center's personnel must be factory trained and must be on call 24 hours a day, 365 days a year.
            (1) The manufacturer shall maintain records of each switch, by serial number, for a minimum of 20 years.
   o. Automatic transfer switch shall operate in the following conditions without any damage to the unit or its loads.

1) Ambient Temperature: -4 to 158 Degrees F
2) Relative Humidity: 5% to 95% noncondensing

1.4 WARRANTY

A. Manufacturer's Warranty
1. The ATS shall include a standard warranty covering one (1) year to guarantee against defective material and workmanship in accordance with the manufacturer's published warranty from the date of initial startup.
2. The ATS manufacturer and its distributor shall maintain a 24-hour parts and service organization. This organization shall regularly engage in maintenance contract programs to perform preventive maintenance and service on equipment similar to that specified. A service agreement shall be available and shall include system operation under simulated operating conditions; adjustment to the generator set, transfer switch, and switchgear controls as required, and certification in the owner's maintenance log of repairs made and functional tests performed on all systems.

PART 2 PRODUCTS

2.1 CONTRACTOR-FURNISHED

A. New Products

2.2 EQUIPMENT

A. Equipment
1. Furnish and install an automatic transfer switches system(s) with 3-Pole / 4-Wire, Solid Neutral, 600 Amps, 480V/60Hz. Automatic transfer shall consist of an inherently double throw power transfer switch mechanism and a microprocessor controller to provide automatic operation. All transfer switches and controllers shall be the products of the same manufacturer.

B. Manufacturer
1. Automatic transfer switches shall be Kohler Service Entrance Rated - Open Transition (KEO)/KEO-DCTF-0600SNN or equivalent switch by: (Contractor shall verify catalogue number prior to purchase of ATS.)
2. Kohler
3. ASCO
4. Caterpillar
5. MTU
6. Any alternate shall be submitted for approval to the consulting engineer at least 10 days prior to bid date. Alternate bids shall include a line-by-line clarification of the specification marked with "D" for deviation; "E" for exception, and "C" for comply.

C. Construction

D. Enclosure
1. The ATS shall be furnished in a NEMA 1 enclosure.
2. All standard door mounted switches and indicating LEDs shall be integrated into a flush-mounted, interface membrane or equivalent in the enclosure door for easy viewing & replacement. The panel

shall be capable of having a manual locking feature to allow the user to lockout all membrane mounted control switches to prevent unauthorized tampering. This cover shall be mounted with hinges and have a latch that may be padlocked. The membrane panel shall be suitable for mounting by others when furnished on open type units.

2.3 OPERATION

A. Controls

1. A four line, 20 character LCD display and dynamic 4 button keypad shall be an integral part of the controller for viewing all available data and setting desired operational parameters. Operational parameters shall also be available for viewing and control through the communications interface port or USB. The following parameters shall only be adjustable via a password protected programming on the controller:
   a. Nominal line voltage and frequency
   b. Single or three phase sensing
   c. Operating parameter protection
   d. Transfer operating mode configuration (Standard transition, Programmed transition, or Closed transition)

B. Voltage and Frequency

1. Voltage (all phases) and frequency on both the normal and emergency sources shall be continuously monitored, with the following pickup, dropout, and trip setting capabilities (values shown as % of nominal unless otherwise specified):

	Parameter	Dropout/Trip	Pickup/Reset
b.	Under voltage	75 to 98%	85 to 100%
c.	Over voltage	106 to 135%	95 to 100% of trip
d.	Under frequency	95 to 99%	80 to 95%
e.	Over frequency	01 to 115%	105 to 120%
f.	Voltage unbalance	5 to 20%	3 to 18%

   g. Repetitive accuracy of all settings shall be within ± 0.5% over an operating temperature range of -20°C to 70°C.
   h. An adjustable dropout time for transient voltage and frequency excursions shall be provided. The time delays shall be 0.1 to 9.9 seconds for voltage and .1 to 15 seconds for frequency.
   i. Voltage and frequency settings shall be field adjustable in 1% increments either locally with the display and keypad, remotely via the communications interface port or USB.
   j. The controller shall be capable of sensing the phase rotation of both the normal and emergency sources. The source shall be considered unacceptable if the phase rotation is not the preferred rotation selected (ABC or BAC). Unacceptable phase rotation shall be indicated on the LCD; the service required LED and the annunciation through the communication protocol and dry contacts. In addition, the phase rotation sensing shall be capable of being disabled, if required.
   k. The controller shall be capable of detecting a single phasing condition of a source, even though a voltage may be regenerated by the load. This condition is a loss of phase and shall be considered a failed source.
   l. Source status screens shall be provided for both normal & emergency to provide digital readout of voltage on all 3 phases (phase to phase and phase to neutral), frequency, and phase rotation.

2.4 ACCESSORIES

A. Standard I/O Module. The standard I/O Module shall have two programmable inputs and six programmable outputs.
   1. Inputs Available: 2
   2. Contact Closure
   3. Current 5mA Max.
   4. Connection Type Terminal Strip
   5. Wire Size #14-24 AWG
   6. Max Distance 700 feet
      a. Outputs Available: 6
         1) Contact Type Form C (SPDT)
            a) Contact Rating 2A @ 30VDC, 500mA @ 125VAC
               (1) Connection Type Terminal Strip
               (2) Wire Size #14-24

2.5 TEST AND INSPECTION

A. Upon request, the manufacturer shall provide a notarized letter certifying compliance with all of the requirements of this specification including compliance with the above codes and standards. The certification shall identify, by serial number(s), the equipment involved. No exceptions to the specifications, other than those stipulated at the time of the submittal, shall be included in the certification.

B. The ATS manufacturer shall be certified to ISO 9001 International Quality Standard and the manufacturer shall have third party certification verifying quality assurance in design/development, production, installation and servicing in accordance with ISO 9001.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify field measurements.

B. Verify transfer switch ratings and configurations.

C. Verify rough-ins for field connections.

D. Verify mounting surfaces are ready to receive transfer switches.

E. Verify conditions are satisfactory for installation before starting work.

3.2 INSTALLATION

A. Comply with NECA 1 for general workmanship.

B. Install products in accordance with manufacturer's instructions.

C. Arrange equipment to provide minimum clearances and required maintenance access.

D. Provide required support and attachment.

E. Provide required seismic controls.

F. Install transfer switches, plumb, and level.

G. Unless otherwise indicated, mount floor-mounted transfer switches on concrete pad, 3 inches high.

H. Provide grounding and bonding in accordance with NFPA 70.

I. Identify transfer switches and associated system wiring.

3.3 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Provide services of manufacturer's authorized representative to observe outcome of installation and assist in inspection and testing. Include manufacturer's detailed testing procedures and field reports with submittals.

C. Prepare and start system in accordance with manufacturer's instructions.

D. Transfer Switch Inspection and Testing:
1. Inspect and test in accordance with NETA ATS, except Section 4.

E. Provide additional inspection and testing as required for completion of associated engine generator testing.

F. Correct defective work, adjust for operation, and retest until entire system complies with Contract Documents.

G. Submit detailed reports indicating inspection and testing results and corrective actions taken.

3.4 CLEANING

A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.

B. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore matching original factory finish.

3.5 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals for additional submittals.

B. See Section 01 7900 - Demonstration and Training for additional requirements.

C. Demonstrate operation of transfer switches to Owner's designated representative and correct deficiencies or make adjustments as directed.

D. Training: Train Owner's personnel on operation, adjustment, and maintenance of transfer switches.
1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
2. Provide minimum of 4 hours of training.

3. Instructor: Manufacturer's authorized representative.
4. Location: At project site.

E. Coordinate with related generator demonstration and training.

3.6 PROTECTION

A. Protect installed transfer switches from subsequent construction operations.

3.7 MAINTENANCE

A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.

B. Provide to Owner at no extra cost, separate maintenance contract for service and maintenance of transfer switches for 2 years from Date of Substantial Completion.

C. Conduct site visit at least once every 3 months to perform inspection, testing, and preventive maintenance. Submit report to Owner indicating maintenance performed, along with evaluations and recommendations.

D. Provide trouble callback service upon notification by Owner:
1. Provide on-site response within 4 hours of notification.
2. Include allowance for callback service during normal working hours at no extra cost to Owner.
3. Owner pays for callback service outside of normal working hours on hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

E. Maintain on-site log listing date and time of each inspection and callback visit, condition of system, nature of trouble, correction performed, and parts replaced.

END OF SECTION 26 3223

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SECTION 26 4113 - LIGHTNING PROTECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Strike (air) terminals and interconnecting conductors.

B. Grounding and bonding for lightning protection.

1.2 RELATED REQUIREMENTS

A. Section : Electrical system grounds.

B. Surge Protection for Wiring Systems: Specified in individual system requirements.

1.3 REFERENCE STANDARDS

A. NFPA 780 - Standard for the Installation of Lightning Protection Systems; 2017.

B. UL 96 - Lightning Protection Components; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination with Roofing Work: Ensure adequate attachment of strike terminals and conductors without damage to roofing.

B. Preinstallation Meeting: Convene a meeting at least prior to commencement of any work affected by lightning protection system requirements to discuss prerequisites and coordination required by other installers; require attendance by representatives of installers whose work will be affected.

1.5 SUBMITTALS

A. See Section , for submittal procedures.

B. Shop Drawings: Indicate location and layout of air terminals, grounding electrodes, and bonding connections to structure and other metal objects. Include terminal, electrode, and conductor sizes, and connection and termination details.
   1. Include data on actual ground resistance determined by field measurement in accordance with NFPA 780.
   2. Include engineering analysis of equalization of potential to metal bodies within the structure.

C. Product Data: Provide dimensions and materials of each component, indication of testing agency listing, and installation instructions.

1.6 QUALITY ASSURANCE

A. Designer Qualifications: Person or entity, employed by installer, who specializes in lightning protection system design with documented experience.

B. Field Quality Control Testing Agency Qualifications: Firm capable of and experienced in grounding and bonding testing with documented experience and minimum of three project references.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Lightning Protection Components:
1. Advanced Lightning Technology (ALT): www.altfab.com/#sle.
2. Harger Lightning and Grounding: www.harger.com/#sle.
3. National Lightning Protection Corporation: www.theprotectionsource.com/#sle.
4. Substitutions:

2.2 LIGHTNING PROTECTION SYSTEM

A. Lightning Protection System: Provide complete system complying with NFPA 780, including air terminals, bonding, interconnecting conductors and grounding electrodes.
1. Provide system that protects:
a. The entire structure.
b. Open air areas within of exterior walls at grade level.
c. Open air areas within building footprint.
2. Coordinate with other grounding and bonding systems specified.
3. Determine ground resistance by field measurement.
4. Provide copper, bronze, or stainless steel components, as applicable; no aluminum.

2.3 COMPONENTS

A. All Components: Complying with applicable requirements of UL 96.

B. Strike (Air) Terminals:

C. Grounding Rods:

D. Ground Plate: Copper.

E. Conductors:

F. Connectors and Splicers:

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated on shop drawings.

B. Coordinate work with installation of roofing and exterior and interior finishes.

3.2 INSTALLATION

A. Install in accordance with referenced system standards.

B. Connect conductors using mechanical connectors or exothermic welding process; protect adjacent construction elements and finishes from damage.

C. Connect conductors using mechanical connectors.

D. Connect conductors using exothermic welding process; protect adjacent construction elements and finishes from damage.

3.3 FIELD QUALITY CONTROL

A. See Section , for additional requirements.

B. Perform visual inspection as specified in NFPA 780 as if this were a periodic follow-up inspection.

C. Perform continuity testing as specified in NFPA 780 as if this were testing for periodic maintenance.

END OF SECTION 26 4113

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SECTION 26 4300 - SURGE PROTECTIVE DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surge protective devices for service entrance locations.

1.2 RELATED REQUIREMENTS

A. Section 26 0526 - Grounding and Bonding for Electrical Systems.

B. Section 26 2416 - Panelboards.

1.3 ABBREVIATIONS AND ACRONYMS

A. SPD: Surge Protective Device.

1.4 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate size and location of overcurrent device compatible with the actual surge protective device and location to be installed. Notify DEDC, LLC of any conflicts or deviations from Contract Documents to obtain direction prior to ordering equipment.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Include detailed component information, voltage, surge current ratings, repetitive surge current capacity, voltage protection rating (VPR) for all protection modes, maximum continuous operating voltage (MCOV), nominal discharge current (I-n), short circuit current rating (SCCR), connection means including any required external overcurrent protection, enclosure ratings, outline and support point dimensions, weight, service condition requirements, and installed features.

1.7 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.8 DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space in accordance with manufacturer's written instructions.

1.9 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.10 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Factory-installed, Internally Mounted Surge Protective Devices:
   1. Same as manufacturer of equipment containing surge protective device, to provide a complete listed assembly including SPD.

B. Substitutions: See Section 01 6000 - Product Requirements.

C. Source Limitations: Furnish surge protective devices produced by a single manufacturer and obtained from a single supplier.

2.2 SURGE PROTECTIVE DEVICES - GENERAL REQUIREMENTS

A. Description: Factory-assembled surge protective devices (SPDs) for 60 Hz service; listed, classified, and labeled as suitable for the purpose intended; system voltage as indicated on the drawings.

B. Unless otherwise indicated, provide field-installed, externally-mounted or factory-installed, internally-mouonted SPDs.

C. List and label as complying with UL 1449, Type 1 when connected on line side of service disconnect overcurrent device and Type 1 or 2 when connected on load side of service disconnect overcurrent device.

D. Protected Modes:
   1. Wye Systems: L-N, L-G, N-G, L-L.

E. UL 1449 Voltage Protection Ratings (VPRs):
   1. 480Y/277V System Voltage: Not more than 1,500 V for L-N, L-G, and N-G modes and 2,000 V for L-L mode.

F. UL 1449 Maximum Continuous Operating Voltage (MCOV): Not less than 115% of nominal system voltage.

G. Enclosure Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
   1. Indoor clean, dry locations: Type 1.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the service voltage and configuration marked on the SPD are consistent with the service voltage and configuration at the location to be installed.

C. Verify system grounding and bonding is in accordance with Section 26 0526, including bonding of neutral and ground for service entrance and separately derived systems where applicable. Do not energize SPD until deficiencies have been corrected.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

C. Do not energize SPD until bonding of neutral and ground for service entrance and separately derived systems is complete in accordance with Section 26 0526 where applicable. Replace SPDs damaged by improper or missing neutral-ground bond.

3.3 CLEANING

A. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION 26 4300

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SECTION 26 5100 - INTERIOR LIGHTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Interior luminaires.

B. Emergency lighting units.

C. Exit signs.

D. Drivers.

E. Accessories.

1.2 RELATED REQUIREMENTS

A. Section 26 0529 - Hangers and Supports for Electrical Systems.

B. Section 26 0533.16 - Boxes for Electrical Systems.

C. Section 26 0548 - Vibration and Seismic Controls for Electrical Systems.

D. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

E. Section 26 2726 - Wiring Devices: Manual wall switches and wall dimmers.

1.3 REFERENCE STANDARDS

A. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products; 2008.

B. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules; 2015, with Errata (2017).

C. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; 2006.

D. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.

E. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2012.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 1598 - Luminaires; Current Edition, Including All Revisions.

H. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.
2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.
4. Notify DEDC, LLC of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate dimensions and components for each fixture that is not a standard product of the manufacturer.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
1. LED Luminaires:
a. Include estimated useful life, calculated based on IES LM-80 test data.

D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Conform to requirements of NFPA 70 and NFPA 101.

1.7 DELIVERY, STORAGE, AND PROTECTION

A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.8 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.9 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for all LED luminaires, including drivers.

C. Provide five year manufacturer warranty minimum for all dimming drivers.

D. Provide 10-year pro-rata warranty for batteries for self-powered exit signs.

E. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

B. Substitutions: See Section 01 6000 - Product Requirements.

2.2 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products that comply with requirements of NFPA 70 and NFPA 101.

D. Provide products listed, classified, and labeled as suitable for the purpose intended.

E. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

F. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

G. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

H. Recessed Luminaires:
1. Ceiling Compatibility: Comply with NEMA LE 4.
2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.
3. Luminaires Recessed in Sloped Ceilings: Provide suitable sloped ceiling adapters.

I. LED Luminaires:
1. Components: UL 8750 recognized or listed as applicable.
2. Tested in accordance with IES LM-79 and IES LM-80.
3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

J. LED Tape Lighting Systems: Provide all power supplies, drivers, cables, connectors, channels, covers, mounting accessories, and interfaces as necessary to complete installation.
   1. LED Tape - General Requirements:
      a. Listed.
      b. Designed for field cutting in accordance with listing.

2.3 DRIVERS

A. Dimmable LED Drivers:
   1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.
   2. Control Compatibility: Fully compatible with the dimming controls to be installed.

2.4 ACCESSORIES

A. Stems for Suspended Luminaires: Steel tubing, minimum 1/2" size, factory finished to match luminaire or field-painted as directed.

B. Airplane cable: Steel Wire.

C. Fire-Rated Luminaire Enclosures:
   1. Provide as required to preserve fire resistance rating of building elements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).

D. Provide required support and attachment in accordance with Section 26 0529.

E. Provide required seismic controls in accordance with Section 26 0548.

F. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

G. Suspended Ceiling Mounted Luminaires:
1. Do not use ceiling tiles to bear weight of luminaires.
2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
3. Secure surface-mounted and recessed luminaires to building structure.
4. Secure pendant-mounted luminaires to building structure.
5. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
6. In addition to ceiling support wires, provide two galvanized steel safety wire(s), minimum 12 gauge, connected from opposing corners of each recessed luminaire to building structure.
7. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.

H. Recessed Luminaires:
1. Install trims tight to mounting surface with no visible light leakage.
2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.
3. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.

I. Suspended Luminaires:
1. Unless otherwise indicated, specified mounting heights are to bottom of luminaire.
2. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.
3. Install canopies tight to mounting surface.
4. Unless otherwise indicated, support pendants from swivel hangers.

J. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to bottom of luminaire.

K. Install fixtures securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting).

L. Install suspended luminaires using pendants supported from swivel hangers. Provide pendant length required to suspend luminaire at indicated height.

M. Install surface mounted luminaires plumb and adjust to align with building lines and with each other. Secure to prevent movement.

N. Install accessories furnished with each luminaire.

O. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within fixture; use flexible conduit.

P. Connect luminaires to branch circuit outlets provided under Section 26 0537 using flexible conduit.

Q. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

R. Bond products and metal accessories to branch circuit equipment grounding conductor.

S. Install specified lamps in each luminaire.

T. Exit Signs:
1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

3.4 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Perform field inspection in accordance with Section 01 4000.

D. Operate each luminaire after installation and connection to verify proper operation.

E. Test self-powered exit signs and emergency lighting units to verify proper operation upon loss of normal power supply.

F. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by DEDC, LLC.

3.5 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by DEDC, LLC. Secure locking fittings in place.

B. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by DEDC, LLC or authority having jurisdiction.

C. Aim and adjust fixtures as directed.

3.6 CLEANING

A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

B. Clean electrical parts to remove conductive and deleterious materials.

C. Remove dirt and debris from enclosures.

D. Clean finishes and touch up damage.

3.7 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. Just prior to Substantial Completion, replace all lamps that have failed.

3.8 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

3.9 PROTECTION

A. Replace luminaires that have failed lamps or drivers at Substantial Completion.

3.10 SCHEDULE - See Drawings

END OF SECTION 26 5100

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SECTION 26 5600 - EXTERIOR LIGHTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Exterior luminaires.

B. Ballasts.

C. Poles and accessories.

D. Luminaire accessories.

1.2 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Materials and installation requirements for concrete bases for poles.

B. Section 26 0526 - Grounding and Bonding for Electrical Systems.

C. Section 26 0529 - Hangers and Supports for Electrical Systems.

D. Section 26 0533.16 - Boxes for Electrical Systems.

1.3 REFERENCE STANDARDS

A. IEEE C2 - National Electrical Safety Code; 2017.

B. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products; 2008.

C. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules; 2015, with Errata (2017).

D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

E. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems; 2006.

F. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2016.

G. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2012.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 1598 - Luminaires; Current Edition, Including All Revisions.

J. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
1. Coordinate placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under other sections or by others. Coordinate elevation to obtain specified foundation height.
2. Notify DEDC, LLC of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:
1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
2. Provide photometric calculations where luminaires are proposed for substitution upon request.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.
1. LED Luminaires:
a. Include estimated useful life, calculated based on IES LM-80 test data.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.8 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for all LED luminaires, including drivers.

PART 2 PRODUCTS

2.1 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

B. Substitutions: See Section 01 6000 - Product Requirements.

2.2 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

G. Provide luminaires listed and labeled as suitable for wet locations unless otherwise indicated.

H. Recessed Luminaires:
1. Ceiling Compatibility: Comply with NEMA LE 4.
2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.
3. Luminaires Recessed in Sloped Ceilings: Provide suitable sloped ceiling adapters.

I. LED Luminaires:
1. Components: UL 8750 recognized or listed as applicable.
2. Tested in accordance with IES LM-79 and IES LM-80.
3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

J. LED Tape Lighting Systems: Provide all power supplies, drivers, cables, connectors, channels, covers, mounting accessories, and interfaces as necessary to complete installation.
1. LED Tape - General Requirements:
   a. Listed.
   b. Designed for field cutting in accordance with listing.

2.3 DRIVERS

A. Drivers - General Requirements:

1. Minimum Efficiency/Efficacy: Provide drivers complying with all current applicable federal and state ballast efficiency/efficacy standards.
2. Electronic Ballasts/Drivers: Inrush currents not exceeding peak currents specified in NEMA 410.

B. Dimmable LED Drivers:
1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.
2. Control Compatibility: Fully compatible with the dimming controls to be installed.

2.4 POLES

A. All Poles:
1. Provide poles and associated support components suitable for the luminaire(s) and associated supports and accessories to be installed.
2. Material: Steel, unless otherwise indicated.
3. Shape: Round straight, unless otherwise indicated.
4. Finish: Match luminaire finish, unless otherwise indicated.
5. Mounting: Install on concrete foundation, height as indicated on the drawings, unless otherwise indicated.

2.5 ACCESSORIES

A. Stems for Suspended Luminaires: Steel tubing, minimum 1/2" size, factory finished to match luminaire or field-painted as directed.

B. Threaded Rods for Suspended Luminaires: Zinc-plated steel, minimum 1/4" size, field-painted as directed.

C. Provide accessory plaster frames for luminaires recessed in plaster ceilings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires in accordance with NECA/IESNA 501.

D. Provide required support and attachment in accordance with Section 26 0529.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Recessed Luminaires:
1. Install trims tight to mounting surface with no visible light leakage.
2. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.

G. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to bottom of luminaire.

H. Pole-Mounted Luminaires:
1. Maintain the following minimum clearances:
   a. Comply with IEEE C2.
   b. Comply with utility company requirements.
2. Foundation-Mounted Poles:
   a. Install foundations plumb.
   b. Install poles plumb, using leveling nuts or shims as required to adjust to plumb.
   c. Tighten anchor bolt nuts to manufacturer's recommended torque.
   d. Install non-shrink grout between pole anchor base and concrete foundation, leaving small channel for condensation drainage.
3. Grounding:
   a. Bond luminaires, metal accessories, metal poles, and foundation reinforcement to branch circuit equipment grounding conductor.
4. Install separate service conductors, 12 AWG copper, from each luminaire down to handhole for connection to branch circuit conductors.

I. Install accessories furnished with each luminaire.

J. Bond products and metal accessories to branch circuit equipment grounding conductor.

K. Install lamps in each luminaire.

3.4 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Operate each luminaire after installation and connection to verify proper operation.

D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by DEDC, LLC.

3.5 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by DEDC, LLC. Secure locking fittings in place.

3.6 CLEANING

A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.7 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. Just prior to Substantial Completion, replace all lamps that have failed.

3.8 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION 26 5600

SECTION 27 0526 - GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Grounding and bonding requirements for communications and radio systems, in compliance with Motorola Solutions R-56, “Standards and Guidelines for Communication Sites.”

B. Conductors for grounding and bonding.

C. Connectors for grounding and bonding.

D. Grounding busbars, including the Primary Bonding Busbar (PBB), Secondary Bonding Busbar(s) (SBB), Entry Point SBB, and Telecommunications Grounding Busbars (TGB).

E. Internal Perimeter Bonding Busbar (IPBB) / Halo Ground Ring.

F. Coaxial surge suppression (polyphasers) at the antenna transmission-line entrance.

G. Rack and cabinet grounding busbars.

H. Bonding of the lightning protection system to roof- and building-mounted antenna masts and support structures.

I. Grounding labeling.

J. Provide all components necessary to complete the communications grounding and bonding system(s) consisting of:
   1. Primary Bonding Busbar (PBB), a.k.a. Telecommunications Main Grounding Busbar (TMGB); tagged “MSBB” on the Drawings.
   2. Secondary Bonding Busbar(s) (SBB); tagged “SBB1” and “SBB2” on the Drawings.
   3. Entry Point SBB, with coaxial surge suppressors.
   4. Bonding backbone conductor between the PBB and each SBB.
   5. Internal Perimeter Bonding Busbar (IPBB) / Halo Ground Ring.
   6. Individual Equipment Bonding Conductors and Rack/Cabinet Bonding Busbars.
   7. Common grounding electrode system specified in Section 26 0526, including the building ground ring.

1.2 DEFINITIONS

A. PBB: Primary Bonding Busbar (a.k.a. Master/Telecommunications Main Grounding Busbar, or MCBB/TMGB).

B. SBB: Secondary Bonding Busbar.

C. IPBB: Internal Perimeter Bonding Busbar, also referred to as the “Halo” Ground Ring.

D. TBC: Telecommunications Bonding Conductor.

E. TEBC: Telecommunications Equipment Bonding Conductor.

F. TGB: Telecommunications Grounding Busbar.

G. R-56: Motorola Solutions "Standards and Guidelines for Communication Sites," current edition, as adopted by the radio system provider / Authority Having Jurisdiction.

H. Standard Duty (Type B) Site: An R-56 site classification, per R-56 Table 4-4, for a site that houses public-safety or mission-critical communications installations; this Project classifies as Standard Duty (Type B), "Building Only," as there is no separate communications tower.

1.3 RELATED REQUIREMENTS

A. Section 26 0526 - Grounding and Bonding for Electrical Systems: Building common grounding electrode system, building ground ring, ground rod electrodes, concrete-encased electrode, and bonding of the lightning protection system grounding electrode to the building grounding electrode system. The communications grounding system specified in this Section bonds to, and is not separate or isolated from, that system.

B. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Oxide inhibiting compound.

C. Section 26 0536 - Cable Trays for Electrical Systems: Additional grounding and bonding requirements for cable tray systems shared with the electrical system.

D. Section 27 0000 - Common Work Results for Communications: General quality assurance requirements for communications work.

E. Section 27 0528 - Pathways for Communications Systems: Grounding bushings for ferrous metallic conduit containing grounding and bonding conductors.

F. Division 27 Sections for Communications Systems Equipment: Radio equipment, antennas, and transmission lines requiring the grounding and bonding specified in this Section.

1.4 REFERENCE STANDARDS

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2018).

B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011 (Reapproved 2017).

C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010 (Reapproved 2014).

D. BICSI TDMM - Telecommunications Distribution Methods Manual, 15th Edition; 2024.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

F. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; 2007.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. NFPA 780 - Standard for the Installation of Lightning Protection Systems; 2017.

I. TIA-607 - Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises; 2015c, with Addendum (2017).

J. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.

K. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

L. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.

M. UL 891 - Switchboards; Current Edition, Including All Revisions.

N. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

O. ANSI/TIA-607-C - Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises; 2015.

P. Motorola Solutions R-56 - Standards and Guidelines for Communication Sites; current edition (Doc. No. 68P81089E50).

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
1. Coordinate the work of this Section with Section 26 0526 to ensure a single, common grounding electrode system serves both the electrical and the communications/radio grounding systems. Do not install a separate or isolated ground system for communications or radio equipment.
2. Verify the R-56 site classification with the Engineer prior to rough-in: this facility classifies as Standard Duty (Type B), “Building Only,” per R-56 Table 4-4 and Table 4-17.
3. Coordinate routing of the bonding backbone conductor and the single-point entry window wall penetration with the structural and general trades.
4. Coordinate location and routing of lightning protection system down conductors and the antenna mast / external ground busbar bonding connection with the lightning protection installer.
5. Notify DEDC, LLC of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
1. Install the PBB and bonding backbone conductor before installation of interior finishes that would conceal the routing path.
2. Do not energize or place into service radio transmission equipment until the grounding and bonding system required by this Section has been installed, inspected, and tested.

1.6 PERFORMANCE REQUIREMENTS

A. Grounding System Resistance: The common grounding electrode system specified in Section 26 0526 (5 ohms) governs and satisfies the R-56 Table 4-17 resistance design goal (10 ohms) applicable to this Standard Duty (Type B) site; no separate resistance requirement applies to the communications grounding system.

B. Bonding Resistance: Not greater than 100 milliohms between any TGB/SBB and the nearest available grounding electrode, when tested per BICSI TDMM procedures.

1.7 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components, including coaxial surge suppressors.

C. Shop Drawings: Include plans showing locations and sizes of grounding and bonding infrastructure, including the following:
1. PBB, SBB(s), Entry Point SBB, IPBB/Halo Ground Ring, and TGBs, including routing of the bonding backbone conductor and Individual Equipment Bonding Conductors.

D. Test Reports: Indicate overall bonding resistance between each TGB/SBB/PBB and the nearest available grounding electrode, and ground loop current measurements.

E. As-Built Submittals: Updated versions of all Action Submittals, updated to indicate as-built products/conditions.

F. Closeout Submittals: As-Built Submittal documents; warranty documentation.

1.8 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70 and R-56.

B. Installer Qualifications: Cabling/grounding Installer must have personnel certified by BICSI on staff.
1. Refer to Section 27 0000 - Common Work Results for Communications, which identifies general quality assurance requirements for the Project.
2. Installation Supervision: Installation shall be under the direct supervision of an ITS Technician, who shall be present at all times when work of this Section is performed at the Project site.
3. Field Inspector: Currently registered by BICSI as a Registered Communications Distribution Designer (RCDD) to perform the on-site inspection.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

B. Products: Listed and classified by Underwriters Laboratories Inc., or other Nationally Recognized Testing Laboratory (NRTL), as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 GROUNDING AND BONDING REQUIREMENTS

A. Do not use products for applications other than as permitted by NFPA 70, R-56, and product listing.

B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete communications grounding and bonding system in accordance with R-56.

C. Where conductor size is not indicated, size to comply with NFPA 70 and R-56 but not less than applicable minimum size requirements specified.

D. Common Grounding Electrode System:
1. Do not provide a separate or isolated grounding electrode system for the communications or radio system. Bond the PBB to the building's common grounding electrode system specified in Section 26 0526.
2. All grounding electrodes serving the building or structure — ground rods, building ground ring, concrete-encased (Ufer) electrode, metal underground water pipe, building steel, and the lightning protection system grounding electrode — shall be bonded together into one common grounding electrode system in accordance with R-56 and NFPA 70/780.

E. Site Classification and Ground Ring Requirements:
1. This facility houses public-safety and mission-critical communications/radio equipment and has no separate communications tower; the site classifies as R-56 Standard Duty (Type B), “Building Only,” per R-56 Table 4-4 and Table 4-17.
2. Building Ground Ring: Required. Provide in accordance with Section 26 0526 and R-56 Section 4.6.1.11: bare or tinned-copper conductor not less than 2 AWG, buried not less than 30 inches deep, with ground rods at intervals not exceeding 15 feet, bonded to the common grounding electrode system.
3. Tower Ground Ring: Not applicable. There is no separate communications tower at this site; antennas are building/roof-mounted.

F. Primary Bonding Busbar (PBB):
1. Provide one PBB per building at the electrical service entrance / single-point grounding location, in accordance with R-56 Section 5.10.
2. Bond the PBB to the building's common grounding electrode system with a grounding electrode conductor not smaller than the size of the bonding backbone conductor served, routed via the electrical service equipment grounding system.
3. Bond the PBB to communications/carrier entrance protectors and to effectively grounded building steel serving the equipment room, where present.

G. Secondary Bonding Busbar (SBB):
1. Provide an SBB in each radio equipment room or telecommunications space containing communications or radio equipment, in accordance with R-56 Section 5.10 and TIA-607-C.
2. Bond each SBB to the PBB with a bonding backbone conductor not smaller than No. 6 AWG, installed without splice.
3. Where more than one SBB is required, bond each SBB independently to the bonding backbone conductor; do not daisy-chain SBBs in series.

H. Entry Point Secondary Bonding Busbar and Coaxial Surge Suppression:
1. Provide an Entry Point SBB at the location where antenna transmission lines (coaxial cable) enter the building.
2. Provide a coaxial surge suppressor (“polyphaser”) at the Entry Point SBB for each transmission line, bonded directly to the Entry Point SBB with the shortest practicable bonding conductor.
3. Provide an interior coaxial surge suppressor at the single-point entry window into the radio equipment room, in addition to the exterior Entry Point SBB, where indicated.

I. Internal Perimeter Bonding Busbar (IPBB) / Halo Ground Ring:

1. Where indicated, provide an internal perimeter ("halo") ground ring within the radio equipment room, bonded to the SBB, for bonding of ancillary metal only: conduit, cable tray, and door frames, and similar normally non-current-carrying metal.
2. The IPBB/Halo Ground Ring shall not be used to bond equipment racks, cabinets, or chassis directly; equipment bonding shall land on the PBB, an SBB, or a Rack Bonding Busbar.
3. The IPBB/Halo Ground Ring is an internal bonding conductor, distinct from the external building ground ring specified in Section 26 0526; one shall not be substituted for the other.

J. Rack and Cabinet Bonding:
1. Provide a Rack Bonding Busbar in each equipment rack or cabinet containing radio, RF, or associated electronic equipment.
2. Bond each Rack Bonding Busbar to the SBB (or, where no SBB is provided in that space, to the nearest TGB) with an Individual Equipment Bonding Conductor not smaller than No. 6 AWG.
3. Bond each piece of powered rack- or cabinet-mounted equipment chassis to the rack or cabinet grounding busbar.

K. Lightning Protection System Bonding:
1. Where a lightning protection system (LPS) is provided, bond the roof-mounted antenna mast(s) and external ground busbar (EGB) directly to the LPS in accordance with R-56 Section 4.14.3; no additional grounding electrode is required for the antenna mast under this condition.
2. Where an LPS is not provided, bond the antenna mast/EGB to the building's grounding electrode system via not less than two down conductors, separated, or via effectively grounded building steel, in accordance with R-56 Section 4.14.4.
3. Do not use a grounding electrode dedicated to the lightning protection system as a separate or isolated component of the communications grounding system; bond the LPS grounding electrode(s) and the common grounding electrode system together in accordance with NFPA 70, NFPA 780, and R-56.

L. Cable Tray Systems: Also comply with Section 26 0536 and Section 27 0528.

2.2 GROUNDING AND BONDING COMPONENTS

A. General Requirements:
1. Provide products listed, classified, and labeled as suitable for the purpose intended.
2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors:
1. Comply with UL 486A-486B.
2. Insulated Conductors: Stranded copper wire, green or green with yellow stripe insulation, insulated for 600 V, and complying with UL 83.
    a. Ground wire for custom-length equipment ground jumpers shall be a minimum of a No. 6 AWG, 19-strand, UL-listed, Type THHN wire.
3. Bare Copper Conductors:
    a. Solid Conductors: ASTM B3.
    b. Stranded Conductors: ASTM B8.
    c. Tinned Conductors: ASTM B33.
4. Bonding Backbone Conductor (PBB to each SBB): Minimum No. 6 AWG stranded copper, or larger where required by length of run per R-56; install without splice.

5. Individual Equipment Bonding Conductor / Rack Bonding Conductor: Minimum No. 6 AWG stranded copper.
6. IPBB/Halo Ground Ring Conductor: Minimum No. 6 AWG bare or insulated copper, unless a larger size is indicated.
7. Bonding Jumper (busbar-to-busbar, flexible): Tinned-copper tape or braided conductors terminated with two-hole copper ferrules, 1-5/8 inches wide and 1/16 inch thick.

C. Connectors:
1. Irreversible connectors listed for the purpose. Listed by an NRTL as complying with NFPA 70 for specific types, sizes, and combinations of conductors and other items connected. Comply with UL 486A-486B.
2. Compression Wire Connectors: Crimp-and-compress connectors that bond to the conductor when the connector is compressed around the conductor. Comply with UL 467.
   a. Electroplated tinned copper, C and H shaped.
3. Busbar Connectors: Cast silicon bronze, solderless compression or exothermic-type mechanical connector; with a long barrel and two holes spaced on 5/8- or 1-inch (15.8- or 25.4-mm) centers for a two-bolt connection to the busbar.
4. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
5. Unless otherwise indicated, use exothermic welded connections for underground, concealed, and other inaccessible connections.
6. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.

D. Grounding Busbars:
1. TGB / SBB / Entry Point SBB: Predrilled rectangular bars of hard-drawn solid copper, ¼ inch by 2 inches in cross section, length as indicated on Drawings. The busbar shall be for wall mounting, shall be NRTL listed as complying with UL 467, and shall comply with TIA-607-C.
   a. Predrilling shall be with holes for use with lugs specified in this Section.
   b. Mounting Hardware: Stand-off brackets that provide at least a 2-inch clearance to access the rear of the busbar. Brackets and bolts shall be stainless steel.
   c. Stand-off insulators for mounting shall be Lexan or PVC. Comply with UL 891 for use in 600-V switchboards, impulse tested at 5000 V.
2. Primary Bonding Busbar (PBB): 1/4 by 4 by 12 inches minimum, or as indicated; coordinate exact size and mounting location with Section 26 0526. Mounting height: 18 inches above finished floor unless otherwise indicated.
3. Rack and Cabinet Grounding Busbars: Rectangular bars of hard-drawn solid copper, accepting conductors ranging from No. 14 to No. 2/0 AWG, NRTL listed as complying with UL 467, and complying with TIA-607-C. Predrilling shall be with holes for use with lugs specified in this Section.
   a. Cabinet-Mounted Busbar: Terminal block, with stainless-steel or copper-plated hardware for attachment to the cabinet. Minimum cross sectional area equal to a 6 AWG wire.
   b. Rack-Mounted Horizontal Busbar: Designed for mounting in 19- or 23-inch equipment racks. Include a copper splice bar for transitioning to an adjoining rack, and stainless-steel or copper-plated hardware for attachment to the rack. Minimum cross sectional area equal to a 6 AWG wire.
   c. Rack-Mounted Vertical Busbar: 72 or 36 inches long, with stainless-steel or copper-plated hardware for attachment to the rack. Minimum cross sectional area equal to a 6 AWG wire.

d. Ground Terminal Block: Designed for attaching ground wires to racks or cabinets. Include extruded, high-strength aluminum two mounting hole ground terminal block with stainless steel set screws.

E. Compression Lugs:
1. Meets TIA-607-C requirements for network systems grounding applications.
   a. Tested by Telcordia — meets NEBS Level 3 with AWG conductor.
2. UL Listed and CSA Certified with AWG conductor for use up to 35 kV and temperature rated 90°C when crimped with manufacturer-specified crimping tools and dies.
3. Have an “inspection window” over tongue to visually assure full conductor insertion.
4. Tin-plated to inhibit corrosion.
5. Available with NEMA and BICSI hole size and spacing.
6. Compression type, with two holes and various hole spacing to fit the busbar.
7. Long barrel that will allow a minimum of two crimps, with standard industry colors.
8. Crimped according to manufacturer's recommendation.
9. Size:
   a. No. 2/0 AWG.
   b. No. 6 AWG.
   c. Material: Copper or alloy copper.

F. Coaxial Surge Suppressors (Polyphasers): Gas-discharge-tube or equivalent solid-state surge suppressor, rated for the frequency and power of the transmission line served, with weatherproof housing for exterior (Entry Point) units.

G. Ground Rod Electrodes: Comply with NEMA GR 1; copper-bonded (copper-clad) steel; 3/4 inch diameter by 10 feet length, unless otherwise indicated. Refer to Section 26 0526 for ground rod electrodes forming the building's common grounding electrode system.

H. Oxide Inhibiting Compound: Comply with Section 26 0519.

I. Labeling:
1. Comply with TIA/EIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.
2. 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. Overlay shall provide a weatherproof and UV-resistant seal for label.
3. Label each TGB/SBB with “fs-SBB,” where “fs” is the telecommunications space identifier for the space containing the SBB; label the PBB “MSBB” to match the Drawings.
4. Label each TBC/bonding backbone conductor at its attachment point: “WARNING! TELECOMMUNICATIONS BONDING CONDUCTOR. IF THIS CONNECTOR OR CABLE IS LOOSE OR MUST BE REMOVED, PLEASE CALL THE BUILDING TELECOMMUNICATIONS MANAGER.”

2.3 MANUFACTURERS

A. Grounding Busbars and Hardware: Chatsworth Products, Inc.; www.chatsworth.com.

B. Coaxial Surge Suppressors: PolyPhaser; www.polyphaser.com.

C. Substitutions: See Section 01 6000 - Product Requirements.

2.4 ELECTRODES

A. Ground rod electrodes, the concrete-encased (Ufer) electrode, and the building ground ring forming the common grounding electrode system are specified in Section 26 0526; also comply with R-56 Section 4.6.1.11 for the building ground ring.

2.5 CONNECTORS AND ACCESSORIES

A. Mechanical Connectors: Bronze.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine the building's common grounding electrode system and ac grounding, specified in Section 26 0526, for compliance with requirements for maximum ground-resistance level and other conditions affecting performance of the communications grounding and bonding system.

B. Verify the R-56 site classification (Standard Duty, Type B, Building Only) and confirm the building ground ring, ground rod electrodes, and concrete-encased electrode required by Section 26 0526 are installed and tested prior to connection of the PBB.

C. Inspect the test results of the ac/common grounding system measured at the point of TBC/PBB connection.

D. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

E. Proceed with connection of the TBC/PBB only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with NECA 1.

B. Comply with TIA-607-C.

C. Bonding shall include the ac utility power service entrance, the communications/antenna cable entrance, and the grounding electrode system. The bonding of these elements shall form a loop so that each element is connected to at least two others, in accordance with the R-56 common grounding principle.

D. Common Grounding: Bond the PBB to the building's common grounding electrode system specified in Section 26 0526. Do not install a separate or isolated ground system for communications or radio equipment.

E. Conductors: Install solid conductor for No. 8 AWG and smaller and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
   1. The bonding conductors between the TGB/SBB and structural steel of steel-frame buildings shall not be smaller than No. 6 AWG.

F. 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.

G. Conductor Support: Secure grounding and bonding conductors at intervals of not less than 36 inches.

H. Grounding and Bonding Conductors:
1. Install in the straightest and shortest route between the origination and termination point, and no longer than required. The bend radius shall not be smaller than ten times the diameter of the conductor. No one bend may exceed 90 degrees.
2. Install without splices.
3. Support at not more than 36-inch intervals.
4. Install grounding and bonding conductors without conduit. Where installation in conduit is required, install in 3/4-inch PVC conduit until conduit enters a telecommunications or radio equipment room. The grounding and bonding conductor pathway through a plenum shall be in EMT. Conductors shall not be installed in EMT unless otherwise indicated.
    a. If a grounding and bonding conductor is installed in ferrous metallic conduit, bond the conductor to each end of the conduit using a grounding bushing that complies with requirements in Section 27 0528 “Pathways for Communications Systems.”

I. Bonding Backbone Conductor (PBB to each SBB): Install continuous, without splice, in the shortest practicable route between the PBB and each SBB; where routed through the single-point entry window wall penetration, seal the penetration in accordance with manufacturer's instructions.

J. Entry Point SBB and Coaxial Surge Suppressors: Install at the point of antenna transmission-line entry to the building; bond each coaxial shield to the Entry Point SBB through its surge suppressor. Provide an interior surge suppressor at the single-point entry window into the radio equipment room, in addition to the exterior Entry Point SBB unit.

K. IPBB/Halo Ground Ring: Install within the radio equipment room, bonded to the SBB. Bond ancillary metal (conduit, tray, door frames, and similar) only; do not bond racks, cabinets, or chassis to the IPBB/Halo Ground Ring.

L. Lightning Protection System Bonding: Bond in accordance with Part 2 Article “Lightning Protection System Bonding” above and with NFPA 780; coordinate down-conductor routing and connection points with the lightning protection installer.

M. Grounding Busbars: Indicate locations of grounding busbars on Drawings. Install busbars horizontally, on insulated spacers 2 inches minimum from wall, 12 inches above finished floor unless otherwise indicated.
1. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

N. Connections:
1. Bond metallic equipment in a telecommunications or radio equipment room to the grounding busbar (SBB, TGB, or Rack Bonding Busbar) in that room, using equipment grounding conductors not smaller than No. 6 AWG.
2. Stacking of conductors under a single bolt is not permitted when connecting to busbars.
3. Assemble the wire connector to the conductor, complying with manufacturer's written instructions and as follows:
    a. Use crimping tool and the die specific to the connector.
    b. Pre-twist the conductor.

c. Apply an antioxidant compound to all bolted and compression connections.

4. Telecommunications Enclosures and Equipment Racks: Bond metallic components of enclosures to the telecommunications bonding and grounding system. Install rack grounding busbar or terminal block as indicated on the Drawings unless the enclosure and rack are manufactured with the busbar. Bond the equipment grounding busbar or terminal block to the TGB/SBB with a TEBC not smaller than No. 6 AWG.
5. Structural Steel: Bond each TGB/SBB to the vertical steel of the building frame.
6. Rack- and Cabinet-Mounted Equipment: Bond powered equipment chassis to the cabinet or rack grounding bar. Power connection shall comply with NFPA 70; the equipment grounding conductor in the power cord of cord- and plug-connected equipment shall be considered as a supplement to bonding requirements in this Section.
7. Access Floors: Bond all metal parts of access floors to the TGB, where access floors are provided.
8. Equipment Room Signal Reference Grid: Provide a low-impedance path between telecommunications cabinets, equipment racks, and the reference grid, using No. 6 AWG bonding conductors.
   a. Install the conductors in grid pattern on 4-foot centers, allowing bonding of one pedestal from each access floor tile.
   b. Bond the TGB of the equipment room to the reference grid at two or more locations.
   c. Bond all conduits and piping entering the equipment room to the TGB at the perimeter of the room.

O. Cable Trays:
1. Bonding jumpers shall be installed at all cable tray splices and connection points unless the cable tray has labeling that identifies it as suitable for use as a grounding (earthing) conductor and it meets the requirements of NFPA 70, Article 392.7(B). Cable trays shall have bolted splices, and the connection points shall use splined shoulder bolts which bite into the side rail of the cable tray to ensure a positive bond between sections. All bolts must be properly installed at each splice in the cable tray system per the manufacturer's instructions. Care must be taken to ensure a continuous electrical path. Bonding jumpers must be used where discontinuities such as expansion splice plates and hinged splice plates exist.
2. Cable trays shall not be utilized as a ground bus conductor for equipment or ancillary support apparatus.

P. Identification:
1. Labels shall be preprinted or computer-printed type.
   a. Label each TGB/SBB with “fs-SBB,” where “fs” is the telecommunications space identifier for the space containing the SBB; label the PBB “MSBB” to match the Drawings.
   b. Label each TBC/bonding backbone conductor at its attachment point: “WARNING! TELECOMMUNICATIONS BONDING CONDUCTOR. IF THIS CONNECTOR OR CABLE IS LOOSE OR MUST BE REMOVED, PLEASE CALL THE BUILDING TELECOMMUNICATIONS MANAGER.”

Q. Identify grounding and bonding system components in accordance with Section 26 0553.

3.3 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Perform tests and inspections.

1. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
2. Test the bonding connections of the system using an AC earth ground-resistance tester, taking two-point bonding measurements in each telecommunications/radio equipment room containing a TGB/SBB/PBB, using the process recommended by BICSI TDMM. Conduct tests with the facility in operation.
    a. Measure the resistance between the busbar and the nearest available grounding electrode. The maximum acceptable value of this bonding resistance is 100 milliohms.
3. Test for ground loop currents using a digital clamp-on ammeter, with a full-scale of not more than 10 A, displaying current in increments of 0.01 A at an accuracy of plus/minus 2.0 percent.
    a. With the grounding infrastructure completed and the communications system electronics operating, measure the current in each TGB/SBB. Maximum acceptable ac current level is 1 A.

C. Excessive Ground Resistance: If resistance to ground at the PBB or common grounding electrode system exceeds the value specified in Section 26 0526 (5 ohms) — which governs and satisfies the R-56 Table 4-17 design goal (10 ohms) for this Standard Duty (Type B) site — notify Engineer promptly and include recommendations to reduce ground resistance.

D. Grounding system will be considered defective if it does not pass tests and inspections.

E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

F. Prepare test and inspection reports.

END OF SECTION 27 0526

SECTION 27 1000 - DATA & VOICE COMMUNICATIONS CABLING

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:
1. Data & Voice Communications Cabling Standards

B. Related Sections: The following sections contain requirements that relate to this section:
1. Division 26 Electrical Materials and Methods sections.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for the following products:
1. Cable
2. Data & Voice jacks and faceplates

1.4 DELIVERY, STORAGE AND HANDLING

A. Store and handle cable and hardware to prevent damage during construction.

B. Store and handle device boxes and conduit to prevent damage during construction.

PART 2 PRODUCTS & MANUFACTURERS

2.1 Available Manufacturers: Subject to compliance with requirements, the following products may be incorporated in the work:

2.2 PLENUM CATEGORY 6 CABLE

A. 23 AWG, 4 pair, White for Voice & Data
1. Commscope Part # 7504 (1000 ft. reel)
2. Commscope Part # 7504 (1000 ft. tote box)
3. HITACHI Part # 30183-8 (1000 ft. reel)
4. HITACHI Part # 30183-8 (1000 ft. tote box)
5. Hubbell Part # C6SPW (1000 ft. reel)

6. Hubbell Part # C6RPW (1000 ft. tote box)

2.3 Category 6 Data & Voice Jacks

A. Hubbell Part #HXJ6EI
   1. T568B, Electrical Ivory

B. Or approved Equal

2.4 Faceplates for Data & Voice

A. Hubbell Part # IFP14EI (4 Port Plate)
   1. IFP PLATES SINGLE-GANG Electrical Ivory

B. Or approved Equal

C. Hubbell Part # P630SR1GC6
   1. Recessed 8-position Category 6, gray jack, RJ45
   2. Only for wall phones

D. Or approved Equal

2.5 Blank Dust Covers for Faceplates

A. Hubbell Part # SFBE10

B. Or approved Equal

2.6 Blank Dust Covers for Data & Voice Jacks

A. Hubbell Part # HXJDC25

B. Or approved Equal

2.7 Termination Tools

A. Punch Down Tool with 110 Blade, BIX Blade & 66 Blade.
   1. When terminating on the new Hubbell CAT 6 jacks for both DATA & VOICE, the tools of choice is: PUNCH-DOWN TOOL,(1-PUNCH) Part number - HUBBELL TX4P.
   2. Or approved Equal

2.8 Termination Tools

A. Punch Down Tool with 110 Blade, BIX Blade & 66 Blade.
   1. When terminating on the new Hubbell CAT 6 jacks for both DATA & VOICE, the tools of choice is: PUNCH-DOWN TOOL,(1-PUNCH) Part number - HUBBELL TX4P.
   2. Or approved Equal

2.9 Wall/Floor/Decking Penetration Fire rated pathway (EZ-Path)

A. Single Series 44 Pathway Through Finished Walls
1. Part Number EZDP44
   a. Single Wall Plate Kit is designed to allow a single Series 44 Pathway to be installed in a 6 in. (152 mm) round opening or 4-1/8 in (105 mm) x 4-5/8 in (118 mm) opening.
2. Or approved Equal

B. Single Series 44 Pathway Through Floors
1. Part Number EZDP144FK
   a. Circular Wall Plate Kits allow a single Series 33 Pathway to be installed in a 4 in. (102 mm) round opening or 3 in. (76 mm) x 3 in. (76 mm) square opening.
2. Part Number EZDP133CWK
   a. The Split Floor Plate Kit is designed to allow a single Series 44 Pathway to be installed in a 6 in. (152 mm) round opening or 4-1/8 in. (105 mm) x 4-5/8 in. (118 mm) opening. Split plate is designed to permit use with previously installed cables.
3. Or approved Equal

C. Multiple or Ganged Pathway Installations
1. Part Number EZP544W
   a. Multi-Gang Wall Brackets are designed to allow 1 to 5 Series 44 Pathways to be installed in finished walls or as the wall is being built. Plates attach directly to studs and pathways are installed prior to application of gypsum board. Brackets are suitable for attachment to studs spaced up to 24 in. (610 mm). Single Wall Plate Kit is designed to allow a single Series 44 Pathway to be installed in a 6 in. (152 mm) round opening or 4-1/8 in (105 mm) x 4-5/8 in (118 mm) opening.
2. Or approved Equal

D. Series 44 Pathways Modular Floor Grid Systems utilize the high volume
1. Part Number EZDG444 Capacity: 4 Pathways
   a. Sold complete with grid and pathways.
   b. Multi-Gang Wall Brackets are designed to allow 1 to 5 Series 44 Pathways to be installed in finished walls or as the wall is being built. Plates attach directly to studs and pathways are installed prior to application of gypsum board. Brackets are suitable for attachment to studs spaced up to 24 in. (610 mm). Single Wall Plate Kit is designed to allow a single Series 44 Pathway to be installed in a 6 in. (152 mm) round opening or 4-1/8 in. (105 mm) x 4-5/8 (118 mm) opening.
2. Or approved Equal

E. NOTE: Ordering Details
1. • Plate packs include plates, gaskets, set screws and labels.
2. • Purchase Pathways (EZD44) and appropriate fasteners separately.

PART 3 EXECUTION

3.1 EXAMINATION

A. Prior to starting work, examine condition of site and existing hardware already in place with Owner's Representative present. Check all existing lines and levels indicated. Report any discrepancies with the construction documents, in writing, to the Owner's Representative.

3.2 Contractor Qualifications and Training

A. The Contractor shall be fully conversant and capable in the cabling of low voltage applications such as, but not limited to data, voice and imaging network systems. The Contractor shall at a minimum possess the following qualifications:
   1. Possess those licenses/permits required to perform both Data & Telecommunications installations in the specified jurisdiction.
   2. Provide references of the type of installation provide in this specification.
   3. Personnel knowledgeable in local, state, province and national codes, and regulations. All work shall comply with the latest revision of the codes or regulations. When conflict exists between local or national codes or regulations, the most stringent codes or regulations shall be followed.
   4. Be in business a minimum of five (5) years.
   5. Must possess current liability insurance certificates.

3.3 INSTALLATION OF WALL/FLOOR/DECKING PENETRATION

A. Contractor shall provide and install approved Penetration Firestop Sleeve System. All data, video, and communications cable bundles shall utilize an enclosed fire rated pathway device wherever said cables penetrate rated walls. The fire-rated pathway shall contain a built-in fire sealing system sufficient to maintain the hourly fire rating of the barrier being penetrated. The self-contained sealing system shall automatically adjust to the installed cable loading and shall permit cables to be installed, removed, or retrofitted without the need to adjust, remove or reinstall firestop materials.

3.4 INSTALLATION OF CABLING

A. Contractor shall provide and install data & voice cables from device jack to specified data termination closet, where end will be rolled up for future termination by the City. Contractor shall terminate cables at wiring device end and clearly label both ends with Owner's numbering system.

B. Materials to be furnished may be subject to inspection at the factory, in the warehouse or in the field by the Owner's Representative or by qualified inspectors retained by the Owner's Representative.

C. Install all elements of the data & voice communications system in accordance with Division 16 Basic Materials and Methods Sections.

D. All Category 6 data wiring to be installed in accordance with IEEE/EIA/TIA 802.3 standards for 100 BASE-TX.

E. All Category 6 voice wiring will be installed in accordance with Telephone and Communications Industry Standards.

F. All UTP and fiber optic cables shall conform to ANSI/TIA/EIA-568-B Commercial Building Telecommunications Cabling Standard (latest amendment and including all applicable addenda) and ISO/IEC 11801 (International) Generic Cabling for Customer Premises standard (latest amendment and including all applicable addenda).

G. All communications wiring shall be installed in a 4” square 2 1/8” deep back box with a single gang tile ring, with a 1" conduit stubbed above the ceiling, not to exceed four per conduit and four jacks per box. Any additional wiring shall require additional conduit and back boxes. Again not to exceed four wires per conduit and per back box.

3.5 LABELING FOR DATA

A. Each new wire should be labeled as follows; closet # - patch panel letter - port # (Example: 6131-A-001). Labels shall be located 1/4"-1" from both ends of each wire. The jack faceplate of each new wire shall be similarly labeled. The contractor shall also label the front of each patch panel port with a P-TOUCH label showing the room number of the corresponding jack. The Owner's Representative will provide the closet number, patch panel letter(s) and available patch panel port numbers.

3.6 LABELING FOR VOICE

A. Device outlets (FACEPLATES) are to be labeled with the closet number and followed by a hyphen then letter “V” followed by cable number. (Example:L106-V001, 2, 3, etc.)

B. Terminal BIX blocks in the closet are to be labeled with room number and followed by hyphen then letter “V” followed by cable number. (Example:L856-V001, 2, 3, etc.)

C. Wire labels shall be located 1/4"-1" from both ends of the cable with the closet number and cable number (Example:L106-V001).
1. (Example:L106-V001)

3.7 TESTING FOR DATA

A. Each installed twisted pair cable shall be tested, using a Fluke/Microtest DPS-4300 series or OMNIScanner2. When running the AUTO TEST feature the following test will executed, Length, Attenuation, Near End Crosstalk (NEXT) Loss, Power Sum Near-End Crosstalk (PSNEXT) Loss, Equal Level Far-End Crosstalk (ELFEXT),Power Sum Equal Level Far-End Crosstalk (PSELFEXT), Return Loss, Propagation Delay (ANSI/TIA/EIA-568-B-1), Longitudinal Conversion Loss (LCL), Attenuation to Crosstalk Ratio (ACR), Power Sum Attenuation to Crosstalk Ratio (PSACR) from both ends. Each circuit number will be identified using the same labeling scheme as required on the jack faceplate. Test results will be provided to the Owners Representative in both hard copy and soft copy on CD as specified in the Reports section. The Contractor may propose an equivalent testing method by submitting full documentation thereof for review by the Owner's Representative.

B. All Category 6 channels are qualified for linear transmission performance up to 300 MHz to ensure that high-frequency voltage phase and magnitude contributions do not prove cumulative or adversely affect channel performance.

C. All UTP field testers shall be factory calibrated each calendar year by the field test equipment manufacturer as stipulated by the manuals provided with the field test unit. The calibration certificate shall be provided for review prior to the start of testing.

D. Autotest settings provided in the field tester for testing the installed cabling shall be set to the default parameters.

E. Test settings selected from options provided in the field testers shall be compatible with the installed cable under test.

3.8 TESTING FOR VOICE

A. Testing for voice wires will consist of wire map and continuity.

3.9 JACK TERMINATIONS

A. Hubbell quad wall jack plate shall be used whenever a new wire for data & voice jacks are required, unless specified otherwise. If there is an existing data & voice jack within two feet of the new jack location, the existing data & voice jack shall be upgraded to a Hubbell quad wall jack.

B. Sockets 1 and 2, in that order, will normally be occupied by voice (telephone) connections. Sockets 4 and 3, in that order, will normally be the data positions on the quad jack. If 6 port single gang plate is required data will start in position 6 and work backwards. If there is no need for voice connections, positions 2 and 1, in that order, may be used for data jacks but only at the discretion of the Owner's Representative.

C. Data Termination
1. Use RJ45-TIA/EIA-568-B Configurations
2. NO SPLITTING OF PAIRS, one jack equals one cable

D. Voice Termination
1. Use RJ45-TIA/EIA-568-B Configurations
2. NO SPLITTING OF PAIRS, one jack equals one cable

PART 4 ADMINISTRATION DOCUMENTATION

4.1 Drawings

A. As-built drawing shall be supplied by the contractor showing the locations of and identifiers for all:
1. Horizontal cable routing and terminations
2. Telecommunications outlets/connectors
3. Backbone cable routing and terminations

4.2 REPORTS

A. All wires installed in the project shall be tested and documented with the completed documentation being turned over to the Owners Representative with all As Built Documentation.

4.3 Data Test Results

A. Each data wire will be tested as specified in Section 3.6. Each record must contain the identifier as specified in Labeling Section.3.4. Final results will be provided in both hard copy and soft copy format, preferably CD.

4.4 Voice Test Results

A. Each voice wire will be tested as specified in Section 3.7. Each record must contain the identifier as specified in Labeling Section 3.5. The final voice report shall be in hard copy and soft copy format preferably CD.

END OF SECTION 27 1000

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SECTION 27 5313 - CLOCK SYSTEMS - PYRAMID TIME SYSTEMS

PART 1 GENERAL

1.1 ABBREVIATIONS AND ACRONYMS

A. PoE: Power over ethernet.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate communications and electronics work for time and sequence to avoid construction delays.

1.3 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with minimum 5 years of documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. See Section 01 7419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Delivery and Acceptance Requirements:
1. Deliver materials and accessories in manufacturer's original packaging with identification labels intact.
2. Protect materials from exposure to moisture during delivery.
3. Replace damaged materials.

C. Storage and Handling Requirements: Store materials off ground in dry location, protected from exposure to fumes and harmful weather and at temperature conditions recommended by manufacturer. Store in original packaging until installed.

1.6 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Pyramid Time Systems; www.pyramidtimesystems.com/#sle.

B. Substitutions: See Section 01 6000 - Product Requirements.

C. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.

2.2 CLOCK SYSTEM REQUIREMENTS

A. Provide new clock system consisting of required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, and system programming as necessary for complete operating system.

B. Support system synchronization of clocks and devices.

C. Provide fail-proof design preventing system failure from power interruption.

D. Provide system capable of programming clocks immediately upon receipt of signal; analog and digital clocks automatically correct themselves.

E. Provide product designed, assembled, and tested in United States of America.

2.3 IP NETWORK CLOCKS

A. Basis of Design: Pyramid Time Systems, TimeTrax Sync PoE Network Clock System.

B. System Requirements:
1. Provide clock system components designed to operate using PoE as part of complete system.
2. Power Source: PoE, in accordance with IEEE 802.3af.
3. Support adjustment of settings via software from one location, including:
    a. IP address assignment.
    b. Universal or individual clock time source and zone selection.
    c. Clock name assignment.
    d. Custom daylight saving time configurations.
4. Provide system software installation on PC connected to PoE network system.
5. Provide clocks with built-in Ethernet interface for programming.

C. Software:
1. Provide desktop software interface capable of the following functions:
    a. Display features, IP settings, associated clocks, clock IP addresses, and clock settings.
    b. Selection of NTP time source.
2. Support customization of daylight saving time in event of international use or change in government regulations.
3. Product: Pyramid Time Systems, TimeTrax Sync PoE Network Clock System Software SASDLCWDXX.

D. POE NETWORK INDICATING CLOCKS
1. Analog PoE Network Indicating Clocks:
    a. UL listed; designed for PoE network system with automatic plug-and-play capability.
    b. Power Source: PoE, in accordance with IEEE 802.3; 48 VDC.
    c. Capable of receiving NTP protocol through RJ45, CAT5.
    d. Clock Display:
        1) Time: 12-hour.

2) Color: White face with black numbers.

e. Provide built-in software interface that includes the following features:
1) Password protection.
2) Clock naming.
3) Time selection interval clock receives NTP time.
4) Capability to set GMT offset for time zone configuration.
5) DHCP capability.
6) Domestic and international daylight saving time capability.

f. Materials:
1) Dial: Polystyrene.
2) Bezel: Low-profile, smooth-surface ABS, black (white face with black numbers only).
3) Crystal: Shatter-proof, side-molded, polycarbonate.

g. Hand Tolerance:
1) Hour and Minute Hands: Plus or minus 15 seconds.
2) Second Hand: Plus/minus 30 seconds.

h. Mounting: Surface-mounted security bracket.

i. Products:
1) Pyramid Time Systems, TimeTrax Sync 13-Inch Series PoE Network Analog Clock.
2) Pyramid Time Systems, TimeTrax Sync 17-Inch Series PoE Network Analog Clock.
3) Pyramid Time Systems, TimeTrax Sync 16-Inch Wood Series PoE Analog Clock.

2.4 SOURCE QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Provide individual product bench testing at manufacturer's facility; random testing is unacceptable.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer's written recommendations.

B. Integrate clock system with Owner's electrical and communications network.

C. Install wiring in accordance with requirements of authorities having jurisdiction.

D. Conceal wiring except in unfinished spaces and as approved in writing by DEDC, LLC.

E. Install clocks only after painting and other finish work is complete.

F. Install clocks and other devices square and plumb.

G. Provide grounding and bonding; see Section 26 0526.

H. Identify system wiring and components; see Section 26 0553.

3.2 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Prepare and start system in accordance with manufacturer's instructions.

C. Test for interface with other systems.

3.3 CLEANING

A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.

B. Progress Cleaning: Perform cleanup as work progresses; leave work area clean at end of each day.

C. Final Cleaning: Upon completion, remove surplus materials, rubbish, tools, and equipment.

D. Waste Management:
1. Coordinate recycling of waste materials.
2. Recycle or dispose of waste generated during construction and final cleaning.
3. Remove recycling containers and bins from site and dispose of materials.

3.4 CLOSEOUT ACTIVITIES

A. Demonstration:
1. Demonstrate operation of equipment to Owner’s designated representative.
2. Correct deficiencies or make adjustments as directed by representative.

3.5 PROTECTIONR

A. Protect installed products from subsequent construction operations.

B. Repair damage to adjacent materials caused by clock system installation.

END OF SECTION 27 5313

SECTION 28 3111 - DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM

1.1

1.2

1.3 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.4 SUMMARY

A. Section Includes:
1. Fire-alarm control unit.
2. Manual fire-alarm boxes.
3. System smoke detectors.
4. System Carbon Monoxide detectors
5. System Combination Smoke/ Carbon Monoxide detectors.
6. Duct Smoke detectors
7. Notification appliances.
8. Addressable interface device.
9. Digital alarm communicator transmitter.

1.5 DEFINITIONS

A. EMT: Electrical Metallic Tubing.

B. FACP: Fire Alarm Control Panel.

C. NICET: National Institute for Certification in Engineering Technologies.

D. PC: Personal computer

1.6 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 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.
3. Include battery-size calculations.
4. Include input/output matrix.
5. 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.
6. 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 III minimum.
   c. Licensed or certified by authorities having jurisdiction.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Field quality-control reports.

1.8 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:
   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. Record copy of site-specific software.
   g. 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.
   h. Manufacturer's required maintenance related to system warranty requirements.

i. 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.

1.9 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 and Tools: One extra set for access to locked or tamperproofed components.

1.10 QUALITY ASSURANCE

A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.

B. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level III technician.

1.11 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 Certificate of Occupancy is granted.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Source Limitations for Fire-Alarm System and Components: Provide system manufacturer's certification that all components provided have been tested as, and will operate as, a system.

B. Noncoded, 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:

1. Manual stations.
2. Smoke detectors.
3. Carbon Monoxide detectors
4. Duct Smoke detectors
5. Automatic sprinkler system water flow.

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 and remote annunciators.
3. Transmit an alarm signal to the remote alarm receiving station.
4. Record events in the system memory.
5. Shutdown respective air handling systems.
6. Turn-on all occupancy controlled egress lighting to 100% output.

C. Supervisory signal initiation shall be by one or more of the following devices and actions:
1. Valve supervisory switch.
2. Ansul System operation.

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.

E. System Supervisory Signal Actions:
1. Initiate notification appliances.
2. Identify specific device initiating the event at fire-alarm control unit and remote annunciator.
3. After a time delay of 200 seconds, transmit a trouble or supervisory signal to the remote alarm receiving station.

2.3 FIRE-ALARM CONTROL UNIT

A. Manufacturers:
1. Silent Knight IntelliKnight.
2. Notifier.
3. Or approved equal.

B. 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.

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, 80 characters, minimum.
2. Keypad: Arranged to permit entry and execution of programming, display, and control commands.

D. 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, two line(s) of 40 characters, minimum.
2. Keypad: Arranged to permit entry and execution of programming, display, and control commands.

E. Initiating-Device, Notification-Appliance, and Signaling-Line Circuits:
1. Pathway Class Designations: NFPA 72, Class B.
2. Pathway Survivability: Level 0.
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.

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. 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.

H. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.

I. 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 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.

J. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.
   1. Batteries: Sealed lead calcium.

K. 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.

2.4 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. Single-action mechanism, pull-lever 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.

2.5 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 two-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.
   7. Remote Control: Unless otherwise indicated, detectors shall be digital-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition.

B. Photoelectric Smoke Detectors:

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.).

2.6 SYSTEM CARBON MONOXIDE DETECTORS

A. General Requirements for System Carbon Monoxide Detectors:
1. Comply with UL2075; operating at 24V dc, nominal.
2. Detectors shall be two 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.
7. Remote Control: Unless otherwise indicated, detectors shall be digital-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition.

B. Carbon Monoxide Detectors:
1. Carbon Monoxide 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. Carbon Monoxide detector shall be capable of providing a temp 4 notification pattern for CO alarm indication.
3. 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.)

2.7 COMBINATION SMOKE AND CARBON MONOXIDE DETECTOR

A. General Requirements for System Carbon Monoxide Detectors:
1. Comply with UL2075 & UL268 for CO detection.
2. Uses only one address on the signaling line circuit.
3. Combination detector shall allow for separate supervisory and alarm signals for the two different detection types.

4. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
5. 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.
6. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
7. Integral Visual-Indicating Light: LED type, indicating detector has operated.
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.

B. Combination Smoke and Carbon Monoxide Detectors:
1. Sensor: The detector shall be a combination smoke and carbon monoxide utilizing four sensing technologies including photoelectric, infrared, heat and carbon monoxide.
2. Capable of providing temp 3 pattern for fire alarm notification and temp 4 pattern for carbon monoxide alarm notification.
3. 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.)

2.8 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. General Requirements for Notification Appliances: Connected to notification-appliance signal circuits, zoned as indicated, equipped for mounting as indicated, and with screw terminals for system connections.
1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated, and with screw terminals for system connections.

C. 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 from the horn, using the coded signal prescribed in UL 464 test protocol.

D. 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-high letters on the lens.
1. Rated Light Output:
   a. 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, white.

2.9 DUCT SMOKE DETECTORS:

A. Comply with UL268A. Provide relay to close smoke dampers.

2.10 ADDRESSABLE INTERFACE DEVICE

A. General:
1. Include address-setting means on the module.
2. Store an internal identifying code for control panel use to identify the module type.
3. Listed for controlling HVAC fan motor controllers.

B. Monitor Module: Microelectronic module providing a system address for alarm-initiating devices for wired applications with normally open contacts.

C. Integral Relay: Capable of providing a direct signal to elevator controller to initiate elevator recall and to circuit-breaker shunt trip for power shutdown.
1. Allow the control panel to switch the relay contacts on command.
2. Have a minimum of two normally open and two normally closed contacts available for field wiring.

D. Control Module:
1. Operate notification devices.

2.11 DIGITAL ALARM COMMUNICATOR TRANSMITTER

A. Digital alarm communicator transmitter shall be acceptable to the remote central station and shall comply with UL 632.

B. Digital alarm communicator transmitter shall be an IP-DACT type.

C. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit and automatically capture two telephone line(s) and dial a preset number for a remote central station or dial out on VOIP, as coordinated with AHJ. When contact is made with central station(s), signals shall be transmitted. If service on either line is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. Transmitter shall automatically report telephone service restoration to the central station. If service is lost on both telephone lines, transmitter shall initiate the local trouble signal.

D. Local functions and display at the digital alarm communicator transmitter shall include the following:
1. Verification that both telephone lines are available.
2. Programming device.
3. LED display.
4. Manual test report function and manual transmission clear indication.
5. Communications failure with the central station or fire-alarm control unit.

E. Digital data transmission shall include the following:
1. Address of the alarm-initiating device.
2. Address of the supervisory signal.
3. Address of the trouble-initiating device.
4. Loss of ac supply.
5. Loss of power.

6. Low battery.
7. Abnormal test signal.
8. Communication bus failure.

F. Secondary Power: Integral rechargeable battery and automatic charger.

G. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

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. Install wall-mounted equipment, with tops of cabinets not more than 78 inches above the finished floor.

C. Manual Fire-Alarm Boxes:
1. Install manual fire-alarm box where indicated within 60 inches 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 and 48 inches above floor level. All devices shall be mounted at the same height unless otherwise indicated.

D. 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.

E. Audible Alarm-Indicating Devices: Install not less than 6 inches 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.

F. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches below the ceiling. Install all devices at the same height unless otherwise indicated.

3.3 PATHWAYS

A. Pathways shall be installed in red EMT. EMT on upper floors shall not be exposed.

3.4 CONNECTIONS

A. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 36 inches from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.
   1. Supervisory connections at low-air-pressure switch of each dry-pipe sprinkler system.
   2. Ansul system.

3.5 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical 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 Architect and 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. Equipment vendor shall provide a One (1) year fire alarm monitoring contract starting at sign off of completion of project by owner. Equipment vendor shall also provide a pricing plan to owner for an optional 2 year extension contract for monitoring after the one year contract is completed.

C. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for two years.

D. 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. Train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system. The training class shall be run for 4 hours.

END OF SECTION 28 3111

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SECTION 31 0513 - SOILS FOR EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Subsoil materials.
2. Topsoil materials.

B. Related Sections:
1. Section 00 33 00B: Geotechnical report; bore hole locations and findings of subsurface materials.
2. Section 31 05 16 - Aggregates for Earthwork.
3. Section 31 22 13 - Rough Grading.
4. Section 31 23 17 - Trenching.
5. Section 31 23 23 - Fill.
6. Section 31 37 00 - Riprap.
7. Section 32 11 23 – Aggregate Base Courses: Subbase preparation.
8. Section 32 91 19 - Landscape Grading.
9. Section 32 92 19 - Seeding and Soil Supplements.
10. Section 32 92 23 - Sodding.
11. Section 32 93 00 - Plants.
12. Section 33 46 00 - Subdrainage: Filter aggregate.

1.2 REFERENCES

A. Pennsylvania Department of Transportation (PennDOT)
1. Publication 19 - Field and Laboratory Test Methods, latest edition.
2. Publication 408 - Specifications, latest edition, as amended.

B. American Association of State Highway and Transportation Officials:
1. AASHTO T89 - Standard Method of Test for Determining the Liquid Limit of Soils.
2. AASHTO T88 - Standard Method of Test for Particle Size Analysis of Soils.
3. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.
4. AASHTO T194 - Standard Method of Test for Determination of Organic Matter in Soils by Wet Combustion.

C. ASTM International:
1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3).
2. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Samples: Submit, in air-tight containers, 10 lb sample of each type of fill to testing laboratory.

C. Materials Source: Submit name of imported materials source.

D. Certificate: Certify Products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

A. Furnish each soil material from single source throughout the Work.

B. Perform Work in accordance with Pennsylvania Department of Transportation Publication 408 standard.

PART 2 - PRODUCTS

2.1 SUBSOIL MATERIALS

A. Suitable Backfill and Embankment Material: Material of maximum size that can be readily placed in loose, 8-inch layers; conforming to the requirements below. Frozen material shall not be utilized.
   1. Soil. Includes earth material with the following physical characteristics:
      a. Gradation-More than 35% passing No. 200 sieve.
      b. Minimum dry mass density-95 pounds per cubic foot determined according to PennDOT PTM No. 106, Method B.
      c. Maximum liquid limit-65, determined according to AASHTO T 89.
      d. Plasticity index-Not less than liquid limit minus 30, determined according to AASHTO T 90 for soils with liquid limits of 41 to 65.
   2. Granular Material. Includes natural or synthetic mineral aggregates having 35% or less passing the No. 200 sieve.
   3. Shale. Includes rock-like material formed by natural consolidation of mud, clay, silt, and fine sand; usually thinly laminated, comparatively soft, and easily split.
   4. Rock. Includes natural material that cannot be excavated without blasting or using rippers; also boulders and detached stones of a size that cannot be readily placed and compacted in loose, 8-inch layers and having insufficient soil to fill the voids in each layer.
   5. Random Material. Includes any accepted combination of the above classifications and may include concrete, brick, stone, or masonry units from demolition.
   6. Suitable Material. Reasonably free of organic matter, coal or coal blossom, or other objectionable matter. Wet, dry, or frozen material may be suitable when dried, wetted, or thawed, respectively.

B. Clean Fill: Fill material consisting of soil, rock, stone, dredged material, used asphalt, and brick, block or concrete from construction and demolition activities. The evaluation of fill materials shall be in accordance with PA DEP's "Clean Fill" regulations and procedures for determining whether material is clean or regulated.

2.2 TOPSOIL MATERIALS

A. Topsoil:
   1. Unclassified.
   2. Graded.

3. Free of roots, rocks larger than 1/2-inch, subsoil, debris, large weeds, foreign matter and/or other material unsuitable or harmful to plant growth.
   a. Screening: Single or double screened.
4. Conforming to ASTM D2487 Group Symbol OH or PT.

B. Topsoil:
1. Imported borrow.
2. Friable loam.
3. Reasonably free of roots, rocks larger than 1/2-inch, subsoil, debris, large weeds, and foreign matter.
   a. Screening: Double screened.
   b. Grading analysis:
      1) 2-inch sieve: minimum 100 percent passing.
      2) No. 4 sieve: minimum 75 percent passing.
      3) No. 10 sieve: minimum 60 percent passing, with following content, as defined by AASHTO T88:
         a) Sand: 5-70 percent
         b) Silt: 10-70 percent
         c) Clay: 5-36 percent
4. Acidity range (pH) of 5.5 to 7.5.
5. Containing minimum of 4 percent and maximum of 10 percent organic matter as determined by AASHTO T194.
6. Magnesium to exceed 100 units; phosphorus to exceed 150 units; potassium to exceed 120 units; soluble salts/conductivity not to exceed 900 ppm/0.9 mmhos/cm in soil.
7. Conforming to ASTM D2487 Group Symbol OH or PT.
8. Limit decaying matter to 10 percent of total content by volume.

2.3 SOURCE QUALITY CONTROL

A. Section 014000 - Quality Requirements: Testing and Inspection Services: Testing and analysis of soil material.

B. Testing and Analysis of Subsoil Material: Perform in accordance with ASTM D698.

C. Testing and Analysis of Topsoil Material: Perform in accordance with ASTM D698.

D. When tests indicate materials do not meet specified requirements, change material and retest.

E. Furnish materials of each type from same source throughout the Work.

PART 3 - EXECUTION

3.1 EXCAVATION

A. Excavate subsoil and topsoil from areas designated. Strip topsoil to full depth of topsoil in designated areas.

B. Stockpile excavated material meeting requirements for subsoil materials and topsoil materials.

C. Remove excess excavated materials not intended for reuse, from site.

D. Remove excavated materials not meeting requirements for subsoil materials and topsoil materials from site.

3.2 STOCKPILING

A. Stockpile materials on site.

B. Stockpile in sufficient quantities to meet Project schedule and requirements.

C. Separate differing materials with dividers or stockpile apart to prevent mixing.

D. Stockpile topsoil 8 feet high maximum.

E. Prevent intermixing of soil types or contamination.

F. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

3.3 STOCKPILE CLEANUP

A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

B. When borrow area is indicated, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION 31 0513

SECTION 31 0516 - AGGREGATES FOR EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Coarse aggregate materials.
2. Fine aggregate materials.

B. Related Sections:
1. Section 00 33 00B: Geotechnical report; bore hole locations and findings of subsurface materials.
2. Section 31 05 13 - Soils for Earthwork: Fill and grading materials.
3. Section 31 22 13 - Rough Grading.
4. Section 31 23 17 - Trenching.
5. Section 31 23 23 - Fill.
6. Section 31 25 00 – Erosion & Sedimentation Control: Slope protection and erosion control.
7. Section 31 37 00 - Riprap.
8. Section 32 11 23 - Aggregate Base Courses: Subbase preparation.
9. Section 32 91 19 - Landscape Grading.
10. Section 33 11 16 - Site Water Utility Distribution Piping.
11. Section 33 31 00 - Sanitary Utility Sewerage Piping.
12. Section 33 41 00 - Storm Utility Drainage Piping.
13. Section 33 46 00 - Subdrainage: Filter aggregate.
14. Section 33 51 00 - Natural-Gas Distribution.

1.2 REFERENCES

A. Pennsylvania Department of Transportation (PennDOT)
1. American Association Publication 19 - Field and Laboratory Test Methods, latest edition.
2. Publication 408 - Specifications, latest edition, as amended.

B. American Association of State Highway and Transportation Officials:
1. AASHTO M147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses.
2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

C. ASTM International:
1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3).
3. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).
4. ASTM D4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Samples: Submit, in air-tight containers, 10 lb sample of each type of fill to testing laboratory.

C. Materials Source: Submit name of imported materials suppliers.

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

A. Furnish each aggregate material from single source throughout the Work.

B. All aggregate must originate from a source approved by PennDOT and meeting PennDOT standards. General fill can utilize aggregate from suitably crushed site rock.

PART 2 - PRODUCTS

2.1 COARSE AGGREGATE MATERIALS

A. On-Site Crushed Coarse Aggregate (Gravel): Angular crushed natural washed stone; free of shale, clay, friable material and debris; graded according to ASTM C136, within the following limits:
   1. Percent Passing per Sieve Size:
      a. 4 inches: 100%
      b. 3 ½ inches: 90-100%.
      c. 2 ½ inches: 25-60%.
      d. 1 ½ inches 0-15%.
      e. 3/4 inch 0-5%.

B. On-Site Crushed Aggregate (Pea Gravel): Natural stone; washed, free of clay, shale, organic matter; graded according to ASTM C136 to the following limits:
   1. Minimum Size: 1/4 inch.
   2. Maximum Size: 5/8 inch.

C. PennDOT 2A: consisting of naturally or artificially graded mixture of natural or crushed gravel, crushed stone, or crushed slag meeting the requirements of PennDOT Publication 408, Section 703.2 for No. 2A, type C.

D. AASHTO No. 57: Open-graded, free-draining coarse aggregate meeting the requirements of PennDOT Publication 408, Section 703.2 for AASHTO No. 57.

E. AASHTO No. 8: Open-graded, free-draining coarse aggregate meeting the requirements of PennDOT Publication 408, Section 703.2 for AASHTO No. 8.

F. AASHTO No. 3: Open-graded, free-draining coarse aggregate meeting the requirements of PennDOT Publication 408, Section 703.2 for AASHTO No. 3.

G. Select Granular Material: Select Granular Material conforming to PennDOT Publication 408 Section 703.3 for 2RC.

2.2 FINE AGGREGATE MATERIALS

A. Fine Aggregates: Conforming to PennDOT's standards as follows:

	Bituminous Concrete Sand Type B			**Mortar Sand**
Sieve Size	**#1**	**#3**	**Filler**	**Type C**
3/8 inch	100	100	--	--
No. 4	95-100	80-100	--	100
No. 8	70-100	65-100	--	95-100
No. 16	40-80	40-80	--	--
No. 30	20-65	20-65	100	--
No. 50	7-40	7-40	95-100	--
No. 100	2-20	2-20	90-100	0-25
No. 200	0-10	0-10	70-100	0-10

PART 3 - EXECUTION

3.1 EXCAVATION

A. Excavate aggregate materials from on-site locations indicated as specified in Section 31 22 13.

B. Stockpile excavated material meeting requirements for coarse aggregate materials and aggregate materials.

C. Remove excess excavated materials not intended for reuse, from site.

D. Remove excavated materials not meeting requirements for coarse aggregate materials and fine aggregate materials from site.

3.2 STOCKPILING

A. Stockpile materials on site at locations indicated.

B. Stockpile in sufficient quantities to meet Project schedule and requirements.

C. Separate different aggregate materials with dividers or stockpile individually to prevent mixing.

D. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

3.3 STOCKPILE CLEANUP

A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

B. When borrow area is indicated, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION 31 0516

SECTION 31 0519.13 - GEOTEXTILES FOR EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Turf reinforcement mats (TRMs).
2. Nonwoven geotextile material.

B. Related Requirements:
1. Section 00 33 00B: Geotechnical report; bore hole locations and findings of subsurface materials.
2. Section 31 05 13 - Soils for Earthwork: Fill and grading materials.
3. Section 31 05 16 - Aggregates for Earthwork: Coarse and fine aggregate materials for fill and grading purposes.
4. Section 31 23 16.13 - Trenching: Soil and subsoil materials for fill and grading purposes.
5. Section 31 23 23 - Fill: Backfilling required at building perimeter and Site structures to subgrade elevations; fill under slabs on grade, pavement, and landscaped areas.
6. Section 31 25 00 - Erosion and Sedimentation Controls: Erosion and sedimentation control devices.
7. Section 31 37 00 - Riprap: Riprap and rock lining used for soil stabilization and slope protection.
8. Section 32 11 23 - Aggregate Base Courses: Subbase and base course for placement under paving.
9. Section 32 91 19 - Landscape Grading: Placing, leveling, and compacting topsoil materials prior to final landscaping.

1.2 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials:
1. AASHTO M288 - Standard Specification for Geotextile Specification for Highway Applications.

B. ASTM International:
1. ASTM D3786/D3786M - Standard Test Method for Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method
2. ASTM D4355/D4355M - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus.
3. ASTM D4491/D4491M - Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
4. ASTM D4533/D4533M - Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
5. ASTM D4632/D4632M - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
6. ASTM D4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile.

7. ASTM D4833/D4833M - Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products.
8. ASTM D4873 - Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples.
9. ASTM D4884/D4844M - Standard Test Method for Strength of Sewn or Bonded Seams of Geotextiles.
10. ASTM D4886 - Standard Test Method for Abrasion Resistance of Geotextiles (Sand Paper/Sliding Block Method).
11. ASTM D6524 - Standard Test Method for Measuring the Resiliency of Turf Reinforcement Mats (TRMs).
12. ASTM D6525/D6525M - Standard Test Method for Measuring Nominal Thickness of Rolled Erosion Control Products.
13. ASTM D6566 - Standard Test Method for Measuring Mass per Unit Area of Turf Reinforcement Mats.
14. ASTM D6567 - Standard Test Method for Measuring the Light Penetration of a Turf Reinforcement Mat (TRM).
15. ASTM D6575 - Standard Test Method for Determining Stiffness of Geosynthetics Used as Turf Reinforcement Mats (TRMs).
16. ASTM D6818 - Standard Test Method for Ultimate Tensile Properties of Rolled Erosion Control Products.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit manufacturer information including tensile strength, elongation, thickness, UV resistance, and other material specifications.

C. Shop Drawings: Indicate fabric layout, seam locations, and overlap details in installation drawings.

D. Samples:
1. Submit two samples, full width by 18 inches long, for each type and weight of geotextile used on Project, illustrating thickness, seaming method, and manufacturing quality.
2. Submit two samples, 18 inches by 18 feet long, for each type and weight of geotextile used on Project, illustrating field seaming method.
3. Submit one sample of securing pin and washer.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Manufacturer Instructions: Submit detailed instructions on installation requirements, including storage and handling procedures.

G. Source Quality-Control Submittals: Indicate results of factory tests and inspections.

H. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

I. Qualifications Statements:
1. Submit qualifications for manufacturer and installer.

1.4 CLOSEOUT SUBMITTALS

A. Section 01 77 00 - Closeout Requirements: Requirements for submittals.

B. Project Record Documents: Record actual locations of geotextile material, including placement depth.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Section 01 73 00 - Execution Requirements: Requirements for maintenance materials.

B. Extra Stock Materials:
1. Furnish two seam repair kits.
2. Furnish 2 sq. yd. of geotextile material.

C. Tools: Furnish special tools and other devices required for Owner to maintain and repair geotextile material.

1.6 QUALITY ASSURANCE

A. Perform Work according to:
1. Pennsylvania Depart of Transportation standards
2. Pennsylvania Department of Environmental Protection Erosion and Sedimentation Control standards.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.

B. Installer: Company specializing in performing Work of this Section with minimum three years' experience.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Section 01 61 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

C. Comply with ASTM D4873.

D. Store materials according to manufacturer instructions.

E. Protection:
1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Provide additional protection according to manufacturer instructions.

PART 2 - PRODUCTS

2.1 SUBSURFACE DRAINAGE GEOTEXTILE

A. Manufacturers:
1. TenCate Geosynthetics - Mirafi FW402
2. Substitutions: As specified in Section 01 61 00 - Product Requirements.

B. Description:
1. Non-biodegradable, UV-resistant, woven geotextile fabric.
2. Material: Polypropylene.
3. Calendar such that yarns will retain relative positions.

C. Performance and Design Criteria:
1. Comply with AASHTO M288.
2. Mass per Unit Area:
   a. 5.6 oz./sq. yd..
   b. Comply with ASTM D6566.
3. Thickness:
   a. 24 mils.
   b. Comply with ASTM D6525/D6525M.
4. Tensile Strength (Grab):
   a. 2,400 by 1,680 lbf/ft..
   b. Comply with ASTM D4595.
5. Maximum Elongation:
   a. 24 percent.
   b. Comply with ASTM D4632.
6. Burst Strength:
   a. 189 psi.
   b. Comply with ASTM D3786.
7. CBR Puncture:
   a. 675 lb.
   b. Comply with ASTM D6241.
8. UV Resistance at 5000 Hours:
   a. Strength Retention: 90 percent.
   b. Comply with ASTM D4355/D4355M.
9. Apparent Opening Size:
   a. 40 US Std Seive
   b. Comply with ASTM D4751.
10. Permittivity
   a. 2.1 sec^{-1}
   b. Comply with ASTM D4491
11. Flow Rate
   a. 145 gal/min/sq. ft.
   b. Comply with ASTM D4491.

2.2 SEDIMENT CONTROL GEOTEXTILE MATERIALS

A. Manufacturers:

1. TenCate Geosynthetics - Mirafi HP570
2. Substitutions: As specified in Section 01 61 00 - Product Requirements.

B. Description:
1. Non-biodegradable, UV-resistant, woven geotextile fabric.
2. Material: Polypropylene.
3. Calendar such that yarns will retain relative positions.

C. Performance and Design Criteria:
1. Comply with AASHTO M288.
2. Tensile Strength (Grab):
   a. 4,800 lbf/ft.
   b. Comply with ASTM D4595.
3. Maximum Elongation:
   a. 20 percent.
   b. Comply with ASTM D4632.
4. UV Resistance at 500 Hours:
   a. Strength Retention: 80 percent.
   b. Comply with ASTM D4355/D4355M.
5. Apparent Opening Size:
   a. 33330 US Std Seive
   b. Comply with ASTM D4751.
6. Permittivity
   a. 0.4 sec^{-1}
   b. Comply with ASTM D4491
7. Flow Rate
   a. 30 gal/min/sq. ft.
   b. Comply with ASTM D4491.

2.3 NONWOVEN GEOTEXTILE MATERIALS

A. Manufacturers:
1. TenCate Geosynthetics - Mirafi S1200
2. Substitutions: As specified in Section 01 61 00 - Product Requirements.

B. Description:
1. Non-biodegradable, UV-resistant, nonwoven geotextile fabric.
2. Material: Polypropylene.
3. Edges: Selvaged or finished to prevent separation of outer material.
4. Calendar such that yarns will retain relative positions.

C. Performance and Design Criteria:
1. Minimum Unseamed Sheet Width: 15 feet.
2. Nominal Weight: 12 oz./sq. yd..
3. Minimum Sheet Thickness: 130 mils.
4. Apparent Opening Size:
   a. No. 100 to No. 140 U.S. standard sieve size.
   b. Comply with ASTM D4751.
5. Water Permittivity: 0.9 per second, minimum average roll value.

6. Vertical Water Flow Rate:
   a. 65 gpm/sq. ft., minimum average roll value.
   b. Comply with ASTM D4491/D4491M.
7. Wide-Width Strip Tensile Strength:
   a. 310 lbf, minimum average roll value.
   b. Comply with ASTM D4632/D4632M.
8. Elongation:
   a. 50 percent, minimum average roll value.
   b. Comply with ASTM D4632/D4632M.
9. Trapezoidal Tear Strength:
   a. 120 lbf, minimum average roll value.
   b. Comply with ASTM D4533/D4533M.
10. CBR Puncture Strength:
    a. 900 lb, minimum average roll value.
    b. Comply with ASTM D6241.
11. UV Resistance at 500 Hours:
    a. Strength Retention: 80 percent.
    b. Comply with ASTM D4355/D4355M.

2.4 ACCESSORIES

A. Sewing Thread:
   1. Material: Polypropylene Polyester or Kevlar.
   2. Durability: Equal to or greater than durability of geotextile.

B. Securing Pins:
   1. Material: Steel rods or bars.
   2. Diameter: 3/16 inch.
   3. Minimum Length: 12 inches.
   4. Washers:
      a. Material: Steel.
      b. Outside Diameter: Minimum 1-1/2 inches.
      c. Inside Diameter: 1/4 inch.
      d. Thickness: 1/8 inch.

C. Wire Staples:
   1. Material: Steel.
   2. Minimum Size: 10 gage.
   3. Minimum Length: 6 inches.

2.5 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for testing, inspection, and analysis.

B. Provide shop inspection and testing of completed assembly.

C. Certificate of Compliance:

1. If manufacturer is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at manufacturer's facility conforms to Contract Documents.
2. Specified shop tests are not required for Work performed by approved manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 73 00 - Execution Requirements: Requirements for installation examination.

B. Verify that underlying surface is smooth and free of ruts or protrusions that could damage geotextile material.

3.2 PREPARATION

A. Section 01 73 00 - Execution Requirements: Requirements for installation preparation.

B. Subgrade Material and Compaction Requirements: As specified in Section 31 23 16.13 - Trenching or 31 23 23 - Fill.

3.3 INSTALLATION

A. Geotextile Material:
1. Lay and maintain smooth and free of tensile stresses, folds, wrinkles, or creases.
2. Ensure that material is in direct contact with subgrade.
3. Orientate with long dimension of each sheet parallel to direction of slope.
4. Minimum Unseamed Joints Overlap: as recommended by manufacturer.

B. Securement Pins:
1. Insert through geotextile midway between edges of overlaps and minimum 6 inches from free edges.
2. Minimum Spacing:
   a. Slopes Steeper than 3 Horizontal on 1 Vertical: 24 inches o.c.
   b. Slopes 3 Horizontal on 1 Vertical to 4 Horizontal on 1 Vertical: 3 feet o.c.
   c. Slopes Flatter than 4 Horizontal on 1 Vertical: 5 feet o.c.
3. Ensure that washer bears against geotextile.

C. Seams:
1. Minimum Seamed Joints Overlap: 12 inches at longitudinal and transverse joints.
2. Seams across Slope: Lap upper panel over lower panel.
3. Sewn Seams:
   a. Continuously sew seams on slopes steeper than 1 vertical on 3 horizontal and at locations indicated on Drawings.
   b. Stitch Type: As recommended by geotextile manufacturer.
   c. Tie off thread at the end of each seam to prevent unraveling.
4. Thermal Seams:
   a. As recommended by geotextile manufacturer.
   b. Comply with ASTM D4886.

D. Penetrations: As recommended by geotextile manufacturer.

E. Repairing Damaged Geotextiles:
1. Repair torn or damaged geotextile by placing patch of same type of geotextile over damaged area minimum of 12 inches beyond edge of damaged area; and fasten as recommended by geotextile manufacturer.
2. Remove and replace geotextile rolls which cannot be repaired.

F. Fill and Cover:
1. Place fill to prevent tensile stress or wrinkles in geotextile.
2. Place fill from bottom of side-slopes upward.
3. Do not drop fill from height greater than 3 feet.

3.4 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.

B. Manufacturer Services: Furnish services of manufacturer's representative experienced in installation of products furnished under this Section for not less than 8 hours on Site for installation, inspection, and field testing.

C. Acceptance:
1. Adjust, repair, modify, or replace components failing to perform as specified.
2. Make final adjustments under direction of manufacturer's representative.

3.5 PROTECTION

A. Section 01 73 00 - Execution Requirements: Requirements for protecting finished Work.

B. Ballast: Adequate to prevent uplift of material by wind.

C. UV Exposure: Do not leave material uncovered for more than 14 days after installation.

D. Do not use staples or pins to hold geotextiles in place where located adjacent to other geosynthetic layers that could be damaged.

E. Do not operate equipment directly on top of geotextile.

END OF SECTION 31 0519.13

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SECTION 31 1000 - SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Removing surface debris.
2. Removing designated paving, curbs, and other designated site improvements.
3. Removing designated trees, shrubs, and other plant life.
4. Removing abandoned utilities.

B. Related Sections:
1. Section 02 41 16 - Structure Demolition: Removing underground storage tanks and designated utilities.
2. Section 31 22 13 - Rough Grading.
3. Section 31 23 18 - Rock Removal.

1.2 DEFINITIONS

A. Clearing is defined as the removal of trees, brush, down timber, rotten wood, rubbish, any other vegetation, and other material at or above original ground elevation not designated to be saved. Clearing also includes removal and replacement of fences, walls, guideposts, guide rail, signs, and other obstructions interfering with the proposed work.

B. Grubbing is defined as the removal from below the surface of the natural ground of stumps, roots and stubs, brush, topsoil, organic materials and debris.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data for herbicide. Indicate compliance with applicable codes for environmental protection.

C. Permits for Disposal of Debris:
1. Arrange for disposal of debris to locations outside the Owner's property, permanent easement, or right of way. Comply with all applicable laws.
2. Submit two copies of any agreement with each property owner releasing the Owner from responsibility in connection with the disposal of the debris.

1.4 QUALITY ASSURANCE

A. Conform to applicable code for environmental requirements, disposal of debris, burning debris on site, and use of herbicides.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Herbicide: approved by authority having jurisdiction.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 73 00 - Execution Requirements: Verification of existing conditions before starting work.

B. Verify existing plant life designated to remain is tagged or identified.

3.2 PREPARATION

A. Call Pennsylvania One Call System, Inc. at 1-800-242-1776 not less than three working days before performing Work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.

3.3 PROTECTION

A. Locate, identify, and protect utilities indicated to remain, from damage.

B. Protect trees, plant growth, and features designated to remain, as final landscaping.

C. Protect benchmarks, survey control points, and existing structures from damage or displacement.

3.4 CLEARING

A. Clear areas required for access to site and execution of Work to minimum depth of 8 inches.

B. Remove trees and shrubs as indicated. Remove stumps, main root ball, root system to depth of 18 inches, and surface rock.

C. Clear undergrowth and deadwood, without disturbing subsoil.

D. Apply herbicide to remaining stumps to inhibit growth.

3.5 REMOVAL

A. Remove debris, rock, and extracted plant life from site.

B. Remove paving, curbs, and other designated site improvements.

C. Remove abandoned utilities. Indicated removal termination point for underground utilities on Record Documents.

D. Continuously clean-up and remove waste materials from site. Do not allow materials to accumulate on site.

E. Do not burn (unless permitted by authority having jurisdiction) or bury materials on site. Leave site in clean condition.

END OF SECTION 31 1000

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SECTION 31 2213 - ROUGH GRADING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Excavating topsoil.
2. Excavating subsoil.
3. Cutting, grading, filling, rough contouring, compacting, and preparing site for site structures, building pads, fields, and site infrastructure.

B. Related Sections:
1. Section 02 41 16 - Structure Demolition.
2. Section 31 05 13 - Soils for Earthwork: Soils for fill.
3. Section 31 05 16 - Aggregates for Earthwork: Aggregates for fill.
4. Section 31 10 00 - Site Clearing: Excavating topsoil.
5. Section 31 23 16 - Excavation: Building excavation.
6. Section 31 23 17 - Trenching: Trenching and backfilling for utilities.
7. Section 31 23 18 - Rock Removal.
8. Section 31 23 23 - Fill: General building area backfilling.
9. Section 32 91 19 - Landscape Grading: Finish grading with topsoil to contours.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3).
3. ASTM D2434 - Standard Test Method for Permeability of Granular Soils (Constant Head).
4. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
5. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.3 CLOSEOUT SUBMITTALS

A. Section 01 77 00 - Closeout Requirements: Requirements for submittals.

B. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with ASTM C136 and ASTM D2434.

B. Perform Work in accordance with State of Pennsylvania Department of Transportation standard.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Topsoil: as specified in Section 31 05 13.

B. Subsoil Fill: Suitable Backfill and Embankment Material as specified in Section 31 05 13.

C. Structural Fill: AASHTO No. 57 as specified in Section 31 05 16.

D. Granular Fill: Type AASHTO No. 8, AASHTO No. 57, PennDOT 2A as specified in Section 31 05 16.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 73 00 - Execution Requirements: Verification of existing conditions before starting work.

B. Verify site conditions under provisions of Section 31 23 16.

C. Verify survey benchmark and intended elevations for the Work are as indicated on Drawings.

3.2 PREPARATION

A. Call Pennsylvania One Call System, Inc. at 1-800-242-1776 not less than three working days before performing Work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.

B. Identify required lines, levels, contours, and datum.

C. Notify utility company to remove and relocate utilities, as required.

D. Protect utilities indicated to remain from damage.

E. Protect plant life, lawns, and other features remaining as portion of final landscaping.

F. Protect benchmarks, survey control point, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

3.3 TOPSOIL EXCAVATION

A. Excavate topsoil from areas to be further excavated, relandscaped, or regraded, without mixing with foreign materials for use in finish grading.

B. Do not excavate wet topsoil.

C. Stockpile in area designated on site to depth not exceeding 8 feet and protect from erosion. Stockpile material on 36 mil Hypalon material and cover over with same material, until disposal.

D. Remove excess topsoil not intended for reuse, from site.

3.4 SUBSOIL EXCAVATION

A. Excavate subsoil from areas to be further excavated, relandscaped, or regraded.

B. Do not excavate wet subsoil or excavate and process wet material to obtain optimum moisture content.

C. When excavating through roots, perform Work by hand and cut roots with sharp axe.

D. Remove excess subsoil not intended for reuse, from site.

E. Benching Slopes: Horizontally bench existing slopes greater than 1: 4 to key placed fill material to slope to provide firm bearing.

F. Stability: Replace damaged or displaced subsoil as specified for fill.

3.5 FILLING

A. Fill areas to contours and elevations with unfrozen materials.

B. Place material in continuous layers as follows:
1. Subsoil Fill: Maximum 8 inches compacted depth.
2. Structural Fill: Maximum 6 inches compacted depth.
3. Granular Fill: Maximum 6 inches compacted depth.

C. Maintain optimum moisture content of fill materials to attain required compaction density.

D. Slope grade away from building minimum 2 percent slope for minimum distance of 10 ft, unless noted otherwise.

E. Make grade changes gradual. Blend slope into level areas.

F. Repair or replace items indicated to remain damaged by excavation or filling.

3.6 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Top Surface of Subgrade: Plus or minus 1/10 foot from required elevation.

3.7 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Perform laboratory material tests in accordance with ASTM D698.

C. Perform in place compaction tests in accordance with the following:
   1. Density Tests: ASTM D2922.
   2. Moisture Tests: ASTM D3017.

D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

E. Frequency of Tests:
   1. Embankment or fill: one per lift every 500 sy.
   2. Subgrade: one per lift every 400 sy.
   3. Utility Backfill: one per 50 cy with minimum of 1 per lift.

3.8 SCHEDULES

A. Structural Fill:
   1. AASHTO #57: To subgrade elevation.
   2. Compact uniformly to minimum 100 percent of maximum density.

B. Subsoil Fill:
   1. Suitable Backfill: To subgrade elevation.
   2. Compact uniformly to minimum 95 percent of maximum density.

END OF SECTION 31 2213

SECTION 31 2316 - EXCAVATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Excavating for building foundations.
2. Excavating for paving, roads, and parking areas.
3. Excavating for slabs-on-grade.
4. Excavating for site structures.
5. Excavating for landscaping.

B. Related Sections:
1. Section 00 33 00B: Geotechnical report; bore hole locations and findings of subsurface materials.
2. Section 26 42 00 - Cathodic Protection.
3. Section 31 05 13 - Soils for Earthwork: Stockpiling excavated materials.
4. Section 31 05 16 - Aggregates for Earthwork: Stockpiling excavated materials.
5. Section 31 22 13 - Rough Grading: Topsoil and subsoil removal from site surface.
6. Section 31 23 17 - Trenching: Excavating for utility trenches.
7. Section 31 23 18 - Rock Removal: Removal of rock during excavating.
8. Section 31 23 23 - Fill.
9. Section 31 25 00 – Erosion & Sedimentation Control: Slope protection and erosion control.
10. Section 33 11 16 - Site Water Utility Distribution Piping.
11. Section 33 51 00 - Natural-Gas Distribution.

1.2 REFERENCES

A. Local utility standards when working within 24 inches of utility lines.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Excavation Protection Plan: Describe sheeting, shoring, and bracing materials and installation required to protect excavations and adjacent structures and property; include structural calculations to support plan.

C. Shop Drawings: Indicate soil densification grid for each size and configuration footing requiring soils densification.

1.4 QUALIFICATIONS

A. Prepare excavation protection plan under direct supervision of Professional Engineer experienced in design of this Work and licensed at Project location.

PART 2 - PRODUCTS

2.1 Not Used.

PART 3 - EXECUTION

3.1 PREPARATION

A. Call Pennsylvania One Call System, Inc. at 1-800-242-1776 not less than three working days before performing Work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.

B. Identify required lines, levels, contours, and datum.

C. Notify utility company to remove and relocate utilities as required.

D. Protect utilities indicated to remain from damage.

E. Protect plant life, lawns and other features remaining as portion of final landscaping.

F. Protect benchmarks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

3.2 EXCAVATION

A. Underpin adjacent structures which may be damaged by excavation work.

B. Excavate subsoil to accommodate building foundations, slabs-on-grade paving and site structures, construction operations, and site grading.

C. Compact disturbed load bearing soil in direct contact with foundations to original bearing capacity; perform compaction in accordance with Section 31 23 23 and Section 31 16.13.

D. Slope banks with machine to angle of repose or less until shored.

E. Do not interfere with 45 degree bearing splay of foundations.

F. Grade top perimeter of excavation to prevent surface water from draining into excavation.

G. Trim excavation. Remove loose matter.

H. Remove lumped subsoil, boulders, and rock up to 1/3 cu yd measured by volume. Remove larger material as specified in Section 31 23 16.26.

I. Notify Engineer of unexpected subsurface conditions.

J. Correct areas over excavated with structural fill or concrete as directed by Engineer.

K. Remove excess and unsuitable material from site.

L. Stockpile subsoil in area designated on site to depth not exceeding 8 feet and protect from erosion.

M. Repair or replace items indicated to remain damaged by excavation.

3.3 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Perform inspection of excavation and controlled fill operations in accordance with applicable code.

C. Request visual inspection of bearing surfaces by inspection agency before installing subsequent work.

3.4 PROTECTION

A. Prevent displacement or loose soil from falling into excavation; maintain soil stability.

B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

C. Protect structures, utilities and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth operations.

END OF SECTION 31 2316

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SECTION 31 2316.13 - TRENCHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Excavating trenches for utilities.
2. Compacted fill from top of utility bedding to subgrade elevations.
3. Backfilling and compaction.

B. Related Sections:
1. Section 00 33 00B: Geotechnical report; bore hole locations and findings of subsurface materials.
2. Section 03 30 00 - Cast-In-Place Concrete: Concrete materials.
3. Section 31 05 13 - Soils for Earthwork: Soils for fill.
4. Section 31 05 16 - Aggregates for Earthwork: Aggregates for fill.
5. Section 31 22 13 - Rough Grading: Topsoil and subsoil removal from site surface.
6. Section 31 23 16 - Excavation: General building excavation.
7. Section 31 23 18 - Rock Removal: Removal of rock during excavating.
8. Section 31 23 23 - Fill: General backfilling.
9. Section 31 37 00 - Riprap.
10. Section 32 91 19 - Landscape Grading: Filling of topsoil over backfilled trenches to finish grade elevation.
11. Section 33 11 16 - Site Water Utility Distribution Piping: Water piping and bedding from building to utility.
12. Section 33 31 00 - Sanitary Utility Sewerage Piping: Sanitary sewer piping and bedding from building to utility.
13. Section 33 41 00 - Storm Utility Drainage Piping: Storm sewer piping and bedding from building to site infrastructure/facilities.
14. Section 33 46 00 - Subdrainage: Building perimeter drainage, filter aggregate, filter fabric, and granular cover.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3).
2. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.3 DEFINITIONS

A. Utility: Any buried pipe, duct, conduit, or cable.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Excavation Protection Plan: Describe sheeting, shoring, and bracing materials and installation required to protect excavations and adjacent structures and property; include structural calculations to support plan.

C. Product Data: Submit data for geotextile fabric indicating fabric and construction.

D. Materials Source: Submit name of imported fill materials suppliers.

E. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
1. Test reports on borrow material.
2. Field reports; in-place soil density tests.
3. One moisture-maximum density curve for each type of soil encountered.
4. Report of actual unconfined compressive strength and/or results of bearing tests of each strata tested.

F. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with:
1. Pennsylvania Department of Transportation standard.
2. Pennsylvania Department of Environmental Protection standards.

1.6 QUALIFICATIONS

A. Prepare excavation protection plan under direct supervision of Professional Engineer experienced in design of this Work and licensed at Project location.

1.7 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.8 COORDINATION

A. Section 01 31 00 - Project Coordination: Coordination and project conditions.

B. Verify Work associated with lower elevation utilities is complete before placing higher elevation utilities.

PART 2 - PRODUCTS

2.1 FILL MATERIALS

A. Subsoil Fill: Type Suitable Backfill and Embankment Material as specified in Section 31 05 13.

B. Structural Fill: AASHTO No. 57 as specified in Section 31 05 16.

C. Granular Fill: Type AASHTO No. 8, ASHTO No. 57, or PennDOT 2A as directed, as specified in Section 31 05 16.

D. Concrete: Flowable fill as specified in Section 31 23 23.33.

PART 3 - EXECUTION

3.1 LINES AND GRADES

A. Lay pipes to lines and grades indicated on Drawings.
1. Owner reserves right to make changes in lines, grades, and depths of utilities when changes are required for Project conditions.
2. Contractor shall not be entitled to extra compensation or to a claim for damages if change does not involve abandonment of an excavated trench.
3. Abandonment of an excavated trench will be classified as Miscellaneous Unclassified Excavation and Miscellaneous Earth or Aggregate Backfill.

B. Use laser-beam instrument with qualified operator to establish lines and grades.

3.2 PREPARATION

A. Call Pennsylvania One Call System, Inc. at 1-800-242-1776 not less than three working days before performing Work.
1. Request underground utilities to be located and marked within and surrounding construction areas.

B. Identify required lines, levels, contours, and datum locations.

C. Protect plant life, lawns and other features remaining as portion of final landscaping.

D. Protect benchmarks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

E. Maintain and protect above and below grade utilities indicated to remain.

F. Establish temporary traffic control and detours when trenching is performed in public right-of-way. Relocate controls and reroute traffic as required during progress of Work.

3.3 TRENCHING

A. Excavate subsoil required for utilities to existing utility.

B. Remove lumped subsoil, boulders, and rock up of 1/6 cubic yard, measured by volume. Remove larger material as specified in Section 31 23 16.26.

C. Perform excavation within 24 inches of existing utility in accordance with utility's requirements.

D. Do not advance open trench more than 200 feet ahead of installed pipe.

E. Cut trenches to width indicated on Drawings and sufficiently wide to enable installation and allow inspection. Remove water or materials that interfere with Work.

F. Excavate bottom of trenches maximum 2 feet wider than outside diameter of pipe.

G. Excavate trenches to depth indicated on Drawings. Provide uniform and continuous bearing and support for bedding material and pipe.

H. Do not interfere with 45 degree bearing splay of foundations.

I. When Project conditions permit, slope side walls of excavation starting 2 feet above top of pipe. When side walls cannot be sloped, provide sheeting and shoring to protect excavation as specified in this section.

J. When subsurface materials at bottom of trench are loose or soft, excavate to greater depth as directed by Engineer until suitable material is encountered.

K. Cut out soft areas of subgrade not capable of compaction in place. Backfill with and compact to density equal to or greater than requirements for subsequent backfill material.

L. Trim excavation. Hand trim for bell and spigot pipe joints. Remove loose matter.

M. Correct areas over excavated areas with compacted backfill as specified for authorized excavation or replace with fill concrete as directed by Engineer.

N. Remove excess subsoil not intended for reuse, from site.

3.4 SHEETING AND SHORING

A. Sheet, shore, and brace excavations to prevent danger to persons, structures and adjacent properties and to prevent caving, erosion, and loss of surrounding subsoil.

B. Support trenches more than 4 feet deep excavated through unstable, loose, or soft material. Provide sheeting, shoring, bracing, or other protection to maintain stability of excavation.

C. Design sheeting and shoring to be removed at completion of excavation work.

D. Repair damage caused by failure of the sheeting, shoring, or bracing and for settlement of filled excavations or adjacent soil and subsurface material.

E. Repair damage to new and existing Work from settlement, water or earth pressure or other causes resulting from inadequate sheeting, shoring, or bracing.

3.5 BACKFILLING

A. Backfill trenches to contours and elevations with unfrozen fill materials.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.

C. Place geotextile fabric over granular Fill prior to placing subsequent fill materials where required.

D. Place material in continuous layers as follows:
1. Subsoil Fill: Maximum 8 inches compacted depth.
2. Structural Fill: Maximum 6 inches compacted depth.
3. Granular Fill: Maximum 6 inches compacted depth.

E. Employ placement method that does not disturb or damage foundation perimeter drainage, utilities in trench, and adjacent utility.

F. Maintain optimum moisture content of fill materials to attain required compaction density.

G. Do not leave more than 50 feet of trench open at end of working day.

H. Protect open trench to prevent danger to the public.

3.6 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Top Surface of Backfilling: ±1 inch from required elevations.

3.7 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Perform laboratory material tests in accordance with ASTM D698.

C. Perform in place compaction tests in accordance with ASTM D6938.

D. When tests indicate Work does not meet specified requirements, remove Work, replace, compact, and retest.

E. Frequency of Tests: one per 25 cy with minimum of 1 per lift for every 500 lf of trench.

3.8 PROTECTION OF FINISHED WORK

A. Section 01 73 00 - Execution Requirements: Protecting finished work.

B. Reshape and re-compact fills subjected to vehicular traffic during construction.

END OF SECTION 31 2316.13

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SECTION 31 2316.26 - ROCK REMOVAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Removing identified and discovered rock during excavation.
2. Mechanical/hydraulic machinery and Explosives to assist rock removal.

B. Related Sections:
1. Section 31 22 13 - Rough Grading.
2. Section 31 23 16 - Excavation: Building excavation.
3. Section 31 23 17 - Trenching: Trenching and backfilling for utilities.
4. Section 31 23 23 - Fill: Backfill materials.
5. Section 31 37 00 - Riprap.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Site Rock Removal:
1. Basis of Measurement: By cubic yard measured before removal.
2. Basis of Payment: Includes preparation of rock for removal, mechanical disintegration of rock, removal from position, loading and removing from site. For over excavation, payment will not be made for over excavated work nor for replacement materials.

B. Trench Rock Removal:
1. Basis of Measurement: By cubic yard measured before removal.
2. Basis of Payment: Includes preparation of rock for removal, mechanical disintegration of rock, removal from position, loading and removing from site. For over excavation, payment will not be made for over excavated work nor for replacement materials.

1.3 REFERENCES

A. National Fire Protection Association:
1. NFPA 495 - Explosive Materials Code.

1.4 DEFINITIONS

A. Site Rock: Solid mineral material with volume in excess of 1/3 cu yd or solid material that cannot be removed with 3/4 cu yd capacity excavator without drilling or blasting.

B. Trench Rock: Solid mineral material with volume in excess of 1/6 cu yd or solid material that cannot be removed with 3/4 cu yd capacity excavator without drilling or blasting.

1.5 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate proposed method of blasting, delay pattern, explosive types, type of blasting

mat or cover, and intended rock removal method.

C. Survey Report: Submit survey report on conditions of buildings near locations of rock removal.

1.6 QUALITY ASSURANCE

A. Seismic Survey Firm: Licensed company specializing in seismic surveys with five years documented experience.

B. Explosives Firm: Company specializing in explosives for disintegration of rock, with five years documented experience.

1.7 PROJECT CONDITIONS

A. Conduct survey and document conditions of buildings near locations of rock removal, prior to blasting, and photograph existing conditions identifying existing irregularities.

B. Advise owners of adjacent buildings or structures in writing, prior to executing seismographic survey. Explain planned blasting and seismic operations.

C. Obtain seismic survey prior to rock excavation to determine maximum charges that can be used at different locations in area of excavation without damaging adjacent properties or other work.

1.8 SCHEDULING

A. Section 01 31 13 - Project Coordination: Coordination and project conditions.

B. Schedule Work to avoid disruption to occupied buildings nearby.

C. Conduct blasting operations between hours of 9am and 3pm only.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Explosives: Type recommended by explosive firm following seismic survey and required by authorities having jurisdiction.

B. Delay Device: Type recommended by explosives firm.

C. Blast Mat Materials: Type recommended by explosives firm.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 31 13 - Project Coordination: Coordination and project conditions.

B. Verify site conditions and note subsurface irregularities affecting Work of this section.

3.2 PREPARATION

A. Identify required lines, levels, contours, and datum.

3.3 ROCK REMOVAL BY MECHANICAL METHOD

A. Excavate and remove rock by mechanical method.
   1. Break rock using trenchers, hydraulic breakers, rippers or other specialized equipment. Break rock to lines and grades shown on the drawings, or as required to complete the work. Finished rock surface should be relatively uniform.

B. Cut away rock at bottom of excavation to form level bearing.

C. Remove shaled layers to provide sound and unshattered base for bearing surfaces, footings and foundations.

D. In utility trenches, excavate to 6 inches below invert elevation of pipe and 16 inches wider than pipe diameter.

E. Remove excavated materials and reuse as applicable.

F. Correct unauthorized rock removal in accordance with backfilling and compacting requirements of Section 31 23 23 as directed by Engineer.

3.4 ROCK REMOVAL BY EXPLOSIVE METHODS

A. When rock is uncovered requiring explosives method for rock disintegration, execute as follows.

B. Provide seismographic monitoring during progress of blasting operations.

C. Drill blasting holes within 12 feet of finished slope.

D. Disintegrate rock and remove from excavation.

E. Remove rock at excavation bottom to form level bearing.

F. Remove shaled layers to provide sound and unshattered base for bearing surfaces, footings and foundations.

G. In utility trenches, excavate to 6 inches below invert elevation of pipe and 16 inches wider than pipe diameter.

H. Remove excavated material, process for re-use on site as applicable.

I. Correct unauthorized rock removal in accordance with backfilling and compacting requirements of Section 31 23 23 to directions of Engineer.

3.5 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Request visual inspection of bearing surfaces by Engineer and inspection agency before installing subsequent work.

END OF SECTION 31 2316.26

SECTION 31 2323 - FILL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Backfilling building perimeter to subgrade elevations.
2. Backfilling site structures to subgrade elevations.
3. Fill under slabs-on-grade.
4. Fill under paving.
5. Fill for over-excavation.

B. Related Sections:
1. Section 00 33 00B: Geotechnical report; bore hole locations and findings of subsurface materials.
2. Section 03 30 00 - Cast-In-Place Concrete: Concrete materials.
3. Section 31 05 13 - Soils for Earthwork: Soils for fill.
4. Section 31 05 16 - Aggregates for Earthwork: Aggregates for fill.
5. Section 31 22 13 - Rough Grading: Site filling.
6. Section 31 23 16 - Excavation.
7. Section 31 23 17 - Trenching: Backfilling of utility trenches.
8. Section 31 37 00 - Riprap.
9. Section 32 91 19 - Landscape Grading: Filling of topsoil to finish grade elevation.
10. Section 33 11 16 - Site Water Utility Distribution Piping.
11. Section 33 46 00 - Subdrainage: Filter aggregate .
12. Section 33 51 00 - Natural-Gas Distribution.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3).
2. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
3. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data for geotextile fabric indicating fabric and construction.

C. Samples: Submit, in air-tight containers, 10 lb sample of each type of fill to testing laboratory.

D. Materials Source: Submit name of imported fill materials suppliers.

E. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with Pennsylvania Department of Transportation standards.

PART 2 - PRODUCTS

2.1 FILL MATERIALS

A. Subsoil Fill:
1. Suitable Backfill and Embankment Material as specified in Section 31 05 13.
2. On-Site Crushed Coarse Aggregate (Gravel) and (Pea Gravel) as specified in Section 31 05 16.

B. Structural Fill: Type AASHTO No. 57 as specified in Section 31 05 16.

C. Granular Fill: Type AASHTO No. 8, AASHTO No. 57 and PennDOT 2A as specified in Section 31 05 16.

D. Concrete: Flowable Fill.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 31 13 - Project Coordination: Coordination and project conditions.

B. Verify subdrainage, dampproofing, or waterproofing installation has been inspected.

C. Verify underground tanks are anchored to their own foundations to avoid flotation after backfilling.

D. Verify structural ability of unsupported walls to support loads imposed by fill.

3.2 PREPARATION

A. Compact subgrade to density requirements for subsequent backfill materials.

B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with structural fill and compact to density equal to or greater than requirements for subsequent fill material.

C. Scarify subgrade surface to depth of 3 inch.

D. Proof roll to identify soft spots; fill and compact to density equal to or greater than requirements for subsequent fill material.

3.3 BACKFILLING

A. Backfill areas to contours and elevations with unfrozen materials.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.

C. Place geotextile fabric over granular fill where required prior to placing next lift of fill.

D. Place material in continuous layers as follows:
1. Subsoil Fill: Maximum 8 inches compacted depth.
2. Structural Fill: Maximum 6 inches compacted depth.
3. Granular Fill: Maximum 6 inches compacted depth.

E. Employ placement method that does not disturb or damage other work.

F. Maintain optimum moisture content of backfill materials to attain required compaction density.

G. Backfill against supported foundation walls. Do not backfill against unsupported foundation walls.

H. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.

I. Slope grade away from building minimum 2 percent slope for minimum distance of 10 ft, unless noted otherwise.

J. Make gradual grade changes. Blend slope into level areas.

K. Remove surplus backfill materials from site.

3.4 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Top Surface of Backfilling Within Building Areas and Under Paved Areas: Plus or minus ½ inch from required elevations.

C. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.5 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Perform laboratory material tests in accordance with ASTM D698.

C. Perform in place compaction tests in accordance with the following:
1. Density Tests: ASTM D2922.
2. Moisture Tests: ASTM D3017.

D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

E. Frequency of Tests:
1. Embankment or fill: one per lift every 500 sy (minimum 6 tests/lift/day).
2. Subgrade: one per lift every 400 sy (minimum 8 tests/lift/day).

F. Proof roll compacted fill surfaces under slabs-on-grade and paving.

3.6 PROTECTION OF FINISHED WORK

A. Section 01 73 00 - Execution Requirements: Protecting finished work.

B. Reshape and re-compact fills subjected to vehicular traffic.

END OF SECTION 31 2323

SECTION 31 2323.33 - FLOWABLE FILL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Flowable fill for:
a. Structure backfill.
b. Utility bedding.
c. Utility backfill.
d. Filling abandoned utilities.

B. Related Requirements:
1. Section 31 23 16 - Excavation: General building excavation.
2. Section 31 23 17 - Trenching: Soil and aggregate backfill for utility trenches.
3. Section 31 23 23 - Fill: Soil and aggregate backfill for structures.
4. Section 32 91 19 - Landscape Grading: Filling of topsoil over backfilled trenches to finish grade elevation.
5. Section 33 11 13 - Public Water Utility Distribution Piping: Utility service water piping and bedding.
6. Section 33 31 00 - Sanitary Utility Sewerage Piping: Sanitary sewer piping and bedding from building to utility service.
7. Section 33 41 00 - Storm Utility Drainage Piping: Storm sewer piping and bedding from building to utility service.
8. Section 33 46 00 - Subdrainage: Building perimeter drainage, filter aggregate, filter fabric, and granular cover.
9. Section 33 51 00 - Natural-Gas Distribution: Gas piping and bedding from building to utility service.

1.2 DEFINITIONS

A. Utility: Any buried pipe, duct, conduit, manhole, tank, or cable.

B. Excavatable Flowable Fill: Lean cement concrete fill used where future excavation may be required, such as fill for utility trenches, bridge abutments, and culverts.

C. Non-excavatable Flowable Fill: Lean cement concrete fill used where future excavation is not anticipated, such as fill below structure foundations and filling abandoned utilities.

1.3 REFERENCE STANDARDS

A. ASTM International:
1. ASTM C33 - Standard Specification for Concrete Aggregates.
2. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
3. ASTM C150 - Standard Specification for Portland Cement.
4. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.

5. ASTM C403/C403M - Standard Test Method for Time of Setting of Concrete Mixtures by Penetration Resistance.
6. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.
7. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
8. ASTM C1017/C1017M - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
9. ASTM C1040 - Standard Test Methods for Density of Unhardened and Hardened Concrete in Place By Nuclear Methods.
10. ASTM D4832 - Standard Test Method for Preparation and Testing of Controlled Low Strength Material (CLSM) Test Cylinders.

B. Pennsylvania Department of Transportation
1. Publication 408 - Specifications

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

C. Field Quality-Control Submittals:
1. Mix Design:
a. Furnish flowable fill mix design for each specified strength.
b. Furnish separate mix designs when admixtures are required for the following:
1) Flowable fill Work during hot and cold weather.
2) Air entrained flowable fill Work.
c. Identify design mix ingredients, proportions, properties, admixtures, and tests.
2. Furnish test results to certify flowable fill mix design properties meet or exceed specified requirements.

D. Delivery Tickets:
1. Furnish duplicate delivery tickets indicating actual materials delivered to Project Site.

E. Qualifications Statements:
1. Submit qualifications for supplier.

1.5 QUALITY ASSURANCE

A. Perform Work according to State of Pennsylvania Department of Transportation standards.

1.6 QUALIFICATIONS

A. Supplier:
1. Company specializing in supplying products specified in this Section with minimum three years' documented experience.
2. Product source approved by authority having jurisdiction.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01 50 00 - Temporary Facilities and Controls specifies ambient condition control facilities for product storage and installation.

B. Minimum Conditions: Do not install flowable fill during inclement weather or when ambient temperature is less than 40 degrees F.

1.8 FIELD MEASUREMENTS

A. Verify field measurements before installing flowable fill to establish quantities required to complete the Work.

PART 2 - PRODUCTS

2.1 FLOWABLE FILL

A. Furnish materials according to State of Pennsylvania Department of Transportation standards.

B. Flowable Fill: Excavatable type and non-excavatable type.
1. PennDOT Flowable Backfill, Type B. Future excavation of the backfill may be necessary such as at utility trenches, pipe trenches, bridge abutments, and around box or arch culverts.
2. PennDOT Flowable Backfill, Type C. Excavation of backfills not anticipated, including replacing unsuitable soils below structure foundations, filling abandoned conduits, and backfilling around pipe culverts where extra strength is required.
3. PennDOT Flowable Backfill, Type D. Construction in areas requiring low-density backfill material as in abutments over highly deformable soils, backfilling retaining walls, filling vaults, and backfilling on top of buried structures.

2.2 MATERIALS

A. Portland Cement: ASTM C150 Type I - Normal; Type IA - Air Entraining.

B. Fine Aggregates: ASTM C33.

C. Water: Clean and not detrimental to concrete.

2.3 ADMIXTURES

A. Air Entrainment: ASTM C260.

B. Chemical Admixture: ASTM C494/C494M.

C. Fly Ash: ASTM C618 Class C or F obtained from residue of electric generating plant using ground or powdered coal.

D. Plasticizing: ASTM C1017/C1017M Type II, plasticizing and retarding.

2.4 MIXES

A. Mix and deliver flowable fill according to ASTM C94/C94M, Option C.

B. Flowable Fill Design Mix:
1. PennDOT Type B, C or D
2. Cement Content:
   a. Type B: 50 lb/cu yd
   b. Type C: 150-200 lb/cu yd
   c. Type D: 300-700 lb/cu yd
3. Fly Ash Content:
   a. Excavatable: None.
4. Pozzolans
   a. Type B: 300 lb/cu yd
   b. Type C: 300 lb/cu yd
   c. Type D: 100-400 lb/cu yd
5. Bottom Ash
   a. Type B: 2600 lb/cu yd
   b. Type C: 2600 lb/cu yd
6. Water Content:
   a. Excavatable: As specified.
   b. Non-Excavatable: As specified.
7. Air Entrainment:
   a. Excavatable: 5 to 35 percent.
   b. Non-Excavatable: 5 to 15 percent.
8. 28-Day Compressive Strength:
   a. Type B: 125 psi, max
   b. Type C: 800 psi, min
   c. Type D: 90-400
9. Density:
   a. Type B: N/A
   b. Type C: N/A
   c. Type D: 30-70 lb/cu ft

C. Provide water content in design mix to produce self-leveling, flowable fill material at time of placement.

D. Design mix air entrainment and unit mass are for laboratory design mix and source quality control only.

2.5 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.

B. Test properties of flowable fill design mix and certify results for the following:
1. Design mix proportions by weight of each material.
2. Aggregate: ASTM C33 for material properties and gradation.
3. Properties of plastic flowable fill design mix including:
   a. Temperature.

b. Slump.
c. Air entrainment.
d. Yield.
e. Cement factor.

4. Properties of hardened flowable fill design mix including:
   a. Compressive strength at 1 day, 7 days, and 28 days. Report compressive strength of each specimen and average specimen compressive strength.
   b. Unit mass for each specimen and average specimen unit mass at time of compressive strength testing.

C. Prepare delivery tickets containing the following information:
1. Project designation.
2. Date.
3. Time.
4. Class and quantity of flowable fill.
5. Actual batch proportions.
6. Free moisture content of aggregate.
7. Quantity of water withheld.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 73 00 - Execution Requirements: Verification of existing conditions before starting Work.

B. Verify excavation specified in Section 31 23 16 and trenching specified in Section 31 23 17 is complete.

C. Verify utility installation as specified is complete and tested before placing flowable fill.

D. Verify excavation is dry and dewatering system is operating.

3.2 PREPARATION

A. Section 01 73 00 - Execution Requirements: Requirements for installation preparation.

B. Support and restrain utilities to prevent movement and flotation during installation of flowable fill.

C. Protect structures and utilities from damage caused by hydraulic pressure of flowable fill before fill hardens.

D. Protect utilities and foundation drains to prevent intrusion of flowable fill.

3.3 INSTALLATION - FILL, BEDDING, AND BACKFILL

A. Place flowable fill by chute, pumping or other methods approved by Engineer.

B. Place flowable fill in lifts to prevent lateral pressures from exceeding structural capacity of structures and utilities.

C. Place flowable fill evenly on both sides of utilities to maintain alignment.

D. Place flowable fill to elevations indicated on Drawings without vibration or other means of compaction.

3.4 INSTALLATION - FILLING ABANDONED UTILITIES

A. Verify pipes and conduits are not clogged and are sufficiently empty to permit gravity installation of flowable fill for entire length indicated to be filled.

B. Seal lower end of pipes and conduits by method to contain flowable fill and to vent trapped air caused by filling operations.

C. Place flowable fill using method to ensure there are no voids.
1. Fill pipes and conduits from high end.
2. Fill manholes, tanks, and other structures from grade level access points.

D. After filling pipes and conduits seal both ends.

3.5 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.

B. Perform inspection and testing according to ASTM C94/C94M.
1. Take samples for tests for every 150 cu yd of flowable fill, or fraction thereof, installed each day.
2. Sample, prepare and test four compressive strength test cylinders according to ASTM D4832. Test one specimen at 3 days, one at 7 days, and two at 28 days.
3. Measure temperature at point of delivery when samples are prepared.

C. Perform in-place density tests using nuclear test device according to ASTM C1040.
1. Perform tests at locations as directed by Engineer.

D. Defective Flowable Fill: Fill failing to meet the following test requirements or fill delivered without the following documentation.
1. Test Requirements:
a. Minimum temperature at point of delivery.
b. Compressive strength requirements for each type of fill.
2. Documentation: Duplicate delivery tickets.

3.6 CLEANING

A. Section 01 73 00 - Execution Requirements: Requirements for cleaning.

B. Remove spilled and excess flowable fill from Project Site.

C. Restore facilities and Site areas damaged or contaminated by flowable fill installation to existing condition before installation.

END OF SECTION 31 2323.33

SECTION 31 2500 - EROSION AND SEDIMENTATION CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Rock Construction Entrance(s)
2. Diversion Channels.
3. Rock Energy Dissipator.
4. Paved Energy Dissipator.
5. Rock Basin.
6. Sediment Ponds.
7. Sediment Traps.
8. Site Stabilization.

B. Related Sections:
1. Section 01 41 26 - Permit Requirements
2. Section 31 10 00 - Site Clearing.
3. Section 31 23 16 - Excavation.
4. Section 31 23 23 - Fill.
5. Section 31 37 00 - Riprap.
6. Section 32 13 13 - Concrete Paving.
7. Section 32 91 19 - Landscape Grading.
8. Section 32 92 19 - Seeding and Soil Supplements.

C. Description: This section of the specification shall serve as a supplement to the Erosion and Sediment Pollution Control Plan for the Project.

1.2 REFERENCES

A. Pennsylvania Department of Environmental Protection, Bureau of Soil and Water Conservation
1. Erosion and Sediment Control Program Manual

B. American Association of State Highway and Transportation Officials:
1. AASHTO T88 - Standard Specification for Particle Size Analysis of Soils.
2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

C. American Concrete Institute:
1. ACI 301 - Specifications for Structural Concrete.

D. ASTM International:
1. ASTM C127 - Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate.
2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3).

3. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
4. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

E. Precast/Prestressed Concrete Institute:
1. PCI MNL-116S - Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Product Data: Submit data on materials.

C. Submit proposed mix design of each class of concrete for review prior to commencement of Work.

D. Test Reports: Indicate certified tests results for precast concrete at manufacturing facility, cast-in-place concrete in field, and granular backfill.

E. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

A. Section 01 77 00 - Closeout Requirements: Requirements for submittals.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with requirements of referenced Sections.

B. Perform Work according to State of Pennsylvania's Erosion and Sediment Control Program Manual standards.

1.6 SEQUENCING

A. See Drawings for specific construction sequence.

1.7 PRE-INSTALLATION MEETINGS

A. Section 01 31 00 - Project Meetings: Pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Section 01 61 00 - Product Requirements: Environmental conditions affecting products on site.

B. Do not place grout when air temperature is below freezing.

C. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

PART 2 - PRODUCTS

2.1 ROCK AND GEOTEXTILE MATERIALS

A. Rock: As specified in Section 31 37 00.

B. Geotextile Separation Fabric:
1. Description:
a. Non-biodegradable, UV-resistant, nonwoven geotextile fabric.
b. Material: Polypropylene.
c. Edges: Selvaged or finished to prevent separation of outer material.
d. Calendar such that yarns will retain relative positions.
2. Performance and Design Criteria:
a. Minimum Unseamed Sheet Width: 15 feet.
b. Nominal Weight: 12 oz./sq. yd..
c. Minimum Sheet Thickness: 120 mils.
d. Apparent Opening Size:
1) No. 100 U.S. standard sieve size.
2) Comply with ASTM D4751.
e. Vertical Water Flow Rate:
1) 70 gpm/sq. ft., minimum average roll value.
2) Comply with ASTM D4491/D4491M.
f. Grab Tensile Strength:
1) 270 lbf, minimum average roll value.
2) Comply with ASTM D4632/D4632M.
g. Grab Tensile Elongation:
1) 50 percent, minimum average roll value.
2) Comply with ASTM D4632/D4632M.
h. Trapezoidal Tear Strength:
1) 125 lbf, minimum average roll value.
2) Comply with ASTM D4533/D4533M.
i. Puncture Strength:
1) 100 lbf, minimum average roll value.
2) Comply with ASTM D4833/D4833M.
j. UV Resistance at 500 Hours:
1) Strength Retention: 70 percent.
2) Comply with ASTM D4355/D4355M.

2.2 BLOCK, AGGREGATE, AND SOIL MATERIALS

A. Precast Solid Concrete Block: 2000 psi, as specified in Section 041000.

B. Coarse Aggregate: as specified in Section 32 05 16.

C. Soil Backfill: Suitable backfill, as specified in Section 32 05 13.

2.3 PLANTING MATERIALS

A. Seeding and Soil Supplements: as specified in Section 32 92 19.

B. Mulch: as specified in Section 32 92 19.

C. Erosion Control Mulch Blanket.
1. Organic Mulch Material. Machine produced mat of organic, biodegradable mulch material evenly distributed and attached on one side of a photodegradable polypropylene mesh with high-strength threads conforming to the following physical properties:
   a. Weight 8 ounces per square yard, minimum
   b. Mat thickness Approximately 0.125 inch to 0.6 inch
2. Reprocessed Wood Fiber. Flexible, non-woven, biodegradable water absorbing mat of mechanically defibrated wood fibers and synthetic fibers with a photodegradable polypropylene netting laminated to one side of the mat and conforming to the following physical properties:
   a. Weight 6.4 to 7.9 ounces per square yard
   b. Mat thickness 0.105 inch, minimum

2.4 PIPE MATERIALS

A. Pipe: Plastic, as specified in Section 33 42 13.

2.5 SEDIMENT BARRIERS

A. Silt Sock
1. Provide filter sock meeting the compost filter sock requirements as shown below.

Material Type	3 mil HDPE	5 mil HDPE	5 mil HDPE
Characteristics	Photo-degradable	Photo-degradable	Bio-degradable
Diameters	12", 18"	12", 18", 24", 32"	12", 18", 24", 32"
Mesh Opening	3/8"	3/8"	3/8"
Tensile Strength		26 psi	26 psi
UV Stability % Original Strength (ASTM G-155)	23% at 1000 hr.	23% at 1000 hr.	23% at 1000 hr.
Min. Functional Longevity	6 months	9 months	6 months

2. Compost: well-decomposed, stable, weed-free, organic compost derived from agriculture, food, stump grindings, and yard or wood/bark organic matter sources - aerobically composted with no objectionable odors. Provide compost meeting the compost standards for compost filter socks:
   a. Organic Matter Content: 80% - 100% (dry weight basis)
   b. Organic Portion:Fibrous and elongated
   c. pH: 5.5 - 8.0
   d. Moisture Content:35% - 55%
   e. Particle Size: 98% pass through 1" screen
   f. Soluble Salt Concentration: Max 5 dS/m (mmhos/cm)

B. Weighted Sediment Filter Tube

1. Core material: washed 100% shredded rubber with metal removed.
2. Containment Material: woven, polypropylene geotextile; minimum permeability shall be equal to or greater than 0.05 cm/sec per ASTM D 4491. Minimum strength retained relative to UV exposure shall be 70% when tested per ASTM D 4355 for 500 hours.
3. Size: 9.5 or 20 inch nominal diameter, 4.5 or 10 foot nominal length.

C. Silt Fencing: Constructed of 2 inch x 2 inches x 4 feet stakes with fencing fabric stapled to stakes.
1. Grab Tensile Strength (lb): 120 per ASTM D1682
2. Elongation at Failure (%): 20% Max. per ASTM D1682
3. Mullen Burst Strength (psi): 200 per ASTM D 3786
4. Trapezoidal Tear Strength (lb): 50
5. Puncture Strength (lb): 40 per ASTM D 751 (modified)
6. Slurry Flow Rate (gal/min/sf): 0.3
7. Equivalent Opening Size: 30US Std. Sieve
8. Ultraviolet Radiation Stability (%): 80 per ASTM G-26

D. Inlet Filter Bag: fabric shall have a minimum properties shown below.
1. Grab Tensile Strength: 450x300 lbs per ASTM D4632
2. Grab Tensile Elongation: 40x25% per ASTM D4632
3. Puncture Strength: 130 lbs per ASTM D4633
4. Mullen Burst Strength: 600 psi per ASTM D3786
5. Trapezoid Tear Strength: 165 x 150 lbs per ASTM D4533
6. % Open Area: 28% COE-22125-86
7. Apparent opening size: 30 US Std Seive per ASTM D4751
8. Water Flow Rate: 250 gal/min/sq. ft. per ASTM D4491

E. High Volume Filter Bags: Made from woven geotextiles that meet the following standards:
1. Avg. Wide Width Strength: min 60 lb/in per ASTM D-4884.
2. Grab Tensile: min 205 lb per ASTM D-4632.
3. Puncture: min 110 lb per ASTM D-4833.
4. Burst: min 350 per ASTM D-3786.
5. UV Resistance: min 70% per ASTM D-4355.
6. AOS % Retained: 80 sieve per ASTM D-4751.

2.6 MIXES

A. Concrete: 3,000 psi, as specified in Section 03 30 00.

2.7 SOURCE QUALITY CONTROL (AND TESTS)

A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.

B. Perform tests on cement, aggregates, and mixes to ensure conformance with specified requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 73 00 - Execution Requirements: Verification of existing conditions before starting work.

B. Verify compacted subgrade or stabilized soil is acceptable and ready to support devices and imposed loads.

C. Verify gradients and elevations of base or foundation for other work are correct.

3.2 CONSTRUCTION ENTRANCE

A. Clear and grub the footprint of the rock construction entrance as specified in Section 31 10 00.

B. Excavating to depth required, forming embankment.

C. Place geotextile over subsoils and place aggregate.

3.3 DIVERSION CHANNELS

A. Windrow excavated material on low side of channel.

B. Compact to 95 percent maximum density.

C. On entire channel area, apply soil supplements and sow seed as specified in Section 32 92 19.

D. Mulch seeded areas with hay as specified in Section 32 92 19.

3.4 ROCK ENERGY DISSIPATOR

A. Excavate to indicated depth of rock lining or nominal placement thickness as follows. Remove loose, unsuitable material below bottom of rock lining, then replace with suitable material. Thoroughly compact and finish entire foundation area to firm, even surface.
   1. Nominal Placement Thickness per NCSA Class:
      a. R8: 48 Inches
      b. R7: 36 Inches
      c. R6: 30 Inches
      d. R5: 24 Inches
      e. R4: 18 Inches
      f. R3: 12 Inches

B. Lay and overlay geotextile fabric over substrate. Lay fabric parallel to flow from upstream to downstream. Overlap edges upstream over downstream and upslope over downslope Provide a minimum overlap of 3 feet. Offset adjacent roll ends a minimum of 5 feet when lapped. Cover fabric as soon as possible and in no case leave fabric exposed more than 4 weeks.

C. Carefully place rock on geotextile fabric to produce an even distribution of pieces, with minimum of voids and without tearing geotextile.

D. Unless indicated otherwise, place full course thickness in one operation to prevent segregation and to avoid displacement of underlying material. Arrange individual rocks for uniform distribution.
   1. Saturate rock with water. Fill voids between pieces with grout, for at least top 6 inches. Sweep surface with stiff broom to remove excess grout.
   2. Moist cure grouted rock for at least 3 days after grouting, using water saturated burlap in accordance with Section 03 30 00.

3.5 SEDIMENT BARRIERS

A. Compost Filter Socks and Weighted Sediment Filter Tubes
   1. Prepare placement area by removing all debris.
   2. Place parallel to contour with both ends of the sock extended upslope at a 45 degree angle to the rest of the sock to prevent end-arounds.
   3. Socks placed on earthen slopes should be anchored with stakes driven through the center of the sock or immediately downslope of the sock at intervals recommended by the manufacturer.
   4. Where socks are placed on paved surfaces, concrete blocks should be used immediately downslope of the socks (at the same intervals recommended for the stakes) to help hold the sock in place.

B. Silt Fence:
   1. Excavate 6 inch deep trench, minimizing the disturbance on the downslope side. The bottom of the trench should be at level grade.
   2. Drive support stakes 18 inches below the existing ground surface at 8 foot intervals.
   3. Stretched and fasten the fabric to the upslope side of the support stakes.
   4. Wherever reinforced silt fence is installed, the reinforcement mesh should be fastened to the stakes prior to the fabric.
   5. At fabric ends, both ends should be wrapped around the support stake and stapled.
   6. Anchor fencing by placing the fabric in the bottom of the trench, backfill and compact.

3.6 ROCK BASIN

A. Construct generally in accordance with rock energy dissipator requirements to indicated shape and depth. Rock courses may be placed in several operations but minimum depth of initial course must be 3 feet or greater.

3.7 ROCK BARRIER

A. Determine length required for ditch or depression slope and excavate, compact and foundation area to firm, even surface.

B. Produce an even distribution of rock pieces, with minimum voids to the indicated shape, height and slope.

C. Construct coarse aggregate filter blanket against upstream face of rock barrier to the indicated thickness.

3.8 SITE STABILIZATION

A. Incorporate erosion control devices indicated on the Drawings into the Project at the earliest practicable time.

B. Construct, stabilize and activate erosion controls before site disturbance within tributary areas of those controls.

C. Stockpile and waste pile heights shall not exceed 35 feet. Slope stockpile sides at 2: 1 or flatter.

D. Stabilize any disturbed area of affected erosion control devices on which activity has ceased and which will remain exposed for more than 4 days.
1. During non-germinating periods, apply mulch at recommended rates.
2. Stabilize disturbed areas which are not at finished grade and which will be disturbed within one year in accordance with Section 32 92 19.
3. Stabilize disturbed areas which are either at finished grade or will not be disturbed within one year in accordance with Section 32 92 19 permanent seeding specifications.

E. Stabilize diversion channels, sediment traps, and stockpiles immediately.

3.9 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Inspect erosion control devices on a weekly basis and after each runoff event. Make necessary repairs to ensure erosion and sediment controls are in good working order.

C. Field test concrete in accordance with Section 03 30 00.

D. Compaction Testing: As specified in Section 31 23 23.

E. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

F. Frequency of Compaction Testing: One for each lift.

3.10 CLEANING

A. Section 01 73 00 - Execution Requirements: Requirements for cleaning.

B. When sediment accumulation in sedimentation structures has reached a point one-third depth of sediment structure or device, remove and dispose of sediment.

C. Do not damage structure or device during cleaning operations.

D. Do not permit sediment to erode into construction or site areas or natural waterways.

E. Clean channels when depth of sediment reaches approximately one half channel depth.

3.11 PROTECTION

A. Section 01 73 00 - Execution Requirements: Requirements for protecting finished Work.

B. Immediately after placement, protect paving from premature drying, excessive hot or cold temperatures, and mechanical injury.

C. Do not permit construction traffic over paving until 75 percent design strength of concrete has been achieved.

D. Protect paving from elements, flowing water, or other disturbance until curing is completed.

END OF SECTION 31 2500

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SECTION 31 3700 - RIPRAP

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Riprap placed loose.

B. Related Sections:
1. Section 31 05 16 - Aggregates for Earthwork.
2. Section 31 22 13 - Rough Grading.
3. Section 31 23 16 - Excavation: Excavating for riprap.
4. Section 31 23 17 - Trenching
5. Section 31 23 23 - Fill.
6. Section 31 32 14 - Cement Soil Stabilization.
7. Section 31 32 15 - Lime Soil Stabilization.
8. Section 32 91 19 - Landscape Grading: Topsoil placement.
9. Section 33 42 13 - Pipe Culverts.

1.2 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data for riprap bags, binder and geotextile fabric.

C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.3 QUALITY ASSURANCE

A. Furnish each aggregate material from single source throughout the Work.

B. Perform Work in accordance with:
1. Pennsylvania Department of Transportation standard.
2. Pennsylvania Department of Environmental Protection standards.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Riprap: Limestone type; Sound, hard and angular shape; well graded; without shale seams, structural defects and foreign substances; with width and thickness greater than one third its length; minimum specific gravity of 2.5, as determined in accordance with ASTM C127, bulk saturated, and surface dry basis; size and gradation in accordance with NCSA Class, within following limits:

Square Opening inches	Percent Passing NCSA Size No.					
	R8	R7	R6	R5	R4	R3
42	100					
30		100				
24	15-50		100			
18		15-50		100		
15	0-15					
12		0-15	15-50		100	
9				15-50		
6			0-15		15-50	100
4				0-15		
3					0-15	15-50
2						0-15

B. Geotextile Fabric: Non-biodegradable, non-woven; TenCate Geosynthetics - Mirafi S1200.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 73 00 - Execution Requirements: Verification of existing conditions before starting work.

B. Do not place riprap bags over frozen or spongy subgrade surfaces.

3.2 PLACEMENT

A. Place geotextile fabric over substrate, lap edges and ends.

B. Place riprap at culvert pipe ends, and as indicated on Drawings.

C. Installed Thickness: As indicated on Drawings.

D. Place rock evenly and carefully to minimize voids, do not tear fabric, place rock in one consistent operation to preclude disturbance or displacement of substrate.

END OF SECTION 31 3700

SECTION 32 1123 - AGGREGATE BASE COURSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Aggregate subbase.
2. Aggregate base course.

B. Related Sections:
1. Section 31 22 13 - Rough Grading: Preparation of site for base course.
2. Section 31 23 17 - Trenching: Compacted fill under base course.
3. Section 31 23 23 - Fill: Compacted fill under base course.
4. Section 31 37 00 - Riprap.
5. Section 32 05 16 - Aggregates for Exterior Improvements.
6. Section 32 12 16 - Asphalt Paving: Binder and wearing asphalt courses.
7. Section 32 13 13 - Concrete Paving: Finish concrete surface course.
8. Section 32 17 13 - Parking Bumpers: Concrete bumpers.
9. Section 32 91 19 - Landscape Grading: Topsoil fill at areas adjacent to aggregate base course.
10. Section 33 05 13 - Manholes and Structures: Manholes including frames.

1.2 REFERENCES

A. Pennsylvania Department of Transportation (PennDOT):
1. Publication 19 - Field and Laboratory Test Methods, latest edition.
2. Publication 408 - Specifications, latest edition, as amended.

B. Commonwealth of Pennsylvania, Pennsylvania Code, Title 67, Transportation, Department of Transportation:
1. Chapter 459, Occupancy of Highways by Utilities, as supplemented or revised.
2. Chapter 213, Work Zone Traffic Control (PennDOT Chapter 213).

C. American Association of State Highway and Transportation Officials:
1. AASHTO M288 - Standard Specification for Geotextile Specification for Highway Applications.

D. ASTM International:
1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3).
2. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data:
1. Submit data for geotextile fabric and herbicide.

C. Materials Source: Submit name of aggregate materials suppliers.

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

E. Material Slips: Furnish certification of the amount of materials utilized from the producer in accordance with PennDOT specifications.

1.4 QUALITY ASSURANCE

A. Furnish each aggregate material from single source throughout the Work.

B. All aggregate must originate from a source approved by PennDOT meeting according to PennDOT standards.

PART 2 - PRODUCTS

2.1 AGGREGATE MATERIALS

A. Base Aggregate: PennDOT Publication 408, Section 703.2 for No. 2A, type C. as specified in Section 31 05 16.

2.2 ACCESSORIES

A. Geotextile Fabric: AASHTO M288; non-woven, polypropylene.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 73 00 - Execution Requirements: Verification of existing conditions before starting work.

B. Verify compacted substrate is dry and ready to support paving and imposed loads.
1. Proof roll substrate with loaded triaxle (GVW 75,000 pounds) in minimum two perpendicular passes to identify soft spots.
2. Remove soft substrate and replace with compacted fill as specified in Section 31 23 23.

C. Verify substrate has been inspected, gradients and elevations are correct.

3.2 PREPARATION

A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.

B. Do not place fill on soft, muddy, or frozen surfaces.

3.3 AGGREGATE PLACEMENT

A. Where required, install geotextile fabric over subgrade according to manufacturer's instructions.
1. Lap ends and edges minimum 6 inches.
2. Anchor fabric to subgrade when required to prevent displacement until aggregate is installed.

B. Spread aggregate over prepared substrate to total compacted thickness indicated on Drawings.

C. When compacted thickness exceeds 6 inches, place aggregate equal thickness layers to total compacted thickness indicated on Drawings.
1. Maximum Layer Compacted Thickness: 6 inches.
2. Minimum Layer Compacted Thickness: 3 inches.

D. Roller compact aggregate to 98 percent maximum density.

E. Level and contour surfaces to elevations, profiles, and gradients indicated.

F. Maintain optimum moisture content of fill materials to attain specified compaction density.

G. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.4 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Maximum Variation From Flat Surface: ¼ inch measured with 10 foot straight edge.

C. Maximum Variation From Thickness and elevation: ¼ inch.

3.5 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Laboratory compaction testing will be performed according to ASTM D698.

C. Field compaction testing will be performed according to ASTM D6938.

D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

E. Frequency of Tests: One test for every 250 square yards of each layer compacted aggregate.

3.6 COMPACTION

A. Compact materials to 98 percent of maximum density as determined from test strip, according to ASTM D698.

END OF SECTION 32 1123

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SECTION 32 1215 - PRICE ADJUSTMENT FOR BITUMINOUS MATERIALS

PART 1 - GENERAL

1.1 SUMMARY

A. These requirements provide for a price adjustment, in the form of a payment to the Contractor or a rebate to the Owner, for fluctuations in the cost of asphalt cement used in the bituminous materials placed as part of the construction work specified in the following Sections:

1. 321216 – "Asphalt Paving"

   Applicable contract items include any modified standard or nonstandard item where the work to be performed involves placement of one or more of the bituminous materials specified in these Sections.

1.2 DEFINITIONS

A. Owner – Exeter Township

B. Department – Pennsylvania Department of Transportation (PennDOT)

1.3 GENERAL

A. These price adjustment provisions apply to projects where asphalt cement, including asphalt cement residue contained in emulsions or cut backs, will be used in the bituminous materials specified or indicated for placement.

The Department posts monthly index prices for asphalt cement (PG 64S-22) using price data obtained, on the last Wednesday of the preceding month, from a survey of producers who do business in Pennsylvania. Data provided by producers serving the eastern portion of the state is averaged to compute the index price for Zone 1 (Districts 3-0, 4-0, 5-0, 6-0, and 8-0). Data provided by producers serving the western portion of the state is averaged to compute the index price for Zone 3 (Districts 1-0, 10-0, 11-0, and 12-0). The index price for Zone 2 (Districts 2-0 and 9-0) is computed as the average of the index prices for Zone 1 and Zone 3.

The price index in the proposal, IB, will be the index price posted by the Department, determined as specified above, for the month in which the project is advertised.

The price index at the time of placement, IP, will be the index price posted by the Department, determined as specified above, for the month during which the applicable material is placed.

1.4 PRICE ADJUSTMENT CRITERIA AND CONDITIONS

The following criteria and conditions will be considered in determining a price adjustment for bituminous materials:

A. No Price Adjustment. When the ratio IP/IB falls within the range of 0.90 to 1.10, no price adjustment will be made for any bituminous material placed during the relevant month.

B. Price Rebate. When the ratio IP/IB is calculated to be less than 0.90, the Owner will receive an automatic

C. price rebate determined according to the following formula:

P.R. = (0.90 – IP/IB) (Q) (IB)

where:
P.R. = Price Rebate
IP = Price Index for the last Wednesday of the month preceding the month in which the material is placed (One-Month Price Adjustment Period)
IB = Price Index in the Proposal
Q = Quantity tonnes (tons) of Bitumen in the Mixture placed

D. Price Increase. When the ratio IP/IB is calculated to be greater than 1.10, the Contractor will receive a price increase determined according to the following formula:

P.I. = (IP/IB – 1.10) (Q) (IB)

where:
P.I. = Price Increase
IP = Price Index for the last Wednesday of the month preceding the month in which the material is placed (One-Month Price Adjustment Period) IB = Price Index in the Proposal
Q = Quantity tonnes (tons) of Bitumen in Mixture Placed

E. Equivalent Tonneage (Tonnage)

1. Square Meter (Square Yard) Basis. For bituminous mixtures placed on a square meter (square yard) basis, the equivalent tonneage (tonnage) is computed as follows:

Metric Only: Bituminous Mixture Tonneage Placed = (0.000 001) (A) (D) (d) where:
A = Surface Area (square meters) D = Design Depth (millimeters)
d = Design Density* (kilograms per cubic meter)

[Bitumen]
|Tonnage in | = [Bituminous Mixture] [Percent] [Bituminous Mixture] [Tonneage Placed] [Bitumen by Mass]

2. English Only: Bituminous Mixture Tonnage Placed = (0.000375) (A) (D) (d) where:

A = Surface Area (square yards) D
= Design Depth (inches)
d = Design Density* (pounds per cubic feet)

[Bitumen]
|Tonnage in | = [Bituminous Mixture] [Percent] [Bituminous Mixture] [Tonnage Placed] [Bitumen by Weight]

*The design density (i.e. lab density) and percent bitumen by mass (weight) will be obtained from the approved JMF (Form TR-448A) for the bituminous mixture placed. Convert the design density obtained from Form TR-448A to SI (the proper) units by multiplying by the density of water, which is 99.1 kg/m^3 (62.4 pounds per cubic foot).

3. Liters per Square Meter (Gallons per Square Yard) Basis. For bituminous material placed on a liters per square meter (gallons per square yard) basis according to specification, and residue content according to Bulletin 25, the equivalent tonneage (tonnage) is computed as follows:

   Metric Only: Bitumen Tonneage = (0.001) (A) (a) (g) where:

   A = Surface Area (square meters)
   a = Actual Residue Application Rate (liters per square meter) g = Specific Gravity of Bituminous Material

   English Only: Bitumen Tonnage = (0.004164) (A) (a) (g) where:

   A = Surface Area (square yards)
   a = Actual Residue Application Rate (gallons per square yard) g = Specific Gravity of Bituminous Material

4. Liter (Gallon) Basis. For bituminous material placed on a liter (gallon) basis, the equivalent tonneage (tonnage) is computed as follows:

   Metric Only: Bitumen Tonneage = (0.001) (g) (p) (No. of liters) where:

   g = Specific Gravity of Bituminous Material

   p = % Asphalt in Emulsion

F. Contractor shall submit daily weight tickets to the Construction Manager and shall submit plant material certificates identifying Bitumen in mixture placed.

G. Contractor shall submit monthly calculation to the Construction Manager based on above formula for verification and final approval by Construction Manager.

H. Final price adjustment will be made by change order or allowance adjustment as determined by Owner based on the actual price adjustment verification by Construction Manager.

I. Current asphalt index:

ASPHALT-DIESEL PRICES

Asphalt Cement / Diesel Fuel Price Indexes

	Zone 1 Districts 3, 4, 5, 6, 8		Zone 2 Districts 2, 9		Zone 3 Districts 1, 10, 11, 12		Diesel Fuel	
Month and Year	$/Ton	$/Tonne	$/Ton	$/Tonne	$/Ton	$/Tonne	$/Gallon	$/Liter
September 2026	786.00	866.00	711.50	784.00	637.00	702.00	4.3100	1.1386
August 2026	789.00	870.00	720.50	794.50	652.00	719.00	3.9300	1.0382
July 2026	784.00	864.00	715.50	788.50	647.00	713.00	3.5700	0.9431
June 2026	778.00	858.00	707.50	780.00	637.00	702.00	4.2000	1.1095
May 2026	749.00	826.00	688.00	758.50	627.00	691.00	4.1200	1.0884
April 2026	732.00	807.00	658.50	726.00	585.00	645.00	4.0600	1.0725
March 2026	588.00	648.00	560.00	617.00	532.00	586.00	2.8000	0.7397
February 2026	589.00	649.00	565.50	623.00	542.00	597.00	2.3500	0.6208
January 2026	614.00	677.00	580.50	640.00	547.00	603.00	2.3000	0.6076
December 2025	628.00	692.00	582.50	642.00	537.00	592.00	2.6400	0.6974
November 2025	632.00	697.00	594.50	655.50	557.00	614.00	2.3900	0.6314
October 2025	639.00	704.00	609.00	671.00	579.00	638.00	2.4100	0.6367
September 2025	652.00	719.00	615.50	678.50	579.00	638.00	2.3700	0.6261
August 2025	652.00	719.00	619.50	683.00	587.00	647.00	2.5400	0.6710
July 2025	650.00	717.00	618.50	682.00	587.00	647.00	2.3800	0.6287
June 2025	641.00	707.00	609.00	671.50	577.00	636.00	2.1900	0.5785
May 2025	641.00	707.00	609.00	671.50	577.00	636.00	2.2300	0.5891
April 2025	642.00	708.00	604.50	666.50	567.00	625.00	2.3700	0.6261
March 2025	633.00	698.00	593.50	654.50	554.00	611.00	2.6300	0.6948
February 2025	626.00	690.00	590.00	650.50	554.00	611.00	2.5800	0.6816
January 2025	609.00	671.00	575.50	634.00	542.00	597.00	2.2800	0.6023
December 2024	597.00	658.00	569.50	627.50	542.00	597.00	2.3100	0.6102
November 2024	586.00	646.00	564.00	621.50	542.00	597.00	2.3000	0.6076
October 2024	588.00	648.00	571.00	629.50	554.00	611.00	2.2000	0.5812

END OF SECTION 32 1215

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SECTION 32 1216 - ASPHALT PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Asphalt materials.
2. Aggregate materials.
3. Aggregate subbase.
4. Asphalt paving base course, binder course, and wearing course.
5. Asphalt paving overlay for existing paving.
6. Surface slurry.

B. Related Requirement:
1. Section 31 22 13 - Rough Grading: Preparation of site for paving and base.
2. Section 31 23 23 - Fill: Compacted subbase for paving.
3. Section 31 05 16 - Aggregates for Earthwork: Product requirements for aggregate for placement by this section.
4. Section 32 11 23 - Aggregate Base Courses: Compacted subbase for paving.
5. Section 32 17 13 - Parking Bumpers: Concrete bumpers.
6. Section 32 17 23 - Pavement Markings: Painted pavement markings, lines, and legends.
7. Section 33 05 13 - Manholes and Structures: Manholes including frames.

1.2 REFERENCE STANDARDS

A. Pennsylvania Department of Transportation:
1. Publication 19 – Field and Laboratory Test Methods, latest edition.
2. Publication 408 - Specifications, latest edition, as amended.

B. American Association of State Highway and Transportation Officials:
1. AASHTO M17 - Standard Specification for Mineral Filler for Bituminous Paving Mixtures.
2. AASHTO M29 - Standard Specification for Fine Aggregate for Bituminous Paving Mixtures.
3. AASHTO M140 - Standard Specification for Emulsified Asphalt.
4. AASHTO M208 - Standard Specification for Cationic Emulsified Asphalt.
5. AASHTO M288 - Standard Specification for Geotextile Specification for Highway Applications.
6. AASHTO M320 - Standard Specification for Performance-Graded Asphalt Binder.
7. AASHTO M324 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
8. AASHTO MP1a - Standard Specification for Performance-Graded Asphalt Binder.

C. Asphalt Institute:
1. AI MS-2 - Mix Design Methods for Asphalt Concrete and Other Hot- Mix Types.
2. AI MS-19 - Basic Asphalt Emulsion Manual.
3. AI SP-2 - Superpave Mix Design.

D. ASTM International:
1. ASTM D242 - Standard Specification for Mineral Filler For Bituminous Paving Mixtures.

2. ASTM D692 - Standard Specification for Coarse Aggregate for Bituminous Paving Mixtures.
3. ASTM D946 - Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction.
4. ASTM D977 - Standard Specification for Emulsified Asphalt.
5. ASTM D1073 - Standard Specification for Fine Aggregate for Bituminous Paving Mixtures.
6. ASTM D1188 - Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Coated Samples
7. ASTM D2027 - Standard Specification for Cutback Asphalt (Medium-Curing Type).
8. ASTM D2397 - Standard Specification for Cationic Emulsified Asphalt.
9. ASTM D2726 - Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures.
10. ASTM D2950 - Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods.
11. ASTM D3381 - Standard Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction.
12. ASTM D3515 - Standard Specification for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.
13. ASTM D3549 - Standard Test Method for Thickness or Height of Compacted Bituminous Paving Mixture Specimens.
14. ASTM D3910 - Standard Practices for Design, Testing, and Construction of Slurry Seal.
15. ASTM D6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data:
1. Submit product information for asphalt and aggregate materials.
2. Submit mix design with laboratory test results supporting design.

C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

A. Mixing Plant: Approved or certified by Pennsylvania Department of Transportation.

B. Obtain materials from same source throughout.

C. Perform Work in accordance with Pennsylvania Department of Transportation standard.

1.5 QUALIFICATIONS

A. Installer: Company specializing in performing work of this section with minimum 5 years documented experience.

1.6 AMBIENT CONDITIONS

A. Section 01 50 00 - Temporary Facilities and Controls: Ambient conditions control facilities for product storage and installation.

B. Do not place asphalt mixture between November 1 and March 1.

C. Do not place asphalt mixture when ambient air or base surface temperature is less than 40 degrees F, or surface is wet or frozen.

D. Place asphalt mixture when temperature is not more than 15 degrees F less than initial mixing temperature.

PART 2 - PRODUCTS

2.1 ASPHALT PAVING

A. Asphalt Materials:
1. Asphalt Binder: AASHTO M332 except as revised in PennDOT Bulletin 25; performance grade PG 64S-22.
2. Tack Coat: In accordance with Pennsylvania Department of Transportation Publication 408 Standard Specification, Section 460.

B. Aggregate Materials:
1. Coarse Aggregate: In accordance with Pennsylvania Department of Transportation standards.
2. Fine Aggregate: In accordance with Pennsylvania Department of Transportation standards.
3. Mineral Filler: AASHTO M17; finely ground mineral particles, free of foreign matter.

C. Aggregate Subbase: Specified in Section 32 11 23.

2.2 MIXES

A. Use dry material to avoid foaming. Mix uniformly.

B. Asphalt Paving Mixtures: Designed in accordance with Pennsylvania Department of Transportation standards with maximum 15 percent by weight reclaimed asphalt pavement.
1. Base Course: 25.0 mm.
2. Binder Course: 19.0 mm (Heavy Duty Pavement).
3. Wearing Course: 9.5 mm with skid resistance level L.

2.3 ACCESSORIES

A. Geotextile Fabric: AASHTO M288; non-woven, polypropylene.

B. Sealant: ASTM D6690, Type II or Type III; hot applied type.

2.4 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.

B. Submit proposed mix design of each class of mix for review prior to beginning of Work.

C. Test samples in accordance with PennDOT Publication 408.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 73 00 - Execution Requirements: Requirements for installation examination.

B. Verify utilities indicated under paving are installed with excavations and trenches backfilled and compacted.

C. Verify compacted subgrade is dry and ready to support paving and imposed loads.
1. Proof roll subbase with loaded triaxle dump truck (72,000 pounds GVW) in minimum two perpendicular passes to identify soft spots.
2. Remove soft subbase and replace with compacted fill as specified in Section 31 23 23.

D. Verify gradients and elevations of base are correct.

E. Verify drainage inlet frames, manhole frames and other embedded items are installed in correct position and elevation.

3.2 PREPARATION

A. Prepare subbase in accordance with Section 32 11 23.

3.3 DEMOLITION

A. Saw cut and notch existing paving as indicted on Drawings.

B. Clean existing paving to remove foreign material, excess joint sealant and crack filler from paving surface.

C. Repair surface defects in existing paving to provide uniform surface to receive new paving.

3.4 INSTALLATION

A. Subbase:
1. Aggregate Subbase: Install as specified in Section 32 11 23.

B. Primer:
1. Apply primer in accordance with PennDOT standards.
2. Use clean sand to blot excess primer.

C. Tack Coat:
1. Apply tack coat on asphalt and concrete surfaces over subgrade surface at uniform rate.
a. New Surfaces: 1/3 gal/sq yd.
b. Existing Surfaces: 1/2 gal/sq yd.
2. Apply tack coat to contact surfaces of curbs.
3. Coat surfaces of manhole and inlet frames with oil to prevent bond with asphalt paving. Do not tack coat these surfaces.

D. Asphalt Paving:
1. Place asphalt base or binder course within 4 hours of applying primer or tack coat.

2. Place base or binder course to thickness indicated on Drawings.
3. Place wearing course within 4 hours of placing and compacting binder course. When binder course is placed more than 24 hours before placing wearing course, clean surface and apply tack coat before placing wearing course.
4. Place wearing course to thickness indicated on Drawings.
5. Compact each course by rolling to specified density. Do not displace or extrude paving from position. Hand compact in areas inaccessible to rolling equipment.
6. Perform rolling with consecutive passes to achieve even and smooth finish, without roller marks.

E. Asphalt Paving Overlay
1. Apply tack coat to existing paving surface at rate recommended by geotextile fabric manufacturer.
2. Install geotextile fabric in accordance with manufacturer's instructions to permit asphalt saturation of fabric. Lap fabric edge and end joints 4 inches.
3. Place wearing course to thickness indicated on Drawings.
4. Compact overlay by rolling to specified density. Do not displace or extrude paving from position. Hand compact in areas inaccessible to rolling equipment.
5. Perform rolling with consecutive passes to achieve even and smooth finish, without roller marks.

3.5 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Flatness: Maximum variation of ¼ inch measured with 10-foot straight edge.

C. Scheduled Compacted Thickness: Within ¼ inch.

D. Variation from Indicated Elevation: Within ½ inch.

3.6 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for inspecting, testing.

B. Take samples and perform tests including mat density tests in accordance with Pennsylvania Department of Transportation standards.

C. Asphalt Paving Mix Temperature: Measure temperature at time of placement.

D. Asphalt Paving Thickness: ASTM D3549; test one core sample from every 500 square yards compacted paving.

E. Asphalt Paving Density: ASTM D2950 nuclear method; test one location for every 250 square yards compacted paving.

3.7 PROTECTION

A. Section 01 73 00 - Execution Requirements: Requirements for protecting finished Work.

B. Immediately after placement, protect paving from mechanical injury for 24 hours or until surface temperature is less than 140 degrees F.

END OF SECTION 32 1216

SECTION 32 1313 - CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Concrete paving for:
a. Concrete stair steps.
b. Concrete curbs, integral curbs and gutters.
c. Concrete parking areas and roads.

B. Related Requirements:
1. Section 07 90 00 - Joint Protection: Sealant for joints.
2. Section 09 90 00 - Painting and Coating: Pavement markings.
3. Section 31 22 13 - Rough Grading: Preparation of site for paving and base.
4. Section 31 23 23 - Fill: Compacted subbase for paving.
5. Section 321123 - Aggregate Base Courses: base course.
6. Section 32 12 16 - Asphalt Paving: Asphalt wearing course.
7. Section 32 17 13 - Parking Bumpers: Precast concrete parking bumpers.
8. Section 32 91 19 - Landscape Grading: Preparation of subsoil at pavement perimeter.
9. Section 33 05 13 - Manholes and Structures: Manholes including frames.

1.2 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials:
1. AASHTO M324 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.

B. American Concrete Institute:
1. ACI 301 - Specifications for Structural Concrete.
2. ACI 304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete.

C. ASTM International:
1. ASTM A185/A185M - Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
2. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
3. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
4. ASTM C33 - Standard Specification for Concrete Aggregates.
5. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
6. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
7. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic Cement Concrete.
8. ASTM C150 - Standard Specification for Portland Cement.
9. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.
10. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.

11. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
12. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
13. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.
14. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
15. ASTM C989 - Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars.
16. ASTM C1017/C1017M - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
17. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
18. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
19. ASTM D1752 - Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

1.3 PRE-INSTALLATION MEETINGS

A. Section 01 31 00 - Project Meetings: Pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data:
   1. Submit data on concrete materials, joint filler, admixtures and curing compounds.

C. Design Data:
   1. Submit concrete mix design for each concrete strength. Submit separate mix designs when admixtures are required for the following:
      a. Hot and cold weather concrete work.
   2. Identify mix ingredients and proportions, including admixtures.
   3. Identify chloride content of admixtures and whether or not chloride was added during manufacture.

D. Source Quality Control Submittals: Indicate results of factory tests and inspections.

1.5 QUALITY ASSURANCE

A. Perform Work according to ACI 301 as well as requirements of Section 03 10 00, Section 03 20 00, and Section 03 30 00.

B. Obtain cementitious materials from same source throughout.

C. Perform Work according to Pennsylvania Department of Transportation standards.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing work of this section with minimum 3 years' experience.

1.7 AMBIENT CONDITIONS

A. Section 01 50 00 - Temporary Facilities and Controls: Ambient conditions control facilities for product storage and installation.

B. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

PART 2 - PRODUCTS

2.1 AGGREGATE BASE COURSE

A. Aggregate Base Course: As specified in Section 32 11 23.

2.2 CONCRETE PAVING

A. Form Materials:
1. Steel form material, profiled to suit conditions.
2. Joint Filler: ASTM D1751; Asphalt impregnated fiberboard or felt, ¼ inch thick.

B. Reinforcement:
1. Welded Plain Wire Fabric: ASTM A185/A185M; in flat sheets; unfinished.
2. Dowels: ASTM A615/A615M; 60 ksi yield strength, plain steel bars; cut to length indicated on Drawings, square ends with burrs removed; unfinished.
3. Tie Wire: Minimum 16 gage annealed type.

C. Concrete Materials:
1. Concrete Materials: As specified in Section 03 30 00.

2.3 FABRICATION

A. Fabricate reinforcing according to CRSI Manual of Practice.

2.4 MIXES

A. Concrete Mix - By Prescriptive Criteria:
1. Mix concrete according to ACI 304. Deliver concrete according to ASTM C94/C94M.
2. Provide concrete to the following mix designs:

a. Curb / Sidewalk (28 Day Design Compressive Strength 3,500 psi)
Compressive Strength Mix Design:
1) 7-day: 3,000 psi
2) 28-day: 4,000 psi
b. Minimum Cement Content: 517 lb./cu yd

c. Maximum Water/Cement Ratio: 0.45 by weight (mass).
d. Slump: 3 inches plus or minus 1 inch
e. Air Entrainment: 6.5 percent.

f. Concrete Paving (28 Day Design Compressive Strength 4,500 psi)
g. Compressive Strength Mix Design:
   1) 7-day: 4,000 psi
   2) 28-day: 5,000 psi
h. Minimum Cement Content: 660 lb./cu yd
i. Maximum Water/Cement Ratio: 0.42 by weight (mass).
j. Slump: 3 inches plus or minus 1 inch
k. Air Entrainment: 6.0 percent.

3. Limit the following cementitious materials to maximum 50 percent by mass of all cementitious materials.
4. Use accelerating admixtures in cold weather when temperatures are below 45 degrees F. Use of admixtures will not relax cold weather placement requirements.
5. Do not use calcium chloride.
6. Use set retarding admixtures during hot weather when temperatures are above 95 degrees F.

2.5 ACCESSORIES

A. Curing Compound: ASTM C309, Type 1D or 2, Class B.

B. Joint Sealers: Specified in Section 07 90 00.

2.6 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.

B. Submit proposed mix design of each class of concrete to appointed firm for review prior to commencement of Work.

C. Tests on cement, aggregates, and mixes will be performed to ensure conformance with specified requirements.

D. Test samples according to ASTM C94/C94M and ACI 301.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 73 00 - Execution Requirements: Requirements for installation examination.

B. Verify compacted subbase is dry and ready to support paving and imposed loads.
   1. Proof roll subbase with a loaded triaxle dump truck (72,000 pounds GVW) in minimum two perpendicular passes to identify soft spots.
   2. Remove soft subbase and replace with compacted fill as specified in Section 31 23 23.

C. Verify gradients and elevations of base are correct.

3.2 PREPARATION

A. Section 01 73 00 - Execution Requirements: Requirements for installation preparation.

B. Moisten substrate to minimize absorption of water from fresh concrete.

C. Coat surfaces of manhole, catch basin and other embedded item frames with oil to prevent bond with concrete paving.

D. Notify Architect/Engineer minimum 24 hours prior to commencement of concreting operations.

3.3 INSTALLATION

A. Base Course:
1. Aggregate Base Course: Install as specified in Section 32 11 23.

B. Forms:
1. Place and secure forms and screeds to correct location, dimension, profile, and gradient.
2. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

C. Reinforcement:
1. Place reinforcing as indicated on Drawings.
2. Interrupt reinforcing at expansion joints.
3. Place dowels to achieve paving and curb alignment as detailed.
4. Provide doweled joints at 18 inches spacing.

D. Placing Concrete:
1. Place concrete according to ACI 301 and as specified in Section 03 30 00.
2. Place concrete using the slip form technique only in areas not adjacent to other site improvements.
3. Ensure reinforcing, inserts, embedded parts, formed joints are not disturbed during concrete placement.
4. Place concrete continuously over the full width of the panel and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.
5. Place concrete to pattern indicated.

E. Joints
1. Place joints at 20-foot intervals. Align curb, gutter, and sidewalk joints.
2. Place joint filler between paving components and building or other appurtenances. Recess top of filler 1/4 inch for sealant installation.
3. Provide scored or sawn joints at 5 feet intervals, between sidewalks and curbs.
4. Saw cut contraction joints 3/16 inch wide at an optimum time after finishing. Cut 1/3 into depth of slab.
5. Seal joints as indicated on Drawings according to Section 079000.

F. Finishing:
1. Area Paving: Light broom.
2. Sidewalk Paving: Light broom and trowel joint edges.
3. Median Barrier: Light broom and trowel joint edges.
4. Curbs and Gutters: Light broom.
5. Direction of Texturing: Transverse to paving direction.

6. Inclined Vehicular Ramps: Broomed perpendicular to slope.
7. Place curing compound on exposed concrete surfaces immediately after finishing.

G. Curing and Protection
1. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
2. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

3.4 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Maximum Variation of Surface Flatness: ¼ inch in 10 ft.

C. Maximum Variation From True Position: ¼ inch.

3.5 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for inspecting, testing.

B. Inspect reinforcing placement for size, spacing, location, support.

C. Strength Test Samples:
1. Sampling Procedures: ASTM C172.
2. Cylinder Molding and Curing Procedures: ASTM C31/C31M, cylinder specimens, field cured.
3. Sample concrete and make one set of 6 cylinders for every 50 cu yds or less of each class of concrete placed each day and for every 5,000 sf of surface area paving.
4. Make one additional cylinder during cold weather concreting, and field cure.

D. Field Testing:
1. Slump Test Method: ASTM C143/C143M.
2. Air Content Test Method: ASTM C173/C173M.
3. Temperature Test Method: ASTM C1064/C1064M.
4. Measure slump and temperature for each compressive strength concrete sample.
5. Measure air content in air entrained concrete for each compressive strength concrete sample.

E. Cylinder Compressive Strength Testing:
1. Test Method: ASTM C39/C39M.
2. Test Acceptance: Average compressive strength of three consecutive tests: Maximum 500 psi less than specified compressive strength.
3. Test two cylinders at 7 days.
4. Test two cylinders at 28 days.
5. Retain two cylinders for 56 days when requested by Architect/Engineer.
6. Dispose remaining cylinders when testing is not required.

F. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.6 PROTECTION

A. Section 01 73 00 - Execution Requirements: Requirements for protecting finished Work.

B. Immediately after placement, protect paving from premature drying, excessive hot or cold temperatures, and mechanical injury.

C. Do not permit traffic over paving until 75 percent design strength of concrete has been achieved.

END OF SECTION 32 1313

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SECTION 32 1623 - SIDEWALKS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Concrete paving for sidewalks.

B. Related Requirements:
1. Section 03 10 00 - Concrete Forming and Accessories: Form materials, waterstops, and accessories.
2. Section 03 20 00 - Concrete Reinforcing: Reinforcing steel and supports for cast-in-place concrete.
3. Section 03 30 00 - Cast-in-Place Concrete: Cast-in-place or in-situ concrete for structural building frames, slabs on fill or grade, and other concrete components.
4. Section 07 90 00 - Joint Protection: Sealant for joints.
5. Section 09 90 00 - Painting and Coating: Pavement markings.
6. Section 31 22 13 - Rough Grading: Preparation of Site for paving and base grade.
7. Section 31 23 23 - Fill: Compacted subgrade for paving.
8. Section 321123 - Aggregate Base Courses: Base course.
9. Section 32 91 19 - Landscape Grading: Preparation of subsoil at pavement perimeter.

1.2 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials:
1. AASHTO M182 - Standard Specification for Burlap Cloth Made from Jute or Kenaf and Cotton Mats.

B. American Concrete Institute:
1. ACI 304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete.

C. ASTM International:
1. ASTM A184/A184M - Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement.
2. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
3. ASTM A706/A706M - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement.
4. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.
5. ASTM A775/A775M - Standard Specification for Epoxy-Coated Steel Reinforcing Bars.
6. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement.
7. ASTM A934/A934M - Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars.
8. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

9. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
10. ASTM C33/C33M - Standard Specification for Concrete Aggregates.
11. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
12. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
13. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete.
14. ASTM C150/C150M - Standard Specification for Portland Cement.
15. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete.
16. ASTM C172/C172M - Standard Practice for Sampling Freshly Mixed Concrete.
17. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
18. ASTM C231/C231M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
19. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete.
20. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
21. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.
22. ASTM C595/C595M - Standard Specification for Blended Hydraulic Cements.
23. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
24. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
25. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete.
26. ASTM C989/C989M - Standard Specification for Slag Cement for Use in Concrete and Mortars.
27. ASTM C1017/C1017M - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
28. ASTM C1064/C1064M - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
29. ASTM C1116/C1116M - Standard Specification for Fiber-Reinforced Concrete.
30. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
31. ASTM C1371 - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.
32. ASTM C1549 - Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
33. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
34. ASTM D1752 - Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
35. ASTM D5893/D5893M - Standard Specification for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements.
36. ASTM D6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
37. ASTM E408 - Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.
38. ASTM E903 - Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres.

39. ASTM E1918 - Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field.
40. ASTM E1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.

1.3 PREINSTALLATION MEETINGS

A. Section 01 31 13 – Project Meetings: Requirements for preinstallation meeting.

B. Convene minimum one week prior to commencing Work of this Section.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data:
1. Submit required information regarding concrete materials, joint filler, admixtures, and curing compounds.
2. Mix Design:
   a. Submit concrete mix design for each concrete strength prior to commencement of Work.
   b. Submit separate mix designs if admixtures are required for hot- and cold-weather concrete Work.
   c. Identify mix ingredients and proportions, including admixtures.
3. Identify chloride content of admixtures and whether or not chloride was added during manufacture.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Source Quality-Control Submittals: Indicate results of shop tests and inspections.

E. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

F. Qualifications Statement:
1. Submit qualifications for manufacturer and installer.

1.5 QUALITY ASSURANCE

A. Perform Work according to 033000 - Cast-in-Place Concrete.

B. Obtain cementitious materials from same source throughout.

C. Perform Work according to PENNDOT standards.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.

B. Installer: Company specializing in performing Work of this Section with minimum three years' documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Section 01 61 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

C. Store materials according to manufacturer instructions.

D. Protection:
1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Provide additional protection according to manufacturer instructions.

1.8 AMBIENT CONDITIONS

A. Section 01 50 00 - Temporary Facilities and Controls: Requirements for ambient condition control facilities for product storage and installation.

B. Minimum Conditions: Do not place concrete if base surface temperature is less than 40 deg. F, or if surface is wet or frozen.

C. Subsequent Conditions: Maintain minimum 50 deg. F, for not less than 72 hours after placing, and at a temperature above freezing for remainder of curing period.

1.9 EXISTING CONDITIONS

A. Field Measurements:
1. Verify field measurements prior to fabrication.
2. Indicate field measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 AGGREGATE SUBGRADE

A. As specified in Section 32 11 23 - Aggregate Base Courses.

2.2 MATERIALS

A. Forms:
1. Material:
a. Wood: Straight and free from warping, twisting, loose knots, splits, or other defects.
b. Steel: Channel-formed sections.
2. Profile: To suit conditions.
3. Joint Filler:
a. Material: Asphalt-impregnated fiberboard or felt.
b. Comply with ASTM D1751.

c. Thickness: 1/4 inch.

B. Reinforcement:
1. Welded Plain-Wire Fabric:
a. Comply with ASTM A1064/A1064M.
b. Configuration: Flat sheets.
c. Finish: uncoated.
2. Dowels:
a. Description: Plain steel bars.
b. Comply with ASTM A615/A615M.
c. Yield Strength: 40 ksi.
d. Length: As indicated on Drawings.
e. Ends: Square, with burrs removed.
f. Finish: Galvanized.
3. Tie Wire:
a. Type: Annealed.
b. Minimum Size: 16 gage.

C. Concrete:
1. Concrete Materials:
2. Cement:
a. Comply with ASTM C150/C150M.
b. Type: I - Normal portland.
c. Color: Gray.
3. Fine and Coarse Aggregates:
a. Comply with ASTM C33/C33M.
b. Class: 4S.
c. Coarse Aggregate Maximum Size: 3/4 inch.
4. Water:
a. Description: Potable.
b. Comply with ASTM C94/C94M.
c. Without deleterious amounts of chloride ions.
5. Air Entrainment: Comply with ASTM C260/C260M.
6. Chemical Admixtures:
a. Comply with ASTM C494/C494M.
7. Color Pigment:
a. Comply with ASTM C979/C979M.
b. Resistant to mineral oxides, alkalis, and fading.
c. Color: As selected.

2.3 FABRICATION

A. Reinforcing:
1. Comply with PENNDOT standards.

2.4 MIXES

A. Concrete:
1. Comply with ASTM C94/C94M.

2. Mix Design:
   a. Compressive Strength: 3,000 psi at seven days.
   b. Compressive Strength: 4,000 psi at 28 days.
   c. Slump: 4 inches, ±1.
   d. Minimum Cement Content: 517 lb./cu. yd.
   e. Maximum Water/Cement Ratio: 0.45
   f. Air Entrainment: 6.5 percent.
3. Admixtures:
   a. Use accelerating admixtures in cold weather only if approved by Architect/Engineer in writing.
   b. Use of admixtures will not relax cold-weather placement requirements.
   c. Use calcium chloride only if approved by Architect/Engineer in writing.
   d. Use set-retarding admixtures during hot weather only if approved by Architect/Engineer in writing.

2.5 FINISHES

A. Reinforcement:
   1. Galvanized Finish for Steel Bars:
      a. Comply with ASTM A767/A767M.
      b. Class: I.
      c. Hot-dip galvanized after fabrication.

2.6 ACCESSORIES

A. Curing Compound:
   1. Comply with ASTM C1315.
   2. Type: I.
   3. Class: A.

B. Joint Sealers:
   1. Cold Applied: Comply with ASTM C920 or D5893/D5893M.

2.7 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for testing, inspection, and analysis.

B. Testing: Comply with ASTM C94/C94M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 73 00 - Execution Requirements: Requirements for installation examination.

B. Verify that compacted subgrade is dry [and ready to support paving and imposed loads].

C. Verify that gradients and elevations of subgrade are as indicated on Drawings.

D. Verify reinforcing placement for proper size, spacing, location, and support.

3.2 PREPARATION

A. Section 01 73 00 - Execution Requirements: Requirements for installation preparation.

B. Moisten substrate to minimize absorption of water from fresh concrete.

C. Notify Architect/Engineer minimum 24 hours prior to commencement of concreting operations.

3.3 INSTALLATION

A. Subgrade:
1. As specified in Section 321123 - Aggregate Base Courses].

B. Forms:
1. Place and secure forms and screeds to correct location, dimension, profile, and gradient.
2. Assemble formwork to permit easy stripping and dismantling without damaging concrete.
3. Clean forms and coat with form oil each time before concrete is placed.
4. Wood Forms: Thoroughly wet with water before concrete is placed.

C. Reinforcement:
1. Place reinforcing as indicated on Drawings.
2. Interrupt reinforcing at expansion joints.
3. Place dowels to achieve indicated paving alignment.
4. Repair damaged galvanizing to match shop finish.

D. Placing Concrete:
1. As specified in Section 033000 - Cast-in-Place Concrete.
2. Use slip-form technique allowed.
3. Place concrete in forms in one layer.
4. Ensure that reinforcing, inserts, embedded parts, formed joints, are not disturbed during concrete placement.
5. Place concrete continuously over full width of panel and between predetermined construction joints.
6. Do not break or interrupt successive pours such that cold joints occur.
7. Consolidate concrete by tamping and vibration.
8. Place concrete to pattern as indicated.

E. Joints:
1. Place continuous transverse joints at 5-foot intervals or width of sidewalk, whichever is less.
2. Filler:
   a. Place joint filler between paving components and building or other appurtenances.
   b. Recess top of filler 1/4 inch for sealant installation.
3. Provide scored or sawn joints at 3-foot intervals between sidewalks and curbs.
4. Saw-cut contraction joints 3/16 inch wide at optimum time after finishing, cutting one-third into depth of slab.
5. Seal joints as indicated on Drawings.

F. Finishing:
1. Light broom, and trowel edges of joints.

2. Texture Direction: Transverse to paving direction.
3. Ramps: Broom perpendicular to slope.
4. Place curing compound on exposed concrete surfaces immediately after finishing.
5. Edges and Joints:
    a. Edger Radius: 1/8 inch.
    b. Spalled Corners and Edges: Clean and fill with mortar mixture and finish.

G. Curing:
1. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
2. Membrane Curing:
    a. Apply membrane-curing compound uniformly to exposed surface after free water has disappeared from finished surface and before concrete has dried.
    b. Apply compound in two coats, with second coat applied perpendicular to first coat.
    c. If concrete has dried, moisten dried surface and apply curing compound as soon as free water disappears.

H. Backfilling: After curing, backfill, grade, and compact adjacent disturbed area as indicated.

3.4 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Requirements for tolerances.

B. Maximum Variation of Surface Flatness: 1/4 inch in 10 feet.

C. Maximum Variation from True Position: 1/4 inch.

D. Line and Grade for Forms: 1/8 inch in any 10-foot-long section.

3.5 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.

B. Inspection and Testing:
1. Comply with ASTM C94/C94M.
2. Samples:
    a. Sampling Procedures: Comply with ASTM C172/C172M.
    b. Cylinder Molding and Curing Procedures: Comply with ASTM C31/C31M, field cured.
    c. Sample concrete and make one set of four cylinders for every 50 cu. yd. or less of each class of concrete placed each day, and for every 5,000 sq. ft. of surface area paving.
    d. Make one additional cylinder during cold-weather concreting, and field cure.
3. Cylinder Compressive Strength:
    a. Comply with ASTM C39/C39M.
    b. Acceptance:
        1) Average Compressive Strength of Three Consecutive Tests: Maximum 500 psi less than specified compressive strength.
    c. Test one cylinder cylinders at seven days, and two cylinders at 28 days.

d. Retain one cylinder for 56 days for testing when requested by Architect/Engineer.
e. Dispose of remaining cylinders if testing is not required.

4. Slump, Temperature, and Air Content:
   a. Measure for each compressive-strength concrete sample.
   b. Slump: Comply with ASTM C143/C143M.
   c. Air Content: Comply with ASTM C173/C173M.
   d. Temperature: Comply with ASTM C1064/C1064M.
5. Records:
   a. Maintain records of placed concrete items.
   b. Record date, location of pour, quantity, air temperature, number of test samples taken.

3.6 PROTECTION

A. Section 01 73 00 - Execution Requirements: Requirements for protecting finished Work.

B. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, rain and flowing water, and mechanical injury.

C. Do not permit traffic over paving until 75 percent design strength of concrete has been achieved].

D. Damaged Concrete:
   1. Remove and reconstruct concrete that has been damaged for entire length between scheduled joints.
   2. Refinishing damaged portion is not acceptable.
   3. Dispose of damaged portions.

END OF SECTION 32 1623

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SECTION 32 1723 - PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Traffic lines and markings.
2. Legends.
3. Paint.
4. Glass beads.

B. Related Requirements:
1. Section 32 12 16 - Asphalt Paving: Asphalt paving for roads, parking areas, and sidewalks.
2. Section 32 13 13 - Concrete Paving: Concrete paving for roads, parking areas, and sidewalks.

1.2 REFERENCE STANDARDS

A. Pennsylvania Department of Transportation
1. Publication 408 - Standard Specifications

B. American Association of State Highway and Transportation Officials:
1. AASHTO M247 - Standard Specification for Glass Beads Used in Pavement Markings.

C. ASTM International:
1. ASTM D34 - Standard Guide for Chemical Analysis of White Pigments.
2. ASTM D126 - Standard Test Methods for Analysis of Yellow, Orange, and Green Pigments Containing Lead Chromate and Chromium Oxide Green.
3. ASTM D562 - Standard Test Method for Consistency of Paints Measuring Krebs Unit (KU) Viscosity Using a Stormer-Type Viscometer.
4. ASTM D711 - Standard Test Method for No-Pick-Up Time of Traffic Paint.
5. ASTM D713 - Standard Practice for Conducting Road Service Tests on Fluid Traffic Marking Materials.
6. ASTM D1301 - Standard Test Methods for Chemical Analysis of White Lead Pigments.
7. ASTM D1394 - Standard Test Methods for Chemical Analysis of White Titanium Pigments.
8. ASTM D1475 - Standard Test Method for Density of Liquid Coatings, Inks, and Related Products.
9. ASTM D1640/D1640M - Standard Test Methods for Drying, Curing, or Film Formation of Organic Coatings.
10. ASTM D2202 - Standard Test Method for Slump of Sealants.
11. ASTM D2371 - Standard Test Method for Pigment Content of Solvent-Reducible Paints.
12. ASTM D2621 - Standard Test Method for Infrared Identification of Vehicle Solids From Solvent-Reducible Paints.
13. ASTM D2743 - Standard Practices for Uniformity of Traffic Paint Vehicle Solids by Spectroscopy and Gas Chromatography.
14. ASTM D4505 - Standard Specification for Preformed Retroreflective Pavement Marking Tape for Extended Service Life.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit paint formulation for each type of paint.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Test and Evaluation Reports: Indicate source and acceptance test results according to AASHTO M247.

E. Manufacturer Instructions:
1. Submit instructions for application temperatures, eradication requirements, application rate, line thickness, type of glass beads, and bead embedment and application rate.
2. Submit detailed instructions on installation requirements, including storage and handling procedures.

F. Source Quality-Control Submittals: Indicate results of factory tests and inspections.

G. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

H. Qualifications Statements:
1. Submit qualifications for manufacturer and applicator.
2. Submit manufacturer's approval of applicator.

1.4 QUALITY ASSURANCE

A. Perform Work according to Pennsylvania Department of Transportation standards.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.

B. Applicator: Company specializing in performing Work of this Section with minimum three years' documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 61 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

C. Storage:
1. According to manufacturer instructions.
2. Paint:
   a. Invert containers several days prior to use if paint has been stored more than two months.
   b. Minimize exposure to air when transferring paint.

c. Seal drums and tanks when not in use.

D. Protection:
1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Provide additional protection according to manufacturer instructions.

1.7 AMBIENT CONDITIONS

A. Do not apply materials if surface and ambient temperatures are outside temperature ranges required by paint product manufacturer.

B. Do not apply exterior coatings during rain or snow if relative humidity is outside range required by paint manufacturer, or if moisture content of surfaces exceeds that required by paint manufacturer.

C. Minimum Conditions: Do not apply paint if temperatures are or are expected to fall below 50 deg. F within 24 hours after application.

D. Thermoplastic Compound: Do not apply unless pavement surface temperature is minimum 40 deg. F and rising.

E. Maximum VOCs: Do not exceed limit required by State or Environmental Protection Agency.

1.8 WARRANTY

A. Section 01 78 36 - Warranties: Requirements for warranties.

B. Furnish three-year manufacturer's warranty for pavement markings.

PART 2 - PRODUCTS

2.1 PAINTED PAVEMENT MARKINGS

A. Manufacturers:
1. Furnish materials according to Pennsylvania Department of Transportation Bulletin 15, Qualified Products List for Construction.

B. Performance and Design Criteria:
1. Paint Adhesion: Adhere to road surface, forming smooth continuous film one minute after application.
2. Paint Drying: Tack free by touch as not to transfer by vehicle tires within two minutes after application.

C. Paint:
1. Description: Ready mixed, conventional, fast-dry, waterborne traffic paints.
2. Lead-free and nontoxic.
3. Minimum Retroreflectance: 85 mcd.
4. Durability Rating: 6 or more, after in place for nine months.
5. Properties:
a. Pigment Percent by Weight: 60, plus or minus 2.

b. Vehicle Percent by Weight: 40, plus or minus 2.
c. Nonvolatile Percent by Weight of Paint: 75.0.
d. Viscosity: 80-90 Kreb Units at 77 deg. F.

6. Grind:
   a. Method: Hegeman Gage.
   b. Minimum Field-Tested, No-Tracking Time under Ambient Conditions: 20 to 90 seconds.
7. Maximum Dry-Through Time:
   a. 125 minutes.
   b. Wet Film Thickness: 15 mils at 90 percent relative humidity and 72 deg. F.
   c. Comply with ASTM D1640/D1640M.
8. Maximum VOC Content: 1 lb./gal.

D. Glass Beads:
1. Comply with AASHTO M247, Type 1.
2. Coating: Enhance embedment and adherence with paint.

E. Thermoplastic Compound:
1. Binder Component: Hydrocarbon resin with pigment, beads, and filler uniformly dispersed.
2. Asphalt Concrete Primer:
   a. Description: Thermosetting adhesive with a solids content of pigment reinforced synthetic rubber and synthetic plastic resin dissolved or dispersed in a volatile organic solvent.
   b. Solids Content: Not less than 10 percent by weight at 70 deg. F and 60 percent relative humidity.
   c. Wet Film Thickness: 0.005 inch, plus or minus 0.03 inch.
3. Portland Cement Concrete Primer: Epoxy resin primer, as recommended by manufacturer of thermoplastic compound.

F. Preformed Tape:
1. Description: Adherent reflectorized strip.
2. Comply with ASTM D4505, Type I or IV.

2.2 APPLICATION EQUIPMENT

A. Paint Gun:
1. Description: Simultaneously apply parallel lines of indicated width in solid or broken patterns or various combinations of those patterns.
2. Type: Dual nozzle.

B. Bead Gun:
1. Description: Automatically dispense glass beads onto painted surface at required application rate.
2. Type: Pressurized.

C. Measuring Device: Automatically and continuously measure to nearest foot length of each line placed.

D. Paint Heater: Capable of heating paint to 125 deg. F for fast-dry applications.

2.3 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for testing, inspection, and analysis.

B. Test and analyze traffic paints.

C. Certificate of Compliance:
1. If manufacturer is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at manufacturer's facility conforms to Contract Documents.
2. Specified shop tests are not required for Work performed by approved manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

A. Section 01 73 00 - Execution Requirements: Requirements for application preparation.

B. Do not apply paint to concrete surfaces until concrete has cured for 28 days.

C. Agitate paint for 1 to 15 minutes prior to application to ensure even distribution of pigment.

D. Maintenance and Protection of Traffic:
1. Provide short-term traffic control as specified in Section 01 50 00 - Temporary Facilities and Controls.
2. Prevent interference with marking operations and prevent traffic on newly applied markings before dry.
3. Maintain travel lanes between 7:00 AM and 9:00 AM, and between 3:00 PM and 6:00 PM.
4. Maintain access to existing businesses and other properties requiring access.

E. Surface Preparation.
1. Clean and dry paved surfaces prior to painting.
2. Blow or sweep surface free of dirt, debris, oil, grease, or gasoline.
3. Spot location of final pavement markings, as specified and as indicated on Drawings, by applying pavement spots 25 feet o.c.
4. Request inspection by Engineer after placing pavement spots and minimum three days prior to applying traffic lines.

3.2 DEMOLITION

A. Remove existing markings in an acceptable manner, using methods that will cause least damage to pavement structure or surface.

B. Do not remove existing pavement markings by painting over with blank paint.

C. Repair pavement or surface damage caused by removal methods.

D. Clean and repair existing, remaining, or reinstalled lines and legends.

3.3 APPLICATION

A. Application Rate:
1. Reflective Markings:
a. Paint: 100 sq. ft./gal.
b. Glass Spheres on Wet Paint: 0.5 lb./gal.
2. Nonreflective Markings:
a. Paint: 100 sq. ft./gal.
3. Thermoplastic Compound:
a. After surface preparation has been completed, prime pavement surface with spray equipment and allow primer materials to dry according to thermoplastic manufacturer recommendations.
b. Apply thermoplastic at temperatures not less than 375 deg. F and not greater than 425 deg. F at point of deposition.
c. Apply reflective glass spheres mechanically at rate of 1 lb./20 sq. ft.
d. Application Thickness: Not less than 0.125 inch and not more than 0.190 inch.

B. Painting:
1. Apply paint pneumatically, using guidelines and templates as necessary to control application.
2. Manually paint numbers, letters, and symbols.
3. Prevent splattering and overspray when applying markings.
4. Paint Guns: Simultaneously apply paint binder at uniform specified rates.
5. Dispense at temperature recommended by manufacturer.
6. Wet-Film Thickness:
a. 15 mils.
b. Edge Markings: 12 mils.

C. Reflective Media:
1. Immediately follow paint application.
2. Bead Guns:
a. Dispense glass beads simultaneously at specified rate.
b. Check guns by dispensing glass beads into gallon container for predetermined fixed period of time.
c. Verify weight of glass beads.

D. Thermoplastic Compound:
1. Place on dry pavement.
2. Apply centerline, skip line, edge line, and other longitudinal type markings with mobile applicator.
3. Place special markings, crosswalks, stop bars, legends, arrows, and similar patterns with portable applicator.

E. Dimensions and Locations: As indicated on Drawings.

F. Crosswalks, Intersections, Stop Lines, Legends:
1. Use walk-behind stripers, hand spray, or stencil trucks.
2. Do not use hand brushes or rollers.
3. Glass beads may be applied by hand.

3.4 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Requirements for tolerances.

B. Maximum Variation from Wet Film Thickness: 1 mil.

C. Maximum Variation from Wet Paint Line Width: Plus or minus 1/8 inch.

D. Automatic Line-Length Gages: Plus or minus 25 ft./mi.

E. Cycle Length Timer: Plus or minus 6 in./40 ft.

F. Paint Line-Length Timer: Plus or minus 3 in./10 ft.

G. Paint Guns: Plus or minus 1 mil.

3.5 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.

B. Inspect for incorrect location, insufficient thickness, line width, coverage, retention, uncured or discolored material, and insufficient bonding.

C. Acceptance:
1. Repair lines and markings which after application and curing do not meet following criteria:
    a. Incorrect location.
    b. Insufficient thickness, width, coverage, or retention.
    c. Uncured or discolored material.
    d. Insufficient bonding.

3.6 CLEANING

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.

B. Collect and legally dispose of residues from painting operations.

3.7 PROTECTION

A. Section 01 73 00 - Execution Requirements: Requirements for protecting finished Work.

B. Protect painted pavement markings from vehicular and pedestrian traffic until paint is dry and track free.

C. Unless material is track free at end of paint application convoy, use traffic cones to protect markings from traffic until track free.

D. If vehicle crosses a marking and tracks it, or if splattering or overspray occurs, eradicate affected marking and resultant tracking and apply new markings.

E. Follow manufacturer instructions or use minimum of 30 minutes of dry time.

F. Barrier cones are satisfactory protection for materials being dried.

3.8 MAINTENANCE

A. Section 01 73 00 - Execution Requirements: Requirements for maintenance service.

END OF SECTION 32 1723

SECTION 32 3113 - CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Fence framework, fabric, and accessories.
2. Excavation for post bases.
3. Concrete foundation for posts and center drop for gates.
4. Manual gates and related hardware.
5. Privacy slats.

B. Related Sections:
1. Section 33 7900 - Site Grounding.
2. Section 32 1313: Concrete anchorage for posts.

1.2 REFERENCES

A. ASTM International:
1. ASTM A121 - Standard Specification for Metallic-Coated Carbon Steel Barbed Wire.
2. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
3. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
4. ASTM A392 - Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric.
5. ASTM A491 - Standard Specification for Aluminum-Coated Steel Chain-Link Fence Fabric.
6. ASTM A817 - Standard Specification for Metallic-Coated Steel Wire for Chain-Link Fence Fabric and Marcelled Tension Wire.
7. A1011/A1011M-07 Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
8. ASTM B429/B429M - Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
9. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
10. ASTM F552 - Standard Terminology relating to Chain Link Fencing.
11. ASTM F567 - Standard Practice for Installation of Chain-Link Fence.
12. ASTM F626 - Standard Specification for Fence Fittings.
13. ASTM F668 - Standard Specification for Polyvinyl Chloride (PVC) and Other Organic Polymer-Coated Steel Chain-Link Fence Fabric.
14. ASTM F900 - Standard Specification for Industrial and Commercial Swing Gates.
15. ASTM F934 - Standard Specification for Standard Colors for Polymer-Coated Chain Link Fence Materials.
16. ASTM F1043 - Standard Specification for Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework.
17. ASTM F1083 - Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.
18. ASTM F1183 - Standard Specification for Aluminum Alloy Chain Link Fence Fabric.
19. ASTM F1184 - Standard Specification for Industrial and Commercial Horizontal Slide Gates.
20. ASTM F1345 - Standard Specification for Zinc - 5% Aluminum -Mischmetal Alloy-Coated Steel Chain-Link Fence Fabric.

B. Chain Link Fence Manufacturers Institute:
   1. CLFMI - Product Manual.

1.3 SYSTEM DESCRIPTION

A. Fence Height: as indicated on Drawings.

B. Line Post Spacing: At intervals not exceeding 10 feet.

C. Fence Post and Rail Strength: Conform to ASTM F1043 Heavy Industrial Fence quality.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, gates, and schedule of components.

C. Product Data: Submit data on fabric, posts, accessories, fittings and hardware.

D. Samples: Submit two 8x8 inch samples of fence fabric, slat infill 2x6 inch in size illustrating construction and colored finish.

E. Manufacturer's Installation Instructions: Submit installation requirements and post foundation anchor bolt templates .

1.5 CLOSEOUT SUBMITTALS

A. Section 01 77 00 - Closeout Requirements: Closeout procedures.

B. Project Record Documents: Accurately record actual locations of property perimeter posts relative to property lines.

C. Operation and Maintenance Data: Procedures for submittals.

1.6 QUALITY ASSURANCE

A. Supply material according to CLFMI - Product Manual.

B. Perform installation according to ASTM F567.

C. Maintain one copy of each document on site.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing work of this section with minimum three years documented experience, approved by manufacturer.

1.8 DELIVERY, STORAGE AND HANDLING

A. Section 01 61 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Deliver fence fabric and accessories in packed cartons or firmly tied rolls.

C. Identify each package with manufacturer's name.

D. Store fence fabric and accessories in secure and dry place.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Framing (Steel): ASTM F1083 Schedule 40 galvanized steel pipe, welded construction, minimum yield strength and coating conforming to ASTM F1083 and F1043, Type A coating on pipe exterior and interior.

B. Fabric Wire (Steel): ASTM F668 PVC coated steel wire.

C. Concrete: ASTM C94/C94M, Option A; Normal Portland Cement, 3,000 psi strength at 28 days.

2.2 COMPONENTS

A. Line Posts: 2.38 inch diameter.

B. Corner and Terminal Posts: 2.88 inch.

C. Gate Posts: 4.5 inch diameter.

D. Top and Brace Rail: 1.66 inch diameter, plain end, sleeve coupled.

E. Gate Frame: 1.90 inch diameter for welded fabrication.

F. Fabric: 3.5” x 5” inch diamond mesh interwoven wire, 9 gage thick, top salvage knuckle end closed, bottom selvage knuckle end closed.

G. Tension Wire: 9 gage thick steel, single strand, marcelled, spiraled or crimped, aluminum-coated tension wire conforming to ASTM A824.

H. Tie Wire: Aluminum alloy steel wire.

2.3 ACCESSORIES

A. Caps: Malleable iron galvanized; sized to post diameter, set screw retainer.

B. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings; galvanized steel.

C. Gate Hardware: Fork latch with gravity drop and center gate stop and drop rod; three 180 degree gate hinges for each leaf and hardware for padlock keyed to match hardware specified in Section 08 7100.

2.4 GATES

A. General:
1. Gate Types, Opening Widths and Directions of Operation: As indicated on Drawings.
2. Factory assemble gates.
3. Conform to requirements specified for PVC coated steel chain link fence.
4. Design gates for operation by one person.

B. Swing Gates:
1. Fabricate gates to permit 180 degree swing.
2. Gates Construction: ASTM F900 with welded corners. Use of corner fittings is not permitted.

2.5 PRIVACY SLATS

A. Privacy Slats: Extruded high density polyethylene (HDPE), with color pigments and ultraviolet inhibitors, color as selected; manufactured by Pexco FIN2000 or approved equal.
1. Slat Profile: Double-wall, finned profile specifically designed for installation in 3.5” x 5” inch chain-link fabric; provide slats sized for the specified chain-link mesh and wire gauge. Provide uniform color and finish throughout.
2. Slat Locking: Provide manufacturer's integral self-locking system designed to retain slats securely within chain-link fabric. Install slats in accordance with manufacturer's written instructions.
3. Privacy: Provide FIN2000® system configured to provide a minimum 90 percent visual screening when installed in the specified chain-link fabric.
4. Installation: Install slats continuously throughout fence fabric and gate fabric where indicated. Provide neat, uniform installation with no missing, damaged, or improperly seated slats.

2.6 FINISHES

A. Components and Fabric: Vinyl coating, color according to ASTM F934 as selected, over galvanized coating.

B. Vinyl Components: color to match fabric as selected.

C. Hardware: Galvanized to ASTM A153/A153M, 2.0 oz/sq ft coating.

D. Accessories: Same finish as framing.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install framework, fabric, accessories and gates according to ASTM F567.

B. Set intermediate, terminal, corner and gate posts plumb, in concrete footings with top of footing flush with finish grade. Slope top of concrete for water runoff.

C. Line Post Footing Depth Below Finish Grade: ASTM F567, 3 feet.

D. Corner and Terminal Post Footing Depth Below Finish Grade: ASTM F567, 3.5 feet.

E. Gate Post Footing Depth Below Finish Grade: ASTM F567, 4 feet.

F. Brace each gate and corner post to adjacent line post with horizontal center brace rail and diagonal truss rods. Install brace rail between each terminal, corner or gate post and the adjacent line post.

G. Install top rail through line post tops and splice with 6 inch long rail sleeves.

H. Install center and bottom brace rail on corner gate leaves.

I. Place fabric on outside (public/exterior side) of posts and rails.

J. Do not stretch fabric until concrete foundation has cured 28 days.

K. Stretch fabric between terminal posts or at intervals of 100 feet maximum, whichever is less.

L. Position bottom of fabric 2 inches above finished grade.

M. Fasten fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 15 inches on centers.

N. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.

O. Install 9-gauge galvanized steel bottom tension wire stretched taut between terminal, corner and gate posts.

P. Support gates from gate posts. Do not attach hinged side of gate from building wall.

Q. Install gate with fabric and privacy slats to match fence. Install three hinges on each gate leaf, latch, catches and drop bolt.

R. Provide concrete center drop to footing depth and drop rod retainers at center of double gate openings.

S. Install posts with 6 inches maximum clear opening from end posts to buildings, fences and other structures.

T. Excavate holes for posts to diameter and spacing indicated on Drawings without disturbing underlying materials.

U. Center and align posts. Place concrete around posts and vibrate or tamp for consolidation. Verify vertical and top alignment of posts and make necessary corrections.

V. Extend concrete footings through the concrete dumpster and into supporting subgrade. Finish top of footing flush with adjacent concrete pad. Trowel concrete to provide positive drainage away from posts and prevent ponding at post locations.

W. Allow footings to cure minimum 7 days before installing fabric and other materials attached to posts.

3.2 PRIVACY SLATS

A. Install slat inserts in vertical pattern woven through fence fabric.

B. Fasten slats according to manufacturers instructions.

3.3 ERECTION TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Maximum Variation From Plumb: 1/4 inch.

C. Maximum Offset From Indicated Position: 1/2 inch.

D. Gate leaves shall align evenly when closed, with latch and drop bolt operating freely without binding.

END OF SECTION 32 3113

SECTION 32 4100 - BOLLARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Bollards.

1.2 ACTION SUBMITTALS

A. Product Data: Provide manufacturer's specifications and descriptive literature, installation instructions, and maintenance information for each type of bollard and bollard cover specified.

B. Shop Drawings: Indicate plans for each unit or group of units, elevations with model number, overall dimensions, construction, and anchorage details.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.

PART 2 PRODUCTS

2.1 BOLLARDS

A. Steel Pipe Bollards: Concrete filled steel pipe with plain shaft.
   1. Shape: Round.
   2. Diameter: 6 inches.
   3. Cap: Concrete fill rounded-off to form a smooth convex cap.
   4. Materials:
      a. Steel Pipe: ASTM A53/A53M, standard weight.
      b. Factory Finish: Hot-dipped galvanized.
   5. Mounting: In-ground.

B. Steel Pipe Bollards: Hollow steel pipe with plain shaft.
   1. Shape: Round.
   2. Cap: Formed steel dome.
   3. Materials:
      a. Steel Pipe: ASTM A53/A53M, standard weight.
      b. Factory Finish: Hot-dipped galvanized.
   4. Mounting: Removable.

C. Bollard Covers: High density polyethylene, mounted over existing bollard.
   1. Shape: Round.

2. Diameter: as required to fit around specified steel pipe bollard.
3. Color: As selected by Architect from manufacturer's standard range.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify proper installation of mounting surfaces, preinstalled anchor bolts, and other mounting devices; and ready to receive bollards.

B. Do not begin installation until unacceptable conditions are corrected.

3.2 INSTALLATION

A. Install bollards in accordance with approved shop drawings, and manufacturer's installation instructions.

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. Anchor internal sleeves for removable bollards in concrete by inserting in pipe sleeves preset into concrete. Fill annular space around internal sleeves solidly with shrinkage-resistant grout; mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch toward internal sleeve.

D. Place removable bollards over internal sleeves and secure with 3/4-inch machine bolts and nuts. After tightening nuts, drill holes in bolts for inserting padlocks. Owner furnishes padlocks.

E. Fill bollards solidly with concrete, mounding top surface to shed water.
1. Do not fill removable bollards with concrete.

F. See Section 03 3000 for bollard infill and underground encasement.

END OF SECTION 32 4100

SECTION 32 9113 - SOIL PREPARATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Preparation of subsoil.
2. Soil testing.
3. Placing topsoil.

B. Related Sections:
1. Section 31 22 13 - Rough Grading: Rough grading of site.
2. Section 31 23 17 - Trenching: Rough grading over cut.
3. Section 32 05 13 - Soils for Exterior Improvements: Topsoil material.
4. Section 32 84 00 - Planting Irrigation.
5. Section 32 91 19 - Landscape Grading: Preparation of subsoil and placement of topsoil in preparation for the Work of this section.
6. Section 32 92 19 - Seeding
7. Section 32 93 00 - Plants.

1.2 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Submit minimum 10 oz sample of topsoil proposed. Forward sample to approved testing laboratory in sealed containers to prevent contamination.

C. Test Reports: Indicate topsoil nutrient and pH levels with recommended soil supplements and application rates.

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.3 COORDINATION

A. Section 01 31 00 – Project Coordination: Requirements for coordination.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Topsoil: As specified in Section 32 05 13.

2.2 ACCESSORIES

A. Edging: As indicated on Drawings.

2.3 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.

B. Analyze to ascertain percentage of nitrogen, phosphorus, potash, soluble salt content, organic matter content, and pH value.

C. Provide recommendation for fertilizer and lime application rates for specified seed mix as result of testing.

D. Testing is not required when recent tests and certificates are available for imported topsoil. Submit these test results to testing laboratory. Indicate, by test results, information necessary to determine suitability.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 73 00 - Execution Requirements: Verification of existing conditions before starting work.

B. Verify prepared soil base is ready to receive the Work of this section.

3.2 PREPARATION OF SUBSOIL

A. Prepare sub-soil to eliminate uneven areas and low spots. Maintain lines, levels, profiles and contours. Make changes in grade gradual. Blend slopes into level areas.

B. Remove foreign materials, weeds and undesirable plants and their roots. Remove contaminated sub-soil.

C. Scarify subsoil to depth of 3 inches where topsoil is to be placed. Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compacted sub-soil.

3.3 PLACING TOPSOIL

A. Spread topsoil to minimum depth of 6 inches over area to be seeded. Rake until smooth.

B. Place topsoil during dry weather and on dry unfrozen subgrade.

C. Remove vegetable matter and foreign non-organic material from topsoil while spreading.

D. Grade topsoil to eliminate rough, low or soft areas, and to ensure positive drainage.

E. Install edging at periphery of seeded areas in straight lines to consistent depth.

END OF SECTION 32 9113

SECTION 32 9119 - LANDSCAPE GRADING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Final grade topsoil for finish landscaping.

B. Related Sections:
1. Section 31 22 13 - Rough Grading: Site contouring.
2. Section 31 23 17 - Trenching: Backfilling trenches.
3. Section 31 23 23 - Fill: Backfilling at building areas.
4. Section 32 05 13 - Soils for Exterior Improvements.
5. Section 32 92 19 - Seeding and Soil Supplements: Finish ground cover.
6. Section 32 93 00 - Plants: Topsoil fill for trees, plants and ground cover.

1.2 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures

B. Materials Source: Submit name of imported materials source.

C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.3 QUALITY ASSURANCE

A. Furnish each topsoil material from single source throughout the Work.

B. Perform Work in accordance with Pennsylvania DEP standards.

PART 2 - PRODUCTS

2.1 MATERIAL

A. Topsoil: as specified in Section 32 93 00.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 73 00 - Execution Requirements: Verification of existing conditions before starting work.

B. Verify building and trench backfilling have been inspected.

C. Verify substrate base has been contoured and compacted.

3.2 PREPARATION

A. Protect landscaping and other features remaining as final Work.

B. Protect existing structures, fences, sidewalks, utilities, paving, and curbs.

3.3 SUBSTRATE PREPARATION

A. Eliminate uneven areas and low spots.

B. Remove debris, roots, branches, stones larger than ½ inch. Remove contaminated subsoil.

C. Scarify surface to depth of 3 inches where topsoil is scheduled. Scarify in areas where equipment used for hauling and spreading topsoil has compacted subsoil.

3.4 PLACING TOPSOIL

A. Place topsoil in areas where seeding and planting is required to thickness as scheduled. Place topsoil during dry weather.

B. Fine grade topsoil to eliminate rough or low areas. Maintain profiles, contour of subgrade.

C. Remove roots, weeds, rocks, and foreign material while spreading.

D. Manually spread topsoil close to plant material, building, and other structures to prevent damage.

E. Lightly compact, roll placed topsoil.

F. Remove surplus subsoil and topsoil from site.

3.5 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Top of Topsoil: Plus or minus ½ inch.

3.6 PROTECTION OF INSTALLED WORK

A. Section 01 73 00 - Execution Requirements: Requirements for protecting finished Work.

B. Prohibit construction traffic over topsoil.

3.7 SCHEDULES

A. Compacted topsoil thicknesses:
   1. Seeded Grass: 6 inches.
   2. Plant Beds: 18 inches.

END OF SECTION 32 9119

SECTION 32 9219 - SEEDING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Fertilizing.
2. Seeding.
3. Hydroseeding.
4. Mulching.
5. Maintenance.

B. Related Sections:
1. Section 31 22 13 - Rough Grading: Rough grading of site.
2. Section 31 23 17 - Trenching: Rough grading over cut.
3. Section 32 05 13 - Soils for Exterior Improvements: Topsoil material.
4. Section 32 84 00 - Planting Irrigation.
5. Section 32 91 13 - Soil Preparation
6. Section 32 91 19 - Landscape Grading: Preparation of subsoil and placement of topsoil in preparation for the Work of this section.
7. Section 32 93 00 - Plants.

1.2 REFERENCES

A. ASTM International:
1. ASTM C602 - Standard Specification for Agricultural Liming Materials.

1.3 DEFINITIONS

A. Weeds: Vegetative species other than specified species to be established in given area.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data for seed mix, fertilizer, mulch, and other accessories.

C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.5 CLOSEOUT SUBMITTALS

A. Section 01 77 00 - Execution and Closeout Requirements: Requirements for submittals.

B. Operation and Maintenance Data: Include maintenance instructions, cutting method and maximum grass height; types, application frequency, and recommended coverage of fertilizer.

1.6 QUALITY ASSURANCE

A. Provide seed mixture in containers showing percentage of seed mix, germination percentage, inert matter percentage, weed percentage, year of production, net weight, date of packaging, and location of packaging.

B. Perform Work according to Pennsylvania[Department of Environmental Protection standards.

1.7 QUALIFICATIONS

A. Seed Supplier: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing work of this section with minimum three years documented experience.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Section 01 61 00 - Product Requirements: Product storage and handling requirements.

B. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.

C. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

1.9 MAINTENANCE SERVICE

A. Section 01 73 00 - Execution Requirements: Requirements for maintenance service.

B. Maintain seeded areas for three months from Date of Substantial Completion, with a minimum of two cuttings.

PART 2 - PRODUCTS

2.1 SEED MIXTURE

A. Temporary:
1. Species: Annual Rye Grass.
2. Pure Live Seed: 88.2%.
3. Germination: 90% minimum.
4. Weed: 0.10% maximum.

B. Lawn:
1. Species:
a. Perennial Ryegrass mixture (combination of varieties with none exceeding 50% of the total): 20%.
b. Creeping Red Fescue or Chewings Fescue: 30%.
c. Kentucky Bluegrass mixture (combination of varieties with none exceeding 50% of the total): 45%
d. Annual Ryegrass: 5%

2.2 ACCESSORIES

A. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable.

B. Fertilizer: Commercial grade; recommended for grass; of proportion necessary to eliminate deficiencies of topsoil, as indicated in analysis.

C. Lime: ASTM C602, Class T agricultural limestone containing a minimum 80 percent calcium carbonate equivalent.

D. Water: Clean, fresh and free of substances or matter capable of inhibiting vigorous growth of grass.

E. Erosion Fabric: Jute matting, open weave.

F. Stakes: Softwood lumber, chisel pointed.

G. String: Inorganic fiber.

2.3 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.

B. Analyze to ascertain percentage of nitrogen, phosphorus, potash, soluble salt content, organic matter content, and pH value.

C. Provide recommendation for fertilizer and lime application rates for specified seed mix as result of testing.

D. Testing is not required when recent tests and certificates are available for imported topsoil. Submit these test results to testing laboratory. Indicate, by test results, information necessary to determine suitability.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 73 00 - Execution Requirements: Verification of existing conditions before starting work.

B. Verify prepared soil base is ready to receive the Work of this section.

3.2 FERTILIZING

A. Apply lime at application rate recommended by soil analysis. Work lime into top 6 inches of soil.

B. Apply fertilizer at application rate recommended by soil analysis.

C. Apply after smooth raking of topsoil and prior to roller compaction.

D. Do not apply fertilizer at same time or with same machine used to apply seed.

E. Mix fertilizer thoroughly into upper 2 inches of topsoil.

F. Lightly water soil to aid dissipation of fertilizer. Irrigate top level of soil uniformly.

3.3 SEEDING

A. Apply seed at rate indicated evenly in two intersecting directions. Rake in lightly.
1. Temporary: 10 lb per 1000 sy.
2. Lawn: 101.6 lb per acre.
3. Infiltration Basin: 20 lb per acre.

B. Do not seed areas in excess of that which can be mulched on same day.

C. Planting Season:
1. Temporary: March 15 to October 15
2. Lawn: March 15 to June 1, August 1 to October 15.

D. Do not sow immediately following rain, when ground is too dry, or when winds are over 12 mph.

E. Roll seeded area with roller not exceeding 112 lbs/linear foot.

F. Immediately following seeding and compacting, apply mulch to thickness of 1/8 inches. Maintain clear of shrubs and trees.

G. Apply water with fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.

3.4 HYDROSEEDING

A. Apply fertilizer, mulch and seeded slurry with hydraulic seeder at rate of 25 lbs per 1000 sq ft evenly in one pass.

B. After application, apply water with fine spray immediately after each area has been hydroseeded. Saturate to 4 inches of soil and maintain moisture levels two to four inches.

3.5 SEED PROTECTION

A. Identify seeded areas with stakes and string around area periphery.

B. Cover seeded slopes where grade is 4 inches per foot or greater with erosion fabric. Roll fabric onto slopes without stretching or pulling.

C. Lay fabric smoothly on surface, bury top end of each section in 6 inch deep excavated topsoil trench. Overlap edges and ends of adjacent rolls minimum 12 inches. Backfill trench and rake smooth, level with adjacent soil.

D. Secure outside edges and overlaps at 36 inch intervals with stakes.

E. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.

F. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 6 inches.

3.6 MAINTENANCE

A. Mow grass at regular intervals to maintain at maximum height of 2-1/2 inches. Do not cut more than 1/3 of grass blade at each mowing. Perform first mowing when seedlings are 40 percent higher than desired height.

B. Neatly trim edges and hand clip where necessary.

C. Immediately remove clippings after mowing and trimming. Do not let clippings lay in clumps.

D. Water to prevent grass and soil from drying out.

E. Roll surface to remove minor depressions or irregularities.

F. Control growth of weeds. Apply herbicides. Remedy damage resulting from improper use of herbicides.

G. Immediately reseed areas showing bare spots.

H. Repair washouts or gullies.

I. Protect seeded areas with warning signs during maintenance period.

END OF SECTION 32 9219

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SECTION 32 9223 - SODDING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Preparation of subsoil.
2. Placement of topsoil.
3. Fertilization.
4. Sod installation.
5. Maintenance.

B. Related Requirements:
1. Section 31 23 16.13 - Trenching: Rough grading over cut.
2. Section 31 23 23 - Fill: Rough grading of Site.
3. Section 32 91 19 - Landscape Grading: Preparation of subsoil and placement of topsoil in preparation for Work of this Section.
4. Section 32 92 19 - Seeding: Seeding and soil supplements.
5. Section 32 93 00 - Plants: Interior and exterior landscaping.

1.2 DEFINITIONS

A. Weeds: Vegetative species other than specified species to be established in given area.

1.3 REFERENCE STANDARDS

A. ASTM International:
1. ASTM C602 - Standard Specification for Agricultural Liming Materials.

B. Turfgrass Producers International:
1. TPI - Guideline Specifications To Turfgrass Sodding.

1.4 COORDINATION

A. Section 01 31 13 – Project Coordination: Requirements for coordination.

1.5 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data:
1. Submit sod producer's information for sod grass species.
2. Submit manufacturer information for fertilizer, mulch, and other accessories.

C. Samples:
1. Submit two 10 oz. samples of topsoil proposed.
2. Forward samples to approved testing laboratory in sealed containers to prevent contamination.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Sod Producer's Certificate: Certify that sod grass meets or exceeds specified requirements.

F. Test and Evaluation Reports: Indicate topsoil nutrient and pH levels, with recommended soil supplements and application rates.

G. Source Quality-Control Submittals: Indicate results of factory tests and inspections.

H. Qualifications Statements:
1. Submit qualifications for sod producer, manufacturer, and installer.
2. Submit sod producer's approval of installer.

1.6 CLOSEOUT SUBMITTALS

A. Section 01 77 00 - Closeout Requirements: Requirements for submittals.

B. Operation and Maintenance Data:
1. Submit maintenance instructions, cutting method, and maximum grass height.
2. Submit fertilizer types, application frequency, and recommended coverage.

1.7 QUALITY ASSURANCE

A. Sod: Ensure root development capable of supporting its own weight without tearing when suspended vertically by holding upper two corners.

B. Perform Work according to TPI standards.

1.8 QUALIFICATIONS

A. Sod Producer: Company specializing in products as specified in this Section with minimum three years documented experience.

B. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years documented experience.

C. Installer: Company specializing in performing Work of this Section with minimum three years documented experience and approved by sod producer.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Section 01 61 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Delivery:
1. Deliver sod in freshly harvested, tightly rolled strips of uniform thickness. Transport sod on pallets capable of maintaining the sod in an intact and undamaged condition.
2. Do not deliver more sod than can be laid within 24 hours.

C. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

D. Store materials according to manufacturer instructions.

E. Protection:
1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Protect exposed roots from dehydration.
3. Provide additional protection according to manufacturer instructions.

1.10 AMBIENT CONDITIONS

A. Section 01 50 00 - Temporary Facilities and Controls: Requirements for ambient condition control facilities for product storage and installation.

B. Minimum Conditions: Do not place sod when temperature is lower than 40 deg. F.

PART 2 - PRODUCTS

2.1 SOD

A. Description:
1. Cultivated grass sod with strong fibrous root system, free of stones, burned or bare spots, disease, insects and undesirable grasses.
2. Grade: TPI certified and field grown.
3. Type: Certified bluegrass blend not more than 14 months old from time of seeding. Provide a sod blend of no less than three Hybrid Bluegrass varieties suitable to project site.
4. Weed Density: No more than five weeds per 1,000 sq. ft.
5. Condition: Uniform color, density and thickness.

B. Harvesting of Sod:
1. Machine-cut sod and load on pallets according to TPI.
2. Cut sod in uniform strips or rolls, with minimum 1/2-inch and maximum 1 -inch soil base attached to the root system.

2.2 MATERIALS

A. Topsoil:
1. As specified in Section 3 0513 - Soils for Exterior Improvements.

2.3 ACCESSORIES

A. Fertilizer:
1. Grade: Commercial.
2. Description: As recommended for grass, with 50 percent of elements derived from organic sources.
3. Proportions: As necessary to eliminate deficiencies of topsoil.

B. Lime:
1. Description: Agricultural limestone containing a minimum of 80 percent calcium carbonate equivalent.
2. Comply with ASTM C602.
3. Class: T.

C. Water: Clean, fresh, and free of substances or matter capable of inhibiting vigorous growth of grass.

2.4 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for testing, inspection, and analysis.

B. Analysis: Ascertain pH and percentage of nitrogen, phosphorus, potash, soluble salt content, and organic matter.

C. Provide recommendation for fertilizer and lime application rates for specified sod grass species based on testing.

D. Prior Tests:
1. Testing is not required if recent tests are available for imported topsoil.
2. Submit such test results to testing laboratory.
3. Indicate, based on test results, information necessary to determine suitability.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 73 00 - Execution Requirements: Requirements for installation examination.

B. Verify that prepared soil base is ready to receive Work of this Section.

3.2 INSTALLATION

A. Subsoil Preparation:
1. Eliminate uneven areas and low spots.
2. Maintain indicated lines, levels, profiles, and contours.
3. Slopes:
   a. Make gradual changes in grade.
   b. Blend slopes into level areas.
4. Foreign Materials:
   a. Remove foreign materials and undesirable plants and their roots.
   b. Do not bury foreign materials beneath areas to be sodded.
5. Remove contaminated subsoil.
6. Scarify subsoil to depth of 4 inches where topsoil is to be placed.
7. Repeat cultivation in areas where equipment used for hauling and spreading topsoil has compacted subsoil.

B. Placing of Topsoil:
1. Spread topsoil to minimum depth of 3 inches over area to be sodded.
2. Place topsoil during dry weather and on dry unfrozen subgrade.
3. Remove vegetable matter and foreign nonorganic material from topsoil while spreading.
4. Grade topsoil to eliminate rough, low, or soft areas, and to ensure positive drainage.
5. Install edging at periphery of sodded areas in straight lines to consistent depth.

C. Fertilizing:
1. Apply lime at application rate recommended by soil analysis.

2. Work lime into top 6 inches of soil.
3. Apply fertilizer at application rate recommended by soil analysis.
4. Apply fertilizer after smooth raking of topsoil and prior to installation of sod.
5. Apply fertilizer no more than 48 hours before laying sod.
6. Mix fertilizer thoroughly into upper 4 inches of topsoil.
7. Lightly water soil to aid dissipation of fertilizer.

D. Laying of Sod:
1. Do not install sod when soil is frozen, excessively wet, muddy, or otherwise unsuitable for preparation and installation.
2. Moisten prepared surface immediately prior to laying sod.
3. Lay sod within 48 hours after harvesting to prevent deterioration.
4. Joints:
   a. Lay sod tightly with no open joints visible and no overlapping.
   b. Stagger end joints minimum 12 inches.
   c. Do not stretch or overlap sod pieces.
5. Lay smooth and align with adjoining grass areas.
6. Place top elevation of sod 1/2 inch below adjoining concrete and curbs.
7. Slopes:
   a. On slopes 6 in./ft. and steeper, lay sod perpendicular to slope and secure every row with wooden pegs at maximum 2 feet o.c.
   b. If using "big roll," lay sod parallel to slope.
   c. Drive pegs flush with soil portion of sod.
   d. Prior to placing sod on slopes exceeding 8 in./ft., place wire mesh over topsoil and securely anchor wire mesh in place with wood pegs sunk firmly into ground.
8. Watering:
   a. Water sodded areas immediately after installation.
   b. Saturate sod to 4 inches of soil.
9. Rolling:
   a. After sod and soil have dried, roll sodded areas to bond sod to soil and to remove minor depressions and irregularities.
   b. Roll sodded areas with roller not exceeding 300 lb.
   c. Roll before first watering.

3.3 MAINTENANCE

A. Section 01 73 00 - Execution Requirements: Requirements for maintenance service.

B. Maintain sodded areas immediately after placement for two cuttings.

C. Mowing:
1. Mow grass at regular intervals to maintain a height of 2-1/2 inches.
2. Do not cut more than 1/3 of grass blade at each mowing.
3. Neatly trim edges and hand-clip where necessary.
4. Immediately remove clippings after mowing and trimming.

D. Water as necessary to establish the sod. Maintain adequate soil moisture during the establishment period and until the sod is firmly rooted and capable of sustaining normal mowing and maintenance operations.

E. Roll surface to remove irregularities.

F. Weed Control:
   1. Control growth of weeds by applying herbicides.
   2. Remedy damage resulting from improper use of herbicides.

G. Immediately replace sod on areas showing deterioration or bare spots.

H. Protect sodded areas with warning signs during maintenance period.

3.4 ACCEPTANCE

A. When work is complete, including maintenance requirements, notify Design Professional. The Design Professional will then make an inspection to determine acceptability.

B. Replant rejected work and continue specified maintenance until re-inspected by Design Professional and deemed to be acceptable.

C. Criteria for Acceptance: An acceptable turf is one which is full, even, healthy, uniform stand of specified grass established at least two and one half (2 ½) inches in height. Turf shall be free of weeds, stones, surface irregularities, disease, or bare spots greater than 3 inches in any dimension.

3.5 CLEANUP AND PROTECTION

A. During preparation and sod work, keep pavements clean and work areas in an orderly condition.

B. Promptly remove soil and debris created by turf work from paved area. Clean wheels of vehicles before leaving site to avoid tracking soil onto surface of roads, walks, or other paved areas.

C. Protect sod work and materials from damage due to operations, by other contractors, trades, and trespassers. Maintain protection during installation and maintenance periods. Treat, repair and replace damaged sod work as directed.

D. All debris ie, stones, roots, construction materials, as well as excess soil, is to be gathered, removed and legally disposed of offsite.

END OF SECTION 32 9223

SECTION 32 9300 - PLANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Preparation of subsoil and topsoil.
2. Topsoil bedding.
3. Trees, plants, and ground cover.
4. Mulch.
5. Fertilizer.
6. Pruning.
7. Maintenance.

B. Related Sections:
1. Section 31 23 17 - Trenching: Rough grading over trench cut.
2. Section 31 23 23 - Fill: Rough grading of site.
3. Section 32 05 13 - Soils for Exterior Improvements: Topsoil material.
4. Section 32 91 19 - Landscape Grading: Preparation of subsoil and placement of topsoil in preparation for the Work of this section.
5. Section 32 92 19 - Seeding and Soil Supplements.

1.2 REFERENCES

A. American National Standards Institute:
1. ANSI A300 - Tree Care Operations - Tree, Shrub and Other Woody Plant Maintenance - Standard Practices.
2. ANSI Z60.1 - Nursery Stock.

B. Forest Stewardship Council:
1. FSC Guidelines - Forest Stewardship Council Guidelines.

1.3 DEFINITIONS

A. Weeds: Vegetative species other than specified species to be established in given area.

B. Plants: Living trees, plants, and ground cover specified in this Section, and described in ANSI Z60.1.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit list of plant material sources, data for fertilizer and other accessories.

1.5 CLOSEOUT SUBMITTALS

A. Section 01 77 00 - Closeout Requirements: Requirements for submittals.

B. Operation and Maintenance Data: Include pruning objectives, types and methods; types, application frequency, and recommended coverage of fertilizer.

1.6 QUALITY ASSURANCE

A. Tree Pruning: ANSI A300 Pruning Standards for Woody Plants.

1.7 QUALIFICATIONS

A. Nursery: Company specializing in growing and cultivating plants with three years documented experience.

B. Installer: Company specializing in installing and planting plants with three years documented experience.

C. Maintenance Services: Performed by installer.

1.8 PRE-INSTALLATION MEETINGS

A. Section 01 31 00 - Project Meetings: Pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Section 01 61 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

C. Protect and maintain plant life until planted.

D. Deliver plant life materials immediately prior to placement. Keep plants moist.

E. Plant material damaged as a result of delivery, storage or handling will be rejected.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Section 01 61 00 - Product Requirements: Environmental conditions affecting products on site.

B. Do not install plant life when ambient temperatures may drop below 35 degrees F or rise above 90 degrees F.

C. Do not install plant life when wind velocity exceeds 30 mph.

1.11 COORDINATION

A. Section 01 31 00 - Project Coordination: Requirements for coordination.

1.12 WARRANTY

A. Section 01 78 36 - Warranties: Requirements for warranties.

B. Furnish two year manufacturer warranty for trees, plants, and ground cover.

1.13 MAINTENANCE SERVICE

A. Section 01 73 00 - Closeout Requirements: Requirements for maintenance service.

B. Maintain plant life immediately after placement until plants are well established and exhibit vigorous growing condition. Continue maintenance until termination of warranty period.

C. Maintenance includes:
1. Cultivation and weeding plant beds and tree pits.
2. Applying herbicides for weed control. Remedy damage resulting from use of herbicides.
3. Remedy damage from use of insecticides.
4. Irrigating sufficient to saturate root system.
5. Pruning, including removal of dead or broken branches.
6. Disease control.
7. Maintaining wrapping, guys, turnbuckles, and stakes. Adjust turnbuckles to keep guy wires tight. Repair or replace accessories when required.
8. Replacement of mulch.

PART 2 - PRODUCTS

2.1 TREES, PLANTS, AND GROUND COVER

A. Planting Stock:
1. Species: According to Standardized Plant Names, official code of American Joint Committee on Horticulture Nomenclature.
2. Identification: Label individual plants or each bundle of plants when tied in bundles.
3. Plants: No. 1 Grade conforming to "American Standard for Nursery Stock" of American Association of Nurserymen (AAN); well-branched, vigorous and balanced root and top growth; free from disease, injurious insects, mechanical wounds, broken branches, decay and other defects.
4. Trees: Furnish with reasonably straight trunks, well balanced tops, and single leader.
5. Deciduous plants: Furnish in dormant state, except those specified as container grown.

B. Trees Plants and Ground Cover: Species and size identifiable in plant schedule, grown in climatic conditions similar to those in locality of the Work.

2.2 SOIL MATERIALS

A. Topsoil: As specified in Section 31 05 13.

2.3 SOIL AMENDMENT MATERIALS

A. When soil tests indicate soil amendment, apply soil conditioners or fertilizers to amend soil to specified conditions.

1. Tree Fertilizer: Containing fifty percent of elements derived from organic sources; of proportion necessary to eliminate deficiencies of topsoil, as indicated in analysis.

B. Peat Moss: Shredded, loose, sphagnum moss; free of lumps, roots, inorganic material or acidic materials; minimum of 85 percent organic material measured by oven dry weight, pH range of 4 to 5; moisture content of 30 percent.

C. Bone Meal: Raw, finely ground, commercial grade, minimum of 3 percent nitrogen and 20 percent phosphorous.

D. Lime: Ground limestone, dolomite type, minimum 95 percent carbonates.

E. Water: Clean, fresh, and free of substances or matter capable of inhibiting vigorous growth of plants.

2.4 MULCH MATERIALS

A. Mulching Material: Composted, shredded hardwood bark, dark brown in color.

2.5 ACCESSORIES

A. Wrapping Materials: Burlap.

B. Stakes: Softwood lumber, pointed end.

C. Cable, Wire, Eye Bolts and Turnbuckles: Non-corrosive, of sufficient strength to withstand wind pressure and resulting movement of plant life.

D. Plant Protectors: Rubber sleeves over cable to protect plant stems, trunks, and branches.

E. Wrapping: Waterproof fabric.

F. Tree Protectors: Plastic with galvanized rings.

2.6 PLANT SOIL MIX

A. Plant Soil Mix: Uniform mixture of 1 part peat and 3 parts topsoil by volume.

2.7 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.

B. Test and analyze imported topsoil.

C. Analyze to ascertain percentage of nitrogen, phosphorus, potash, soluble salt and organic matter; pH value.

D. Provide recommendation for fertilizer and soil amendment application rates for specified planting as result of testing.

E. Testing is not required when recent tests are available for imported topsoil. Submit these test results to testing laboratory. Indicate, by test results, information necessary to determine suitability.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 73 00 - Execution Requirements: Verification of existing conditions before starting work.

B. Verify prepared subsoil are ready to receive work.

C. Saturate soil with water to test drainage.

D. Verify required underground utilities are available, in proper location, and ready for use.

3.2 PREPARATION OF SUBSOIL

A. Prepare subsoil to eliminate uneven areas. Maintain profiles and contours. Make changes in grade gradual. Blend slopes into level areas.

B. Remove foreign materials, weeds and undesirable plants and their roots. Remove contaminated subsoil.

C. Scarify subsoil to depth of 3 inches where plants are to be placed. Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compacted subsoil.

D. Dig pits and beds three times wider than plant root system.

3.3 PLACING TOPSOIL

A. Spread topsoil to minimum depth of 6 inches over area to be planted. Rake smooth.

B. Place topsoil during dry weather and on dry unfrozen subgrade.

C. Remove vegetable matter and foreign non-organic material from topsoil while spreading.

D. Grade topsoil to eliminate rough, low or soft areas, and to ensure positive drainage.

E. Install topsoil into pits and beds intended for plant root balls, to minimum thickness of 6 inches.

3.4 FERTILIZING

A. Apply starter fertilizer at rate indicated in analysis.

B. Apply after initial raking of topsoil.

C. Mix thoroughly into upper 2 inches of topsoil.

D. Lightly water soil to aid dissipation of fertilizer.

3.5 PLANTING

A. Place plants for best appearance [for review and final orientation by Architect/Engineer].

B. Set plants vertical.

C. Remove non-biodegradable root containers.

D. Set plants in pits or beds, partly filled with prepared plant mix, at minimum depth as indicated on Drawings under each plant. Remove burlap, ropes, and wires, from top half of root ball.

E. Place bare root plant materials so roots lie in natural position. Backfill soil mixture in 6 inch layers. Maintain plant life in vertical position.

F. Saturate soil with water when pit or bed is half full of topsoil and again when full.

3.6 INSTALLATION OF ACCESSORIES

A. Wrap deciduous shade and flowering tree trunks and place tree protectors.

3.7 PLANT SUPPORT

A. Brace plants vertically with plant protector wrapped guy wires and stakes.

B. Tree Support Method per Tree Caliper:
1. 1 Inch: One stake with one tie.
2. 1 to 2 Inches: Two stakes with two ties.
3. 2 to 4 Inches: Three guy wires with eye bolts and turnbuckles.
4. Over 4 Inches: Four guy wires with eye bolts and turnbuckles.

3.8 TREE PRUNING

A. When pruning trees is required, lightly prune trees according to ANSI A300 Maintenance Pruning Type: Crown Cleaning.

3.9 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Plants will be rejected when ball of earth surrounding roots has been disturbed or damaged prior to or during planting.

END OF SECTION 32 9300

SECTION 33 0110.58 - DISINFECTION OF WATER UTILITY PIPING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Disinfection of potable water distribution system.
2. Testing and reporting of results.

B. Related Requirements:
1. Section 22 40 00 - Plumbing Fixtures: Disinfection of building domestic water piping systems.
2. Section 33 14 16 - Site Water Utility Distribution Piping: Product and execution requirements for installation and testing of site domestic water distribution piping.

1.2 REFERENCE STANDARDS

A. American Water Works Association:
1. AWWA B300 - Hypochlorites.
2. AWWA B302 - Ammonium Sulfate.
3. AWWA B303 - Sodium Chlorite.
4. AWWA C651 - Disinfecting Water Mains.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Disinfection Procedure:
1. Submit description of procedure, including type of disinfectant and calculations indicating quantities of disinfectants required to produce specified chlorine concentration.

C. Product Data: Submit manufacturer information for proposed chemicals and treatment doses.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Certify that final water complies with disinfectant quality standards of authority having jurisdiction.

F. Test and Evaluation Reports: Indicate testing results comparative to specified requirements.

G. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

H. Qualifications Statements:
1. Submit qualifications for manufacturer and applicator.

1.4 CLOSEOUT SUBMITTALS

A. Section 01 77 00 - Closeout Requirements: Requirements for submittals.

B. Disinfection Report:
   1. Type and form of disinfectant used.
   2. Date and time of disinfectant injection start and completion.
   3. Test locations.
   4. Name of person collecting samples.
   5. Initial and 24-hour disinfectant residuals in treated water in ppm for each outlet tested.
   6. Date and time of flushing start and completion.
   7. Disinfectant residual after flushing in ppm for each outlet tested.

1.5 QUALITY ASSURANCE

A. Perform Work according to AWWA C651.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.

B. Applicator: Company specializing in performing Work of this Section with minimum three years' documented experience.

PART 2 - PRODUCTS

2.1 DISINFECTION CHEMICALS

A. Chemicals:
   1. Hypochlorite: Comply with AWWA B300.
   2. Sodium Chlorite: Comply with AWWA B303.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 73 00 - Execution Requirements: Requirements for installation examination.

B. Verify that piping system has been cleaned, inspected, and pressure tested.

C. Verify that access fittings have been installed under Section 33 14 16 - Site Water Utility Distribution Piping.

D. Perform scheduling and disinfecting activity with startup, water pressure testing, adjusting and balancing, and demonstration procedures, including coordination with related systems.

3.2 INSTALLATION

A. Provide required equipment to perform Work of this Section.

B. Inject treatment disinfectant into piping system.

C. Maintain disinfectant in system for 24 hours.

D. Flush, circulate, and clean until required disinfectant quality standard has been achieved using municipal domestic water.

E. Replace permanent system devices that were removed for disinfection.

3.3 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.

B. Disinfection, Flushing, and Sampling:
   1. Disinfect pipeline installation according to AWWA C651.
   2. Use of liquid chlorine is not permitted.
   3. Upon completion of retention period required for disinfection, flush pipeline until chlorine concentration in water leaving pipeline is no higher than that generally prevailing in existing system or is acceptable for domestic use.
   4. Disposal:
      a. Legally dispose of chlorinated water.
      b. If chlorinated discharge may cause damage to environment, apply neutralizing chemical to chlorinated water to neutralize chlorine residual remaining in water.
   5. After final flushing and before pipeline is connected to existing system or placed in service, certify that disinfectant level meets quality standards of authority having jurisdiction.

END OF SECTION 33 0110.58

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SECTION 33 0505.31 - HYDROSTATIC TESTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Hydrostatic testing of pressure piping.

B. Related Requirements:
1. Section 33 14 16 - Site Water Utility Distribution Piping: Pipe materials and accessories normally encountered with pressurized water distribution systems.

1.2 REFERENCE STANDARDS

A. American Water Works Association:
1. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.

B. American Standard Testing Methods
1. ASTM F 2164 - Standard Practice for Field Leak Testing of Polyethylene (PE) and Crosslinked Polyethylene (PEX) Pressure Piping Systems Using Hydrostatic Pressure

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Submit following items prior to start of testing:
1. Testing procedures.
2. List of test equipment.
3. Testing sequence schedule.
4. Provisions for disposal of flushing and test water.
5. Certification of test gage calibration.

C. Test and Evaluation Reports: Indicate results of piping tests.

D. Qualifications Statement:
1. Submit qualifications for applicator.

1.4 QUALIFICATIONS

A. Applicator: Company specializing in performing Work of this Section with minimum three years' documented experience.

PART 2 - PRODUCTS

2.1 HYDROSTATIC TESTING

A. Equipment:
1. Pressure pump.

2. Pressure hose.
3. Water meter.
4. Test connections.
5. Pressure relief valve.
6. Pressure Gage: Calibrated to 0.1 psi.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 73 00 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify that piping is ready for testing.

C. Verify that trenches are backfilled.

D. Verify that pressure piping thrust restraints have been installed.

3.2 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.

B. Testing of Pressure Ductile Iron or PVC Piping:
1. Test system according to AWWA C600 and following:
a. Hydrostatically test each portion of pressure piping, including valved section, at 1.5 times working pressure of piping, based on elevation of lowest point in piping corrected to elevation of test gage.
b. Conduct hydrostatic testing for at least two hours.
c. Slowly fill with water portion of piping to be tested, expelling air from piping at high points.
d. Install corporation cocks at high points.
e. Close air vents and corporation cocks after air is expelled.
f. Raise pressure to specified test pressure.
g. Observe joints, fittings, and valves undergoing testing.
h. Remove and renew cracked pipes, joints, fittings, and valves that show visible leakage.
i. Retest.
j. Correct visible deficiencies and continue testing at same test pressure for additional two hours to determine leakage rate.
k. Maintain pressure within plus or minus 5.0 psi of test pressure.
l. Leakage is defined as quantity of water supplied to piping necessary to maintain test pressure during period of testing.
m. Compute maximum allowable leakage using following formula:
1) $L = [SD \times \sqrt{P}]/C$.
a) L = testing allowance, gph.
b) S = length of pipe tested, feet.
c) D = nominal diameter of pipe, inches.

d) P = average test pressure during hydrostatic testing, psig.
e) C = 148,000.
f) If pipe undergoing testing contains sections of various diameters, calculate allowable leakage from sum of computed leakage for each pipe size.

2. If testing of piping indicates leakage greater than that allowed, locate source of leakage, make corrections, and retest until leakage is within acceptable limits.
3. Correct visible leaks regardless of quantity of leakage.

C. Testing of Pressure PE Piping:
1. Test system according to ASTM F 2164 and following:
   a. Hydrostatically test each portion of pressure piping, including valved section, at 1.5 times working pressure of piping, based on elevation of lowest point in piping corrected to elevation of test gage.
   b. Initial expansion phase
      1) Slowly fill with water portion of piping to be tested, expelling air from piping at high points.
      2) Install corporation cocks at high points.
      3) Close air vents and corporation cocks after air is expelled.
      4) Raise pressure to specified test pressure.
      5) Observe joints, fittings, and valves undergoing testing.
      6) Add make-up water as necessary to maintain maximum test pressure for 4 hours.
   c. Test Phase:
      1) Immediately after expansion phase, reduce test pressure by 10 psi and stop adding makeup water.
      2) Monitor pressure for 1 hour.
   d. Remove and renew cracked pipes, joints, fittings, and valves that show visible leakage.
   e. Retest after section is depressurized for 8 hours, minimum.
   f. If no visual leakage is observed and test pressure remains within 5% of the target pressure, no leakage is indicated.
2. If testing of piping indicates leakage, locate source of leakage, make corrections, and retest until leakage is within acceptable limits.
3. Correct visible leaks regardless of quantity of leakage.

END OF SECTION 33 0505.31

SECTION 33 0505.41 - AIR TESTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Low-pressure air testing of gravity sewer piping.

B. Related Requirements:
1. Section 33 31 00 - Sanitary Sewerage Piping: Pipe materials, manholes, and accessories normally encountered with gravity sewerage piping.

1.2 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Submit following items prior to start of testing:
1. Testing procedures.
2. List of test equipment.
3. Testing sequence schedule.
4. Provisions for disposal of flushing and test water.
5. Certification of test gage calibration.

C. Test and Evaluation Reports: Indicate results of piping tests.

D. Qualifications Statement:
1. Submit qualifications for applicator.

1.3 QUALIFICATIONS

A. Applicator: Company specializing in performing Work of this Section with minimum three years' documented experience.

PART 2 - PRODUCTS

2.1 AIR TESTING

A. Equipment:
1. Air compressor.
2. Air supply line.
3. Shutoff valves.
4. Pressure regulator.
5. Pressure relief valve.
6. Stopwatch.
7. Plugs.
8. Pressure Gage: Calibrated to 0.1 psi.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 73 00 - Execution Requirements: Requirements for installation examination.

B. Verify that piping is ready for testing.

C. Verify that trenches are backfilled.

3.2 PREPARATION

A. Section 01 73 00 - Execution Requirements: Requirements for preparation.

B. Lamping:
1. Lamp gravity piping after flushing and cleaning.
2. Perform lamping operation by shining light at one end of each pipe section between manholes.
3. Observe light at other end.
4. Pipe not installed with uniform line and grade will be rejected.
5. Remove and reinstall rejected pipe sections.
6. Clean and lamp until pipe section is installed to uniform line and grade.

C. Plugs:
1. Plug outlets, wye branches, and laterals.
2. Brace plugs to resist test pressures.

3.3 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.

B. Low-Pressure Air Testing:
1. Test each reach of gravity sewer piping between manholes.
2. Introduce air pressure slowly to approximately 4 psig.
3. Determine ground water elevation above spring line of piping.
4. For every foot of ground water above spring line of piping, increase starting air test pressure by 0.43 psi.
5. Do not increase pressure above 10 psig.
6. Allow pressure to stabilize for at least five minutes.
7. Adjust pressure to 3.5 psig or to increased test pressure as determined above when ground water is present.
8. Do not make allowance for laterals.
9. Minimum Testing Duration in Minutes Per 100 Feet:
    a. Pipe Size 4 Inches: 3:46.
    b. Pipe Size 6 Inches: 5:40.
    c. Pipe Size 8 Inches: 7:34.
    d. Pipe Size 10 Inches: 9:26.
    e. Pipe Size 12 Inches: 11:20.

f. Pipe Size 15 Inches: 14:10.
g. Pipe Size 18 Inches: 17:00.
h. Pipe Size 21 Inches: 19:50.
i. Pipe Size 24 Inches: 22:47.
j. Pipe Size 27 Inches: 28:51.
k. Pipe Size 30 Inches: 35:37.
l. Pipe Size 36 Inches: 51:17.
m. Pipe Size 42 Inches: 69:48.

10. Record drop in pressure during testing period.
11. If air pressure drops more than 1.0 psi during testing period, piping has failed.
12. If 1.0-psi air pressure drop has not occurred during testing period, piping is acceptable; discontinue testing.
13. If piping fails, test reach of piping in incremental stages until leaks are isolated, repair leaks, and retest entire reach between manholes.
14. If unsatisfactory testing results are achieved, make necessary repairs and retest until result meets criteria.
15. Repair visible leaks regardless of quantity of leakage.

END OF SECTION 33 0505.41

SECTION 33 0505.43 - MANDREL TESTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Deflection testing of plastic sewer piping.

B. Related Requirements:
1. Section 33 31 00 - Sanitary Sewerage Piping: Pipe materials, manholes, and accessories normally encountered with gravity sewerage piping.

1.2 REFERENCE STANDARDS

A. ASTM International:
1. ASTM D2122 - Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Submit following items prior to start of testing:
1. Testing procedures.
2. List of test equipment.
3. Testing sequence schedule.
4. Provisions for disposal of flushing and test water.
5. Certification of test gage calibration.
6. Deflection mandrel drawings and calculations.

C. Test and Evaluation Reports: Indicate results of piping tests.

PART 2 - PRODUCTS

2.1 DEFLECTION TESTING

A. Equipment:
1. Properly sized rigid ball or "go, no go" mandrel.
2. Pull/retrieval ropes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 73 00 - Execution Requirements: Requirements for installation examination.

B. Verify that piping is ready for testing.

C. Verify that trenches are backfilled.

3.2 PREPARATION

A. Section 01 73 00 - Execution Requirements: Requirements for preparation.

B. Lamping:
1. Lamp gravity piping after flushing and cleaning.
2. Perform lamping operation by shining light at one end of each pipe section between manholes.
3. Observe light at other end.
4. Pipe not installed with uniform line and grade will be rejected.
5. Remove and reinstall rejected pipe sections.
6. Clean and lamp until pipe section is installed to uniform line and grade.

C. Plugs:
1. Plug outlets, wye branches, and laterals.
2. Brace plugs to resist test pressures.

3.3 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.

B. Deflection Testing of Plastic Sewer Piping:
1. Perform vertical ring deflection testing on PVC and ABS sewer piping after backfilling has been in place for at least 30 days, but not longer than 12 months.
2. Allowable maximum deflection for installed plastic sewer pipe is no greater than five percent of original vertical internal diameter.
3. Perform deflection testing using properly sized rigid ball or "go, no go" mandrel.
4. Rigid Ball or Mandrel Diameter:
   a. Not less than 95 percent of base or average ID of pipe.
   b. Pipe Diameter: Comply with ASTM D2122.
5. Perform testing without mechanical pulling devices.
6. Locate, excavate, replace, and retest piping that exceeds allowable deflection.

END OF SECTION 33 0505.43

SECTION 33 0561 - CONCRETE MANHOLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Modular precast concrete manholes and structures with tongue-and-groove joints and transition to cover frame, covers, anchorage, and accessories.
2. Masonry manhole and structure sections with masonry transition to cover frame, covers, anchorage, and accessories.
3. Cast-in-place concrete manholes and structures with transition to cover frame, covers, anchorage, and accessories.
4. Doghouse manhole connections to existing sanitary or storm sewer lines.
5. Bedding and cover materials.
6. Pile support systems.
7. Vertical adjustment of existing manholes and structures.

B. Related Requirements:
1. Section 31 05 13 - Soils for Earthwork: Soils for backfill in trenches.
2. Section 31 05 16 - Aggregates for Earthwork: Aggregate for backfill in trenches.
3. Section 31 05 19.13 - Geotextiles for Earthwork: Filter fabric for subsurface drainage.
4. Section 31 23 16 - Excavation: Excavating for manholes, structures, and foundation slabs.
5. Section 31 23 23 - Fill: Backfilling after manhole and structure installation.
6. Section 33 05 05.36 - Vacuum Testing: Testing requirements for manholes.
7. Section 33 01 30.86 - Manhole Rim Adjustment: Resetting existing castings and grates.
8. Section 33 31 00 - Sanitary Sewerage Piping: Piping connections to manholes.
9. Section 33 42 00 - Stormwater Conveyance: Piping connections to manholes and structures.
10. Section 33 71 19 - Electrical Underground Ducts, Ductbanks, and Manholes: Ducts and manholes affected by this Section.

1.2 DEFINITIONS

A. Bedding: Specialized material placed under manhole prior to installation and subsequent backfill operations.

1.3 REFERENCE STANDARDS

A. American Association of State Highway Transportation Officials:
1. AASHTO M288 - Standard Specification for Geotextile Specification for Highway Applications.
2. AASHTO M306 - Standard Specification for Drainage, Sewer, Utility, and Related Castings.

B. American Concrete Institute:
1. ACI 530/530.1 - Building Code Requirements and Specification for Masonry Structures.

C. ASTM International:
1. ASTM A48/A48M - Standard Specification for Gray Iron Castings.
2. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
3. ASTM C55 - Standard Specification for Concrete Building Brick.
4. ASTM C361 - Standard Specification for Reinforced Concrete Low-Head Pressure Pipe.
5. ASTM C478 - Standard Specification for Circular Precast Reinforced Concrete Manhole Sections.
6. ASTM C497 - Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile.
7. ASTM C857 - Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures.
8. ASTM C877 - Standard Specification for External Sealing Bands for Concrete Pipe, Manholes, and Precast Box Sections.
9. ASTM C913 - Standard Specification for Precast Concrete Water and Wastewater Structures.
10. ASTM C923 - Standard Specification for Resilient Connectors between Reinforced Concrete Manhole Structures, Pipes, and Laterals.
11. ASTM C990 - Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants.
12. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
13. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

D. Pennsylvania Department of Transportation (PENNDOT):
1. Publication 72 - Standard Drawings
2. Publication 408 - Standard Specifications, Section 605 and 714.
3. Bulletin 15 - Approved Construction Materials

1.4 COORDINATION

A. Section 01 31 13 - Project Coordination: Requirements for coordination.

B. Coordinate Work of this Section with connection to municipal sewer utility service and trenching.

1.5 PREINSTALLATION MEETINGS

A. Section 01 31 00 - Project Meetings: Requirements for preinstallation meeting.

B. Convene minimum one week prior to commencing Work of this Section.

1.6 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit manufacturer information for manhole covers, component construction, features, configuration, and dimensions.

C. Shop Drawings:

1. Indicate structure locations and elevations.
2. Indicate sizes and elevations of piping and penetrations.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
1. PennDOT CS-430 form for all Precast Concrete Structures within the PennDOT right-of-way.
2. Pennsylvania Steel Products Procurement Act compliance certification.
3. Manholes: certificate of construction compliance with ASTM C478.
4. Manhole Frame and Cover:
   a. Certificate of material compliance with ASTM A48, Class 35B tensile strength. Furnish certification that tensile test bars were from same pour as castings.
   b. Manufacturer certification AASHTO HS-20 highway loading requirements.

E. Manufacturer Instructions: Submit detailed instructions on installation requirements, including storage and handling procedures.

F. Source Quality-Control Submittals: Indicate results of factory tests and inspections.
1. Manufacturer sworn certification that sanitary sewer manholes were constructed using Type II Portland cement.
2. Precast concrete unit manufacturer shall be listed in PennDOT Bulletin 15.
3. Precast concrete supplier plant shall be registered and certified under either the Prestressed Concrete Institute (PCI) or the National Precast Concrete Association (NPCA) plant certification program.

G. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

H. Qualifications Statement:
1. Submit qualifications for manufacturer.

1.7 CLOSEOUT SUBMITTALS

A. Section 01 77 00 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents: Record actual locations of manholes and connections, and record invert elevations.

1.8 QUALITY ASSURANCE

A. Perform Work according to referenced standards.

B. Structural Design Loading: Unless otherwise noted, utilities, structures and underground conveyance systems shall be constructed to withstand minimum loads in accordance with ASTM C857 with the following loading conditions, including impact load.
1. Heavy Traffic: ASTM C857; A-16, maximum 16,000 lb each wheel.

1.9 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Section 01 61 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

C. Handling: Comply with precast concrete manufacturer instructions and ASTM C913 for unloading and moving precast manholes and drainage structures.

D. Storage:
1. Store materials according to manufacturer instructions.
2. Store precast concrete manholes and drainage structures to prevent damage to Owner's property or other public or private property.
3. Repair property damaged from materials storage.

E. Protection:
1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Provide additional protection according to manufacturer instructions.

1.11 AMBIENT CONDITIONS

A. Section 01 50 00 - Temporary Facilities and Controls: Requirements for ambient condition control facilities for product storage and installation.

B. Cold Weather Requirements: Comply with ACI 530/530.1.

1.12 EXISTING CONDITIONS

A. Field Measurements:
1. Verify field measurements prior to fabrication.
2. Indicate field measurements on Shop Drawings.

1.13 WARRANTY

A. Section 01 78 36 - Warranty Requirements: Requirements for warranties.

B. Furnish five-year manufacturer's warranty for concrete manholes.

PART 2 - PRODUCTS

2.1 CONCRETE MANHOLES

A. Manhole Sections:
1. Materials:
a. Reinforced Precast Concrete: Comply with ASTM C478 with 4,500 psi Type II, concrete.
b. Gaskets: Comply with ASTM C923.

2. Joints:
    a. Comply with ASTM C913.
    b. Maximum Leakage: 0.025 gal. per hour per foot of joint at 3 feet of head.

B. Shaft and Eccentric Cone Top Sections:
1. Sections: Reinforced precast concrete.
2. Joints:
    a. Lipped male/female.
3. Hold Down Bolt Inserts:
    a. 4 inserts to accommodate 3/4-inch frame hold down bolts.
    b. Ultimate tension load capacity: 12,500 pounds.
    c. Locations coordinated with frame.

C. Shape: Cylindrical.

D. Clear Inside Dimensions:
1. Diameter: As indicated on Drawings.

E. Design Depth:
1. As indicated on Drawings.

F. Clear Cover Opening:
1. Diameter: As indicated on Drawings.

G. Pipe Entry: Furnish openings as indicated on Drawings.

H. Structure Joint Gaskets:
1. Comply with ASTM C361.
2. Material: Rubber.

2.2 FRAMES AND COVERS

A. Description:
1. Material:
    a. Cast iron.
    b. Comply with ASTM A48/A48M, Class 35B.
2. Lid:
    a. Bearing Surface: Machined flat.
    b. Configuration: Removable with two concealed pick holes.
3. Cover Design: Closed, Waterproof.
4. Live-Load Rating: AASHTO Highway Loading Class H-20.
5. Furnish sealing gasket installed in grove machined into cover.
6. Cover: Molded with identifying name.
7. Frame Hold-down Bolts: ¾" diameter Type 316 stainless steel bolts and washers.

2.3 RISER RINGS

A. Riser Rings:
1. Thickness of 2 to 4 Inches:
a. Precast concrete.
b. Comply with ASTM C478.
2. Thickness Less Than 4 Inches:
a. Cast iron.
b. Comply with AASHTO M306.
3. Rubber Seal Wraps:
a. Wraps and Band Widths: Comply with ASTM C877, Type III.
b. Cone/Riser Ring Joint: Minimum 3-inch overlap.
c. Frame/Riser Ring Joint: 2-inch overlap.
d. Additional Bands: Overlap upper band by 2 inches.

2.4 MATERIALS

A. Cover and Bedding:
1. Bedding: PennDOT 2A aggregate, as specified in Section 31 05 16 - Aggregates for Earthwork.
2. Cover within roadway: PennDOT 2A aggregate, as specified in Section 31 05 16 - Aggregates for Earthwork.
3. Cover outside roadway: Suitable Fill, as specified in Section 31 05 13 - Soils for Earthwork.

2.5 ACCESSORIES

A. Steps:
1. Rungs: steel reinforced formed PP.
2. Width:
a. As indicated on Drawings.
3. Spacing:
a. 12 inches o.c. vertically, set into structure wall.

B. Pipe Openings:
1. Resilient Gasket Type Pipe Opening Seals:
a. Manufacturers:
1) A-LOK Products Corporation; A-LOK X-Cel Connectors.
2) Hamilton Kent; Tylox Dual Seal II Series.
3) Or equal.
b. Cast integrally with manhole component conforming to requirements specified in ASTM C923.
2. Expandable Sleeve Type: ASTM C923, consisting of a power sleeve, gasket and two (2) take up clamps. Power sleeve is mechanically expanded to compress gasket against receptacle hole in manhole wall. Install at precast plant.
a. Power Sleeve: Type 304 stainless steel, 85,000 psi yield strength.
b. Gasket: Compound Polyisoprene suitable for use with raw sewage.
c. Take Up Clamps: Type 304 stainless steel with stainless steel screw.

C. Joint Sealant: Comply with ASTM C990 and Fed. Spec. SS-S-210A, Type 1

D. Fasteners: Stainless steel; ASTM F593.

E. Geotextile Filter Fabric: As specified in Section 31 05 19.13 - Geotextiles for Earthwork.

F. Concrete: As specified in Section 03 30 00 - Cast-in-Place Concrete.

G. Grout: As specified in Section 03 30 00 - Cast-in-Place Concrete.

2.6 FINISHES

A. Bituminous Exterior Manhole Coating:
1. Description: As specified in Section 09 90 00 - Painting and Coating.

B. Steel Galvanizing:
1. Hot-dip galvanize after fabrication.
2. Comply with ASTM A123/A123M.

2.7 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for testing, inspection, and analysis.

B. Provide shop inspection and testing of completed assembly.

C. Certificate of Compliance:
1. If manufacturer is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at manufacturer's facility conforms to Contract Documents.
2. Specified shop tests are not required for Work performed by approved manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 73 00 - Execution Requirements: Requirements for installation examination.

B. Verify that items provided by other Sections of Work are properly sized and located.

C. Verify that built-in items are in proper location and are ready for roughing into Work.

D. Verify that excavation base is ready to receive Work and excavations and that dimensions and elevations are as indicated on Drawings.

3.2 PREPARATION

A. Section 01 73 00 - Execution Requirements: Requirements for installation preparation.

B. Mark each precast structure by indentation or waterproof paint showing date of manufacture,

manufacturer, and identifying symbols and numbers as indicated on Drawings to indicate its intended use.

C. Coordinate placement of inlet and outlet pipe or duct sleeves as required by other Sections.

D. Do not install manholes and structures where Site conditions induce loads exceeding structural capacity of manholes or structures.

E. Inspect precast concrete manholes and structures immediately prior to placement in excavation to verify that they are internally clean and free from damage; remove and replace damaged units.

3.3 INSTALLATION

A. Conduct operations not to interfere with, interrupt, damage, destroy, or endanger integrity of surface structures or utilities in immediate or adjacent areas.

B. Correct over-excavation with coarse aggregate.

C. Remove large stones or other hard matter impeding consistent backfilling or compaction.

D. Protect manhole from damage or displacement while backfilling operation is in progress.

E. Excavating:
1. As specified in Section 312316 - Excavation and in indicated locations and depths.
2. Provide clearance around sidewalls of manhole or structure for construction operations, granular backfill, and placement requirements.
3. If ground water is encountered, prevent accumulation of water in excavations; place manhole or structure in dry trench.
4. Where possibility exists of watertight manhole or structure becoming buoyant in flooded excavation, anchor manhole or structure to avoid flotation as approved by Architect/Engineer.

F. Base and Alignment:
1. Install manholes supported at proper grade and alignment on compacted crushed-stone bedding.
2. Grout base of shaft sections to achieve slope to exit piping, trowel smooth, and contour as indicated on Drawings.
3. Form and place manhole or structure cylinders plumb and level, to correct dimensions and elevations.

G. Backfilling: As specified in Section 31 05 13 - Soils for Earthwork and 31 05 16 - Aggregates for Earthwork.

H. Coating: Paint interior with two coats of bituminous exterior coating at rate of 120 sq. ft./gal. for each coat.

I. Precast Concrete Manholes:
1. Lift precast components at lifting points designated by manufacturer.

2. When lowering manholes and structures into excavations and joining pipe to units, take precautions to ensure that interior of pipeline and structure remains clean.
3. Assembly:
    a. Assemble multisection manholes and structures by lowering each section into excavation.
    b. Install rubber gasket joints between precast sections according to manufacturer recommendations.
    c. Lower, set level, and firmly position base section before placing additional sections.
4. Remove foreign materials from joint surfaces and verify that sealing materials are placed properly.
5. Maintain alignment between sections by using guide devices affixed to lower section.
6. Joint sealing materials may be installed on Site or at manufacturer's plant.
7. Verify that installed manholes and structures meet required alignment and grade.
8. Remove knockouts or cut structure to receive piping without creating openings larger than required to receive pipe; fill annular spaces with mortar.
9. Cut pipe flush with interior of structure.
10. Shape inverts through manhole and structures as indicated on Drawings.

J. Doghouse Manholes and Structures:
1. Stake out location and burial depth of existing sewer line in area of proposed manhole or structure.
2. Carefully excavate around existing sewer line to adequate depth for foundation slab installation.
3. Protect existing pipe from damage.
4. Cut out soft spots and replace with granular fill compacted to 95 percent maximum density.
5. Bear firmly and fully on compacted crushed stone bedding.
6. Install precast concrete or Construct cast-in-place concrete manhole or structure around existing pipe according to applicable Paragraphs in this Section.
7. Grout pipe entrances as specified.
8. Perform connection to existing pipe while maintaining existing flow with temporary by-pass pumping.
9. Block upstream flow at existing manhole or structure with expandable plug.
10. Use hydraulic saw to cut existing pipe at manhole or structure entrance and exit and along pipe length at a point halfway up OD on each side of pipe.
11. Bottom half of pipe is to remain as manhole flow channel.
12. Saw cut to smooth finish with top half of pipe flush with interior of manhole or structure.
13. Grout base of manhole or structure to achieve slope to manhole or structure channel as specified and trowel smooth.

K. Sanitary Manhole Drop Connections: As indicated on Drawings.

L. Castings:
1. Set frames using mortar and masonry as indicated on Drawings.
2. Install radially laid concrete brick with 1/4-inch-thick, vertical joints at inside perimeter.
3. Lay concrete brick in full bed of mortar and completely fill joints.
4. If more than one course of concrete brick is required, stagger vertical joints.

5. Set frame and cover 2 inches above finished grade for manholes and other structures with covers located within unpaved areas to allow area to be graded away from cover beginning 1 inch below top surface of frame.

3.4 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.

B. Testing:
1. Concrete Manhole Sections: Comply with ASTM C497; As specified in Section 33 05 05.36 - Vacuum Testing.

C. Equipment Acceptance: Adjust, repair, modify, or replace components failing to perform as specified and rerun tests.

3.5 ADJUSTING

A. Section 01 73 00 - Execution Requirements: Requirements for starting and adjusting.

B. Vertical Adjustment of Existing Manholes and Structures:
1. As specified in Section 33 01 30.86 - Manhole Rim Adjustment.
2. If required, adjust top elevation of existing manholes and structures to finished grades as indicated on Drawings.
3. Frames, Grates, and Covers:
   a. Remove frames, grates, and covers cleaned of mortar fragments.
   b. Reset to required elevation according to requirements specified for installation of castings.
4. Reinforcing Bars:
   a. Remove concrete without damaging existing vertical reinforcing bars if removal of existing concrete wall is required.
   b. Clean vertical bars of concrete and bend into new concrete top slab or splice to required vertical reinforcement as indicated on Drawings.
5. Clean and apply sand-cement bonding compound on existing concrete surfaces to receive cast-in-place concrete.

END OF SECTION 33 0561

SECTION 33 1416 - SITE WATER UTILITY DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Pipe and fittings for Site water line, including domestic water line and fire water line.
2. Tapping sleeves and valves.
3. Valves: Gate, ball, swing check, and butterfly.
4. Hydrants and yard hydrants.
5. Positive displacement meters.
6. Reduced-pressure backflow preventers.
7. Underground pipe markers.
8. Precast concrete vaults.
9. Valve boxes.
10. Bedding and cover materials.

B. Related Requirements:
1. Section 03 30 00 - Cast-in-Place Concrete: Concrete for thrust restraints.
2. Section 09 90 00 - Painting and Coating: Painting requirements for fire hydrants.
3. Section 22 11 00 - Facility Water Distribution: Product and execution requirements for domestic water piping at building.
4. Section 31 05 13 - Soils for Earthwork: Soils for backfill in trenches.
5. Section 31 05 16 - Aggregates for Earthwork: Aggregate for backfill in trenches.
6. Section 31 23 16 - Excavation: Product and execution requirements for excavation and backfill.
7. Section 31 23 16.13 - Trenching: Execution requirements for trenching.
8. Section 31 23 23 - Fill: Requirements for backfill to be placed by this Section.
9. Section 33 12 33 - Water Utility Metering: Positive displacement meters as required by this Section.
10. Section 33 13 00 - Disinfecting of Water Utility Distribution: Disinfection of Site service utility water piping.

1.2 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials:
1. AASHTO T 180 - Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. American Society of Mechanical Engineers:
1. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.
2. ASME B16.18 - Cast Copper Alloy Solder-Joint Pressure Fittings.
3. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings.

C. American Society of Sanitary Engineering:
1. ASSE 1012 - Performance Requirements for Backflow Preventers with an Intermediate Atmospheric Vent.

2. ASSE 1013 - Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Principle Fire Protection Backflow Preventers.

D. ASTM International:
1. ASTM A48 - Standard Specification for Gray Iron Castings.
2. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
3. ASTM C858 - Standard Specification for Underground Precast Concrete Utility Structures.
4. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft3 (600 kN-m/m3).
5. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
6. ASTM D2241 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
7. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
8. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings.
9. ASTM D3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter.
10. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
11. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

E. American Water Works Association:
1. AWWA C104 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings.
2. AWWA C105 - Polyethylene Encasement for Ductile-Iron Pipe Systems.
3. AWWA C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
4. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast.
5. AWWA C500 - Metal-Seated Gate Valves for Water Supply Service.
6. AWWA C502 - Dry-Barrel Fire Hydrants.
7. AWWA C504 - Rubber-Seated Butterfly Valves, 3 In. (75 mm) Through 72 In. (1,800 mm).
8. AWWA C508 - Swing-Check Valves for Waterworks Service, 2-In. Through 24-In. (50-mm Through 600-mm) NPS.
9. AWWA C509 - Resilient-Seated Gate Valves for Water Supply Service.
10. AWWA C600 - Installation of Ductile-Iron Mains and Their Appurtenances.
11. AWWA C606 - Grooved and Shouldered Joints.
12. AWWA C700 - Cold-Water Meters - Displacement Type, Bronze Main Case.
13. AWWA C701 - Cold-Water Meters - Turbine Type, for Customer Service.
14. AWWA C702 - Cold-Water Meters - Compound Type.
15. AWWA C706 - Direct-Reading, Remote-Registration Systems for Cold-Water Meters.
16. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Transmission and Distribution.
17. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 1/2 In.(13 mm) Through 3 In.(76 mm) for Water Service.
18. AWWA C906 - Polyethylene (PE) Pressure Pipe and Fittings, 4 In. (100 mm) Through 63 In. (1,600 mm), for Water Distribution and Transmission.
19. AWWA M6 - Water Meters - Selection, Installation, Testing, and Maintenance.

F. American Welding Society:

1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.

G. Manufacturers Standardization Society of the Valve and Fittings Industry:
1. MSS SP-60 - Connecting Flange Joints between Tapping Sleeves and Tapping Valves.

H. UL:
1. UL 246 - Hydrants for Fire-Protection Service.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data on pipe materials, pipe fittings, valves, and accessories.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

1.4 CLOSEOUT SUBMITTALS

A. Section 01 77 00 - Closeout Requirements: Requirements for submittals.

B. Project Record Documents: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations.

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.5 QUALITY ASSURANCE

A. Perform Work according to Pennsylvania Department of Environmental Protection and AWWA standards.

PART 2 - PRODUCTS

2.1 WATER PIPING

A. Ductile Iron Pipe:
1. Comply with AWWA C151.
2. Fittings:
a. Material: Ductile iron
b. Thickness: Standard.
3. Joints:
a. Comply with AWWA C111.
b. Provide rubber gasket with rods.
4. Jackets: AWWA C105, polyethylene jacket.

B. PVC Pipe:
1. Comply with AWWA C900, Class 165, DR 18.
2. Fittings:
a. Material: Cast iron.
b. Comply with AWWA C111.

3. Joints:
   a. Comply with ASTM D3139.
   b. Provide compression gasket ring.

2.2 TAPPING SLEEVES AND VALVES

A. Tapping Sleeves:
   1. Manufacturers:
      a. Ford, Romac Industries, Mueller Co., US Pipe Valve & Hydrant.
      b. Substitutions: As specified in Section 01 61 00 - Product Requirements.

B. Description:
   1. Material: Ductile or cast iron.
   2. Type: Dual compression.
   3. Outlet Flange Dimensions and Drilling: Comply with ASME B16.1, Class 125 and MSS SP-60.

C. Tapping Valves:
   1. Manufacturers:
      a. Kennedy Valve Company, Mueller Co., US Pipe Valve & Hydrant.
      b. Substitutions: As specified in Section 01 61 00 - Product Requirements.

D. Description:
   1. Comply with AWWA C500.
   2. Type: Double disc with non-rising stem.
   3. Inlet Flanges: Comply with ASME B16.1, Class 125, and MSS SP-60.
   4. Mechanical Joint Outlets: Comply with AWWA C111.
   5. Mark manufacturer's name and pressure rating on valve body.

2.3 GATE VALVES

A. Manufacturers:
   1. Kennedy Valve Company, Clow, American Flow Control.
   2. Substitutions: As specified in Section 01 61 00 - Product Requirements.

B. 2-1/2 Inch and Smaller: Brass or bronze body, non-rising stem, inside screw, single wedge or disc, Mechanical joint ends, with control rod, valve box, and valve key.

C. 3 Inch and Larger: AWWA C509, iron body, bronze trim, non-rising stem with square nut, single wedge, resilient seat, mechanical joint ends, control rod, valve box, and valve key.

D. Mark manufacturer's name and pressure rating on valve body.

2.4 BALL VALVES

A. 2 Inch and Smaller: Brass body, TEFC-coated brass ball, rubber seats and stem seals, tee stem pre-drilled for control rod, AWWA inlet end, IPS outlet with electrical ground connector, with control rod, valve box, and valve key.

B. Mark manufacturer's name and pressure rating on valve body.

2.5 SWING CHECK VALVES

A. 2 Inches to 24 Inches: AWWA C508, iron body, bronze trim, 45-degree swing disc, renewable disc and seat, and flanged ends.

B. Mark manufacturer's name and pressure rating on valve body.

2.6 BUTTERFLY VALVES

A. 2 Inches to 24 Inches: AWWA C504, iron body, bronze disc, resilient replaceable seat, water or lug ends, infinite-position lever handle.

B. Mark manufacturer's name and pressure rating on valve body.

2.7 HYDRANTS

A. Hydrants: According to Pennsylvania American Water and Exeter Township requirements.

2.8 METERS

A. Meters: According to Pennsylvania American Water requirements.

2.9 REDUCED-PRESSURE BACKFLOW PREVENTERS

A. Description:
1. Comply with ASSE 1013.
2. Materials:
a. Body: Bronze.
b. Internal Parts: Bronze.
c. Springs: Stainless steel.
3. Check Valves:
a. Quantity: Two.
b. Description: Independently operating, spring-loaded.
c. Type: Diaphragm type, differential pressure relief, located between check valves.
d. Provide third check valve opening under back pressure in case of diaphragm failure.
e. Vent Outlet: Non-threaded.
4. Provide two gate valves, one strainer, and four test cocks.

B. Double Check Valve Assemblies:
1. Comply with ASSE 1012.
2. Description: Two independently operating check valves, with intermediate atmospheric vent.
3. Materials:
a. Body: Bronze.
b. Internal Parts: Corrosion resistant.
c. Springs: Stainless steel.

C. Double Check Valve Assembly in Meter Pit:
1. Comply with ASSE 1015.

2. Description: Two independently operating check valves, with intermediate atmospheric vent.
3. Type: Short lay-length for small space installation.
4. Materials:
    a. Body: Stainless Steel
    b. Internal Parts: Corrosion resistant.
    c. Springs: Stainless steel.
    d. Maximum Operating Pressure: 175 psig.
    e. Size: 6 inch.

2.10 UNDERGROUND PIPE MARKERS

A. Plastic Ribbon Tape:
1. Brightly colored, continuously printed.
2. Minimum 6 inches wide by 4 mil thick.
3. Manufactured for direct burial service.

B. Trace Wire:
1. Electronic detection materials for nonconductive piping products.
2. Unshielded, 10 AWG, THWN-insulated copper wire.
3. Conductive tape.

2.11 PRECAST CONCRETE VAULTS

A. Description:
1. Precast vault designed according to ASTM C858, comprising modular and interlocking sections, complete with accessories.
2. Shape: Rectangular.
3. Nominal Inside Dimensions: As required.
4. Inside Depth: 6 feet.
5. Wall Thickness: As determined by manufacturer to suit application.

B. Base Section:
1. Size: As indicated on Drawings.
2. Sump Size: 3 inches deep by 14 inches in diameter.
3. Provide cast sleeve and two 1-inch ground rod openings.

C. Top Section:
1. Grooved Opening for Frame and Cover.

D. Riser Casting:
1. Size: 6 inches.
2. Provide manhole step cast into frame.

E. Frames and Covers:
1. Comply with ASTM A48.
2. Material: Class 30B gray cast iron.
3. Diameter: 30 inches.
4. Finish: Machine-finished with flat bearing surfaces.
5. Covers marked WATER SERVICE.

F. Steps:
1. Polypropylene plastic step with 1/2-inch steel reinforcement.
2. Cast steps at 12 inches o.c. vertically.

2.12 VALVE BOXES

A. Description:
1. Valve boxes and covers, including position indicators and valve extensions, and as indicated on Drawings.
2. Material: Cast iron.
3. Type: Extension, with slide adjustment.
4. Covers marked WATER SERVICE.

2.13 MATERIALS

A. Bedding and Cover:
1. Bedding and cover: PennDOT 2A, as specified in Section 31 05 16 - Aggregates for Earthwork.
2. Soil Backfill from above Pipe to Finish Grade: Suitable Backfill and Embankment Material as specified in Section 310513 - Soils for Earthwork.
3. Subsoil: No rocks more than 6 inches in diameter, frozen earth, or foreign matter.

2.14 ACCESSORIES

A. Concrete for Thrust Restraints: Concrete type as specified in Section 033000 - Cast-in-Place Concrete.

B. Manhole and Cover: As specified in Section 330513 - Manholes and Structures.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 73 00 - Execution Requirements: Requirements for installation examination.

B. Verify that building service connections and municipal utility water main sizes, locations, and elevations are as indicated on Drawings.

3.2 PREPARATION

A. Section 01 73 00 - Execution Requirements: Requirements for installation preparation.

B. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, and remove burrs.

C. Remove scale and dirt on inside and outside before assembly.

D. Prepare pipe connections to equipment with flanges or unions.

E. Protect and support existing distribution piping and appurtenances as Work progresses.

3.3 INSTALLATION

A. Bedding:
1. Excavate pipe trench as specified in Section 31 23 16.13 - Trenching.
2. Place bedding material at trench bottom.
3. Level fill materials in continuous layers not exceeding 6 inches compacted depth.
4. Compact to 100 percent of maximum density.
5. Backfill around sides and to top of pipe as specified in Section 31 23 23 - Fill.
6. Maintain optimum moisture content of fill material to attain required compaction density.
7. Place fill materials as specified in Section 31 23 23 - Fill.

B. Piping:
1. Maintain separation of water main from sewer piping according to PA DEP code.
2. Group piping with other Site piping work whenever practical.
3. Install pipe to elevations indicated on Drawings.
4. Install piping and fittings according to AWWA C600.
5. Route pipe in straight line.
6. Install access fittings to permit disinfection of water system performed under Section 33 01 10.58 - Disinfecting of Water Utility Distribution Piping.
7. Thrust Restraints:
   a. Form and place concrete for pipe thrust restraints at each elbow or change of pipe direction.
   b. Place concrete to permit full access to pipe and pipe accessories.
   c. Provide bearing area as indicated on Drawings.
8. Establish elevations of buried piping with not less than 4 feet of cover.
9. Pipe Markers:
   a. Install plastic ribbon tape and trace wire continuous buried 6 inches below finish grade, above piping.
   b. Coordinate with trench Work as specified in Section 31 23 16.13 - Trenching.
10. Backfill trench as specified in Section 31 23 23 - Fill.

C. Valves and Hydrants:
1. Set valves on solid bearing.
2. Valve Box:
   a. Center and plumb valve box over valve.
   b. Set box cover flush with finished grade.
3. Set hydrants plumb.
4. Locate pumper nozzle perpendicular to and facing roadway.
5. Set hydrants to grade, with nozzles at least 20 inches above ground.
6. Locate control valve 4 inches away from hydrant.
7. Provide drainage pit 36 inches square by 24 inches deep, filled with 2 inches washed gravel.
8. Encase elbow of hydrant in gravel to 6 inches above drain opening.
9. Do not connect drain opening to sewer.
10. Paint hydrants as specified in Section 09 90 00 - Painting and Coating.

D. Meters:
1. Install meters according to AWWA M6 with isolating valves on inlet and outlet.
2. Provide full line size bypass with globe valve for liquid service meters.

E. Service Connections:

1. Install water service according to utility company requirements with double check valve backflow preventer, and water meter with bypass valves.
2. Install water meter and backflow preventer in concrete vault located on Site.
3. Install water service to 5 feet of building and connect to building water service as specified in Section 22 11 00 - Facility Water Distribution.
4. Pipe Sleeve:
   a. Install 18-gage galvanized sheet metal sleeve surrounding service main to 6 inches above floor and 6 feet minimum below grade.
   b. Size for 2 inches minimum of glass fiber insulation stuffing.

F. Disinfection:
1. Flush and disinfect system as specified in Section 33 01 10.00 - Disinfecting of Water Utility Distribution.

3.4 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Requirements for tolerances.

B. Install pipe within tolerance of ½ inch.

3.5 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.

B. Pressure test system according to AWWA C600 and following:
1. Test Pressure: Not less than 200 psig or 50 psi in excess of maximum static pressure, whichever is greater.
2. Conduct hydrostatic test for at least two hours.
3. Slowly fill with water section to be tested and expel air from piping by installing corporation cocks at high points.
4. Close air vents and corporation cocks after air is expelled and raise pressure to specified test pressure.
5. Observe joints, fittings, and valves under test. Remove and renew cracked pipes, joints, fittings, and valves showing visible leakage and retest.
6. Correct visible deficiencies and continue testing at same test pressure for additional two hours to determine leakage rate.
7. Maintain pressure within plus or minus 5 psi of test pressure.
8. Leakage is defined as quantity of water supplied to piping necessary to maintain test pressure during period of test.
9. Compute maximum allowable leakage using following formula:
   a. $L = SD \times \sqrt{P}/C$.
      1) L = testing allowance, gph.
      2) S = length of pipe tested, feet.
      3) D = nominal diameter of pipe, inches.
      4) P = average test pressure during hydrostatic test, psig.
      5) C = 148,000.
   b. If pipe under test contains sections of various diameters, calculate allowable leakage from sum of computed leakage for each size.
10. If test of pipe indicates leakage greater than that allowed, locate source of leakage, make corrections, and retest until leakage is within allowable limits.

11. Correct visible leaks regardless of quantity of leakage.

C. Perform pressure test on piping according to AWWA standards.

D. Compaction Testing for Bedding: Comply with ASTM D698 and ASTM D6938.

E. When tests indicate Work does not meet specified requirements, remove Work, replace, and retest.

F. Frequency of Compaction Tests: one per 25 cy with minimum of 1 per lift for every 500 lf of trench.

END OF SECTION 33 1416

SECTION 33 3100 - SANITARY SEWERAGE PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Sanitary sewerage piping.
2. Bedding and cover materials.

B. Related Requirements:
1. Section 22 13 00 - Facility Sanitary Sewerage: Product and execution requirements for sanitary waste and vent piping at building.
2. Section 31 05 13 - Soils for Earthwork: Soil for backfill in trenches.
3. Section 31 05 16 - Aggregates for Earthwork: Aggregate for backfill in trenches.
4. Section 31 23 16 - Excavation: Requirements for excavation and backfill as required by this Section.
5. Section 31 23 16.13 - Trenching: Requirements for trenching as required by this Section.
6. Section 31 23 23 - Fill: Requirements for backfilling as required by this Section.
7. Section 33 05 05.41 - Air Testing: Testing of pressurized sewerage piping
8. Section 33 05 05.43 - Mandrel Testing: Deflection testing of plastic sewerage piping.
9. Section 33 05 61 - Concrete Manholes: Manholes for sanitary sewerage piping.
10. Section 33 05 97 - Identification and Signage for Utilities: Pipe markers.

1.2 DEFINITIONS

A. Bedding: Fill placed under, besides, and directly over pipe, prior to subsequent backfill operations.

1.3 REFERENCE STANDARDS

A. ASTM International:
1. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings.
2. ASTM C14 - Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe.
3. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
4. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
5. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
6. ASTM C923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals.
7. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3).
8. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.

9. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
10. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
11. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
12. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

1.4 COORDINATION

A. Section 01 31 00 - Project Coordination: Requirements for coordination.

B. Coordinate Work of this Section with termination of sanitary sewer connection outside building, connection to municipal sewer utility service, and trenching.

1.5 PREINSTALLATION MEETINGS

A. Section 01 31 00 - Project Meetings: Requirements for preinstallation meeting.

B. Convene minimum one week prior to commencing Work of this Section.

1.6 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit manufacturer information indicating pipe material to be used, pipe accessories.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Source Quality-Control Submittals: Indicate results of factory tests and inspections.

E. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

1.7 CLOSEOUT SUBMITTALS

A. Section 01 77 00 - Execution Requirements: Requirements for submittals.

B. Project Record Documents: Record finished locations of pipe runs, connections, manholes, cleanouts, and invert elevations.

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.8 QUALITY ASSURANCE

A. Perform Work according to Pennsylvania Department of Environmental standards.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Section 01 100 - Product Requirements: Requirements for transporting, handling, storing, and

protecting products.

B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

C. Storage:
1. Store materials according to manufacturer instructions.
2. Store valves in shipping containers with labeling in place.

D. Protection:
1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Block individual and stockpiled pipe lengths to prevent moving.
3. Provide additional protection according to manufacturer instructions.

1.10 EXISTING CONDITIONS

A. Field Measurements:
1. Verify field measurements prior to fabrication.
2. Indicate field measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 SANITARY SEWERAGE PIPING

A. Plastic Pipe:
1. Material: PVC.
2. Comply with ASTM D3034, SDR-35.
3. Inside Nominal Diameter: as shown on Drawings,
4. End Connections: Bell and spigot with rubber-ring-sealed gasket joint.
5. Fittings: PVC.
6. Joints:
a. Elastomeric gaskets.
b. Comply with ASTM F477.

2.2 MANHOLES

A. As specified in Section 33 05 61 - Concrete Manholes.

2.3 FLEXIBLE COUPLINGS

A. Description:
1. Material: Resilient, chemical-resistant, elastomeric PVC.
2. Attachment: Two Series-300 stainless-steel clamps, screws, and housings.

2.4 FLEXIBLE PIPE BOOTS FOR MANHOLE PIPE ENTRANCES

A. Description:
1. Material: EPDM.
2. Comply with ASTM C923.

3. Attachment: Series-300 stainless-steel clamp and hardware.

2.5 MATERIALS

A. Bedding and Cover:
1. Bedding and cover: AASHTO No. 8, as specified in Section 31 05 16 - Aggregates for Earthwork.
2. Backfill from above Pipe to Finish Grade (Paved Areas): PennDOT 2A.
3. Soil Backfill from above Pipe to Finish Grade (Non-paved Areas): Suitable Backfill and Embankment Material as specified in Section 310513 - Soils for Earthwork
4. Subsoil: No rocks more than 6 inches in diameter, frozen earth, or foreign matter.

2.6 ACCESSORIES

A. Pipe Markers: As specified in Section 33 05 97 - Identification and Signage for Utilities.

2.7 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for testing, inspection, and analysis.

B. Provide shop inspection and testing of pipe.

C. Certificate of Compliance:
1. If manufacturer is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at manufacturer's facility conforms to Contract Documents.
2. Specified shop tests are not required for Work performed by approved manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 73 00 - Execution Requirements: Requirements for installation examination.

B. Verify that trench cut is ready to receive Work of this Section.

C. Verify that excavations, dimensions, and elevations are as indicated on Drawings.

3.2 PREPARATION

A. Section 01 73 00 - Execution Requirements: Requirements for installation preparation.

B. Correct over-excavation with coarse aggregate.

C. Remove large stones or other hard materials that could damage pipe or impede consistent backfilling or compaction.

D. Protect and support existing sewer lines, utilities, and appurtenances.

E. Utilities:

1. Maintain profiles of utilities.
2. Coordinate with other utilities to eliminate interference.
3. Notify Architect/Engineer if crossing conflicts occur.

3.3 INSTALLATION

A. Bedding:
1. Excavate pipe trench as specified in Section 31 23 16.13 - Trenching.
2. Place bedding material at trench bottom.
3. Level materials in continuous layer not exceeding 6 inches.
4. Maintain optimum moisture content of bedding material to attain required compaction density.

B. Piping:
1. Install pipe, fittings, and accessories according to ASTM D2321, and seal joints watertight.
2. Lay pipe to slope gradients as indicated on Drawings.
3. Begin at downstream end of system and progress upstream.
4. Bedding: Install at sides and over top of pipe, to minimum compacted thickness as indicated on Drawings.
5. Lay bell-and-spigot pipe with bells upstream.
6. Backfill and compact as specified in Section 31 23 16.13 - Trenching.
7. Do not displace or damage pipe when compacting.
8. Connect to building sanitary sewer outlet and municipal sewer system.
9. Pipe Markers: As specified in Section 33 05 97 - Identification and Signage for Utilities.
10. Install Site sanitary sewage system piping to within 5 feet of building and connect to building sanitary waste system as specified in Section 22 13 00 - Facility Sanitary Sewerage.

C. Manholes: As specified in Section 330561 - Concrete Manholes.

D. Backfilling:
1. Backfill around sides and to top of pipe with cover fill in minimum lifts of 6 inches.
2. Tamp fill in place and compact to 100 percent of maximum density.
3. Place and compact material immediately adjacent to pipes to avoid damage to pipe and prevent pipe misalignment.
4. Maintain optimum moisture content of bedding material as required to attain specified compaction density.

3.4 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Requirements for tolerances.

B. Maximum Variation from Indicated Slope: 1/16 inch in 10 feet.

3.5 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.

B. Request inspection by Engineer prior to and immediately after placing bedding.

C. Testing:
   1. If tests indicate that Work does not meet specified requirements, remove Work, replace, and retest.
   2. Pipe Testing:
      a. Pressure Testing: As specified in Section 330505.41 - Air Testing.
      b. Infiltration and Exfiltration Testing: As specified in Section 330505.33 - Infiltration and Exfiltration Testing.
      c. Deflection Testing: As specified in Section 330505.43 - Mandrel Testing.
   3. Compaction Testing:
      a. Comply with ASTM D698 and ASTM D6938.
      b. Testing Frequency: one per 25 cy with minimum of 1 per lift for every manhole run.

3.6 PROTECTION

A. Section 01 73 00 - Execution Requirements: Requirements for protecting finished Work.

B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

C. Cap open ends of piping during periods of Work stoppage.

END OF SECTION 33 3100

SECTION 33 3900 - UNDERGROUND PROTECTED STEEL GRAVITY BASED OIL/SAND INTERCEPTOR

PART 1 – GENERAL

1.1 SCOPE

A. This section describes requirements for providing a single walled, protected steel underground gravity based Oil/Sand Interceptor.

B. The Oil/Sand Interceptor shall be designed to intercept and collect sand, grit, and free oil and grease (hydrocarbons and other petroleum products) and prevent their entry into the sanitary sewer system.

C. All parts, not specifically mentioned herein which are necessary in order to furnish a complete unit, shall be provided and shall conform to the best practices known to the trade.

1.2 GENERAL REQUIREMENTS

A. Unless otherwise specified, equipment furnished under this section shall be fabricated and installed in compliance with the instructions of the manufacturer.

1. The Contractor shall ensure that all equipment, accessories, and installation materials comply with the specification and that adequate provision is made in the interceptor design and fabrication for mounting the specified system equipment and accessories.

2. The Contractor is solely responsible for construction means, methods, techniques, sequences and procedures and for safety precautions and programs.

1.3 STANDARDS

A. Work shall be performed in accordance with applicable federal, state and local fire protection, environmental, building, plumbing, and safety codes and regulations and the latest version of the following industry standards:

1. International Plumbing Code, Chapter 10 Traps, Interceptors, and Separators, International Code Council, 500 New Jersey Avenue, NW, 6th Floor, Washington, DC 20001.

2. Recommended Practices for Installation of Underground Liquid Storage Systems, PEI/RP100-(2005); Petroleum Equipment Institute, P.O. Box 2380, Tulsa, OK 74101.

3. Installation of Underground Petroleum Storage Systems, API/1615, Cathodic Protection of Underground Petroleum Storage Tank and Piping Systems, API 1632, American Petroleum Institute, 1220 L Street, Washington, D.C. 20005.

4. Flammable and Combustible Liquid Code, NFPA/30, 2003 Edition, Automotive and Marine Service Station Code, NFPA/30A, National Electrical Code, NFPA/70, and Underground Leakage of Flammable and Combustible Liquids, NFPA/329, National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9904.

5. Hazardous Waste Operations and Emergency Response and Excavating, OSHA/29 CFR 1910.120 & 29 CFR 1926 Subpart P., Occupational Safety and Health Administration, U.S. Department of Labor, Region V, 230 S. Dearborn Street, Room 3244, Chicago, IL 60604.

6. Occupational Safety and Health Standards, Flammable and Combustible Liquids, 29CFR 1910.106, Personal Protective Equipment 29CFR 1910 Subpart I, Excavations 29CFR 1926.650 Subpart P, U. S. Department of Labor, Occupational Safety and Health Administration (OSHA), Washington, D.C.

7. Control of External Corrosion of Metallic Buried, Partially Buried, and Submerged Liquid Storage Systems, NACE Recommended Practice RP0285-95; National Association of Corrosion Engineers, P.O. Box 218340, Houston, TX 77213.

8. UL-58, Standard for Safety, "Steel Underground Tanks for Flammable and Combustible Liquids", 1997, UL-1746, Standard for "Corrosion Protection for Underground Storage Tanks" Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062.

9. Underground Storage Tanks; Technical Requirements and State Program Approval; Final Rules, 40 CFR Parts 280 and 281, Part II, Federal Register, Friday, September 23, 1988, Musts for USTs: A Summary of the New Regulations for Underground Storage Tank Systems, and Hazardous Waste Management Standards, Federal Register July 14, 1986. U.S. Environmental Protection Agency, Office of Underground Storage Tanks, 401 M. Street, S.W., Washington, D.C. 20460.

10. The codes and standards listed are the latest as of this publication. Codes and standards are continuously updated. The Contractor shall confirm the construction standard edition enforced by the authority having jurisdiction.

1.4 SUBMITTALS AND DOCUMENTATION

A. Provide manufacturer's published product data sheets and descriptive material for major components to be provided.

1. Interceptor (s).

2. Anchoring system.

3. Manway grade level covers.

B. The Contractor shall furnish the labor, materials, equipment, appliances, services and hauling, and perform operations in connection with the construction and installation of the work. Work shall be as herein specified and as denoted on the accompanying drawings but not limited to the following general terms of work:

1.5 GUARANTEES AND WARRANTIES

A. The manufacturer shall provide the following guarantees/warranties:

1. The manufacturer shall warrant its products to be free from defects in material and workmanship for a period of one year from the date of shipment. The warranty shall be limited to repair or replacement of the defective part(s).

2. HighGuard™ Limited Warranty.

PART 2 – PRODUCTS

2.1 UNDERGROUND PROTECTED STEEL GRAVITY BASED OIL/SAND INTERCEPTOR (S)

A. Provide and install Highland Tank Model SB OSI Double Basin Oil/Sand Interceptor (s).

1. Alternate manufacturers meeting the intent of this specification will be considered by the Owner

B. Gravity-based oil/sand interceptor shall be constructed of high-strength, mild carbon steel to ASTM specifications and coated inside and outside with high-solids polyurethane.

C. Interceptor shall be 4' - 0" in diameter and 10' - 9" long; having a total volume of 1000 gallons and a sludge holding capacity of 60 cubic feet to comply with the requirements of the plumbing code. The sizing and construction of this interceptor is consistent with industry protocols for complying with the sewer pretreatment regulations, therefore an interceptor of smaller volume or multiple, interconnecting vessel construction is not permissible.

D. Interceptor shall have two compartments to minimize turbulence and promote separation.

E. Flow to the interceptor shall be by gravity. Interceptor shall retain wastewater long enough to allow sand, grit, and free oil and grease to separate from the water due to their differences in specific gravity. The wastewater will then flow to a sanitary sewer.

F. Interceptor shall be installed underground with top access at or above grade level (as specified on drawings).

2.2 DESIGN CRITERIA

A. The Interceptor shall be constructed of high-strength, mild carbon steel, meeting ASTM specifications, with capacities, dimensions, construction, and thickness in strict accordance with Underwriters Laboratories, Subject UL-58 Standard for Safety, Steel Underground Tanks for Flammable and Combustible Liquids, September 30, 1997, Single Wall construction.

B. The Interceptor's Corrosion Control System shall be in strict accordance with Underwriters Laboratories Inc. Subject UL-1746 Standard for External Corrosion Protection Systems for Steel Underground Storage Tanks and Highland Tank's HighGuard External Corrosion Protection Specifications.

C. The Interceptor shall be the standard product of a steel tank manufacturer regularly engaged in the production of such equipment. No subcontracting of Interceptor fabrication shall be permitted.

D. The Interceptor shall be fabricated, inspected and pressure tested for leakage before shipment from the factory by manufacturer as a completely assembled, single vessel ready for installation.

E. The Interceptor shall be cylindrical, horizontal, atmospheric-type steel vessel.

F. The Interceptor shall have the structural strength to withstand static and dynamic hydraulic loading while empty and during operating conditions.

1. The Interceptor's dimensions and thickness shall be in strict compliance with Roark's Formulas for Stress and Strain as presented in UL 58, September 30, 1997.

2. Calculations, signed and stamped by a Registered Professional Engineer shall be submitted to document structural strength under specified overbearing or external pressure. An interceptor with a reduced shell thickness is not permissible.

G. The Interceptor shall consist of inlet and outlet connections, internal influent nozzle, heavy duty sludge baffle, large sediment and oil pump-out access, effluent downcomer, fittings for vent, sampling, gauging, and lifting lugs.

2.3 GENERAL DESCRIPTION

A. The Interceptor shall be cylindrical with construction and thickness in strict accordance with Underwriters Laboratories Subject 58, using flat-flanged heads.

B. The Interceptor shall be a pre-packaged, pre-engineered, ready to install unit consisting of:

1. An influent connection, (NPT/Flanged). A factory welded internal influent nozzle at the inlet end of the interceptor. Nozzle discharge to be located at the furthest diagonal point from the effluent discharge opening.

2. A large internal basin to disperse flow and collect separated sand, grit, and oil.

3. A heavy duty sludge baffle to retain sand and grit and prevent them from entering the downcomer.

4. An internal effluent downcomer to allow for discharge from the bottom of the Interceptor basin only.

5. Two (2) 24" diameter manhole, UL approved, complete with extension, cover, gasket, and bolts. Manhole shall be placed to facilitate access into the Interceptor basin for inspection, pumping, cleaning, and access. Heavy duty striker plates shall be placed under the manhole to protect the Interceptor shell during pump-out operations.

6. A factory welded effluent connection (NPT/Flanged).

7. Fittings for cleanout, vent, sampling, and gauge.

8. Lifting lugs at balancing points for handling and installation.

C. Testing Requirements

1. Interceptor tightness testing to UL-58 requirements shall be performed by the manufacturer at the factory.

2. The Interceptor shall be pressure tested at 3-5 psig and all surfaces soaped and carefully inspected for leaks.

D. Electrically Isolating Exterior Protective Coating

1. After testing, all interior and exterior surfaces shall be grit blasted per Steel Structures Painting Council Surface Preparation Specification SSPC-SP-6 Commercial Grit Blast Cleaning with an angular profile of 2.0 mils.

2. Exterior surfaces: Apply HighGuard Corrosion Protection System consisting of:

a. Application of 75 mils DFT self-reinforcing, high-solids polyurethane material complying with the following specifications:

b. Property/Value

1) Hardness (ASTM D 2240): 70 Shore D

2) Temperature Range: 35-120°F (1-49°C)

3) Impact Strength: >40 in. lbs

4) Flexibility: 15 mils bent 180 over 1/8” (3 mm) mandrel

5) Abrasion Resistance: 110 mg (C17, 1 kg, 100 cycles)

c. A 15,000-volt spark test shall be performed in the factory to ensure coating integrity.

3. Internal surfaces: Apply 15 mils DFT Polyurethane Lining.

a. Lining shall be of a light color to aid in visual inspection of the interior.

E. Interceptor Hold Down Anchoring

1. Interceptor shall be provided with polyester hold down straps and turnbuckles. Number and size as recommended by manufacturer.

2. Provide float out and anchorage calculations, signed and stamped by a registered professional engineer, to document proper burial depth and anchoring to counteract the Interceptor's buoyant forces.

3. Provide 2 concrete deadman anchors as required. Number and size are as recommended by manufacturer.

4. If a reinforced concrete pad is required for anchoring purposes, the pad dimensions are shown on the drawings.

5. Note: An 8” minimum reinforced concrete pad is required on for all interceptors 10’0’” diameter and larger.

F. Labeling

1. Identification plates: Plates to be affixed in prominent location and be durable and legible throughout equipment life.

2. Each Interceptor shall be permanently labeled on the Interceptor head with pertinent handling, safety, and installation instructions.

G. Grade Level Manways

1. Provide 36” diameter manway ring and (H-20) rated steel cover for access to Interceptor manways.

PART 3 - EXECUTION

3.1 TRANSPORTATION TO SITE

A. Manufacturer shall take extreme care in protecting the Interceptor coating when transporting the Interceptor to the delivery site. Padding between the truck and Interceptors, and padding on the chains should be utilized.

3.2 INTERCEPTOR OFF-LOADING, HANDLING, AND STORAGE

A. Interceptor shall be handled, lifted, stored, and secured in accordance with the manufacturer's instructions.

B. Unload with equipment having sufficient lifting capacity to avoid damage to the Interceptor.

3.3 INTERCEPTOR INSTALLATION

A. Refer to manufacturer’s label on the Interceptor head and submitted User’s Manual for pertinent handling, safety, and installation instructions.

B. The Interceptor excavation shall be free from material that may cause damage to the Interceptor coating. Care shall be taken during installation that foreign matter is not introduced into excavation or backfill. The bottom of the excavation shall be covered with clean sand or gravel to depth shown on the drawings suitably graded and leveled. NOTE: If Interceptor is to be placed on a concrete pad for anchoring purposes, the Interceptor must not be placed directly on the pad. A layer of fine or pea gravel, sand or #8 crushed stone (#8 coarse aggregate ASTM D-448) at least 6" deep must be spread evenly over the dimensions of the pad to separate the Interceptor from the pad. If installation area is in a tidal area, the Interceptor "bedding" material should be fine gravel or pea gravel rather than sand.

C. If an air test of the Interceptor above ground is required. Pressure should not exceed 5 psi while a bubble solution is applied to welded seams. Refer to instructions on side of Interceptor or per PEI/RP100-(2005).

D. Before placing the Interceptor in the excavation, all dirt clods and similar foreign matter shall be cleaned from the Interceptor, and areas of coating damage shall be repaired with a compatible coating supplied by the manufacturer.

E. Equipment to lift the Interceptor shall be of adequate size to lift and lower the Interceptor without dragging and dropping to ensure no damage to the Interceptor or the coating. Interceptor shall be carefully lifted and lowered by use of cables or chains of adequate length (not less than 45 including angle) attached to the lifting lugs provided. A spreader bar should be used where necessary. Under no circumstances use chains or slings around the Interceptor shell.

F. Backfill consisting of sand, #8 crushed stone (#8 crushed aggregate ASTM D-448) or fine gravel, shall be placed along bottom side of Interceptor by shoveling and tamping to ensure the Interceptor is fully and evenly supported around bottom quadrant. The backfill shall be deposited carefully around Interceptor and to a depth over Interceptor to avoid damage to coating.

G. The shipping plugs at unused Interceptor openings shall be removed, a pipe compound shall be added, and permanent plugs shall be reinstalled in the unused openings. The dielectric bushings or flange isolation devices shall not be removed from openings. The plugs in Interceptor openings, which are to be used, should not be over tightened as this may cause the bushing to unscrew with the plug. Care should be taken not to cross-thread or damage the non-metallic bushings when replacing plugs or installing required Interceptor piping.

END OF SECTION 33 3900

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SECTION 33 4200 - STORMWATER CONVEYANCE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Stormwater drainage piping.
2. Manholes.
3. Inlets and Catch basins.
4. Cleanouts.
5. Concrete encasement and cradles.
6. Bedding and cover materials.

B. Related Requirements:
1. Section 03 20 00 - Concrete Reinforcing: Reinforcement of concrete cradles.
2. Section 03 60 00 - Grouting: Cementitious grout.
3. Section 31 05 13 - Soils for Earthwork: Soils for backfill in trenches.
4. Section 31 05 16 - Aggregates for Earthwork: Aggregate for backfill in trenches.
5. Section 31 05 19.13 - Geotextiles for Earthwork: Geotextile filter fabric.
6. Section 31 23 16 - Excavation: Product and execution requirements for excavation and backfill as required by this Section.
7. Section 31 23 16.13 - Trenching: Execution requirements for trenching as required by this Section.
8. Section 31 23 23 - Fill: Requirements for backfill to be placed under this Section.
9. Section 33 01 30.11 - Television Inspection of Sewers: Visual inspection of stormwater piping.
10. Section 33 05 05.33 - Infiltration and Exfiltration Testing: Infiltration testing of gravity-flow sewerage piping.
11. Section 33 05 05.43 - Mandrel Testing: Deflection testing of plastic sewerage piping.
12. Section 33 05 61 - Concrete Manholes: Manholes and accessories as required by this Section.
13. Section 33 05 97 - Identification and Signage for Utilities: Underground pipe markers.
14. Section 33 41 13 - Foundation Drainage: Termination of subdrainage tile system for connection to Work of this Section.

1.2 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials:
1. AASHTO M252 - Standard Specification for Corrugated Polyethylene Drainage Pipe.
2. AASHTO M288 - Standard Specification for Geotextile Specification for Highway Applications.
3. AASHTO M289 - Standard Specification for Aluminum-Zinc Alloy Coated Sheet Steel for Corrugated Steel Pipe.
4. AASHTO M294 - Standard Specification for Corrugated Polyethylene Pipe, 300- to 1500-mm (12- to 60-in.) Diameter.

5. AASHTO T241 - Standard Method of Test for Helical Continuously Welded Seam Corrugated Steel Pipe.

B. ASTM International:
1. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings.
2. ASTM A123/.
3. ASTM A746 - Standard Specification for Ductile Iron Gravity Sewer Pipe.
4. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
5. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
6. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3).
7. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
8. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
9. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
10. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
11. ASTM F405 - Standard Specification for Corrugated Polyethylene (PE) Pipe and Fittings.
12. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
13. ASTM F667/F667M - Standard Specification for 3 through 24 in. Corrugated Polyethylene Pipe and Fittings.

C. Pennsylvania Department of Transportation
1. Publication 72 - Standard Drawings.
2. Publication 408 - Standard Specifications.
3. Bulletin 15 - Approved Construction Materials.

1.3 COORDINATION

A. Section 01 31 00 - Project Coordination: Requirements for coordination.

B. Coordinate Work of this Section with termination of storm sewer connection outside building, trenching, connection to foundation drainage system , municipal sewer utility service, as shown on Drawings.

1.4 PREINSTALLATION MEETINGS

A. Section 01 31 00 - Project Meetings: Requirements for preinstallation meeting.

B. Convene minimum one week prior to commencing Work of this Section.

1.5 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit manufacturer information describing pipe, pipe accessories, inlets.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Manufacturer Instructions: Submit special procedures required to install specified products.

E. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

F. Qualifications Statement:
1. Submit qualifications for manufacturer.

1.6 CLOSEOUT SUBMITTALS

A. Section 01 77 00 - Closeout Requirements: Requirements for submittals.

B. Project Record Documents: Record actual locations of pipe runs, connections, inlets, and invert elevations.

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.7 QUALITY ASSURANCE

A. Perform Work according to Pennsylvania Department of Transportation standards.

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.

B. Installer: PennDOT prequalified.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Section 01 61 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

C. Store materials according to manufacturer instructions.

D. Protection:
1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Provide additional protection according to manufacturer instructions.

1.10 EXISTING CONDITIONS

A. Field Measurements:
1. Verify field measurements prior to fabrication.
2. Indicate field measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 STORM DRAINAGE PIPING

A. PVC Piping:
1. Pipe:
a. Comply with ASTM D3034; SDR 35.
b. Inside Nominal Diameter: 4-6 inches.
c. Style: Bell and spigot with rubber-ring sealed gasket joint.
2. Fittings: PVC.
3. Joints:
a. Comply with ASTM F477.
b. Gaskets: Elastomeric.

B. Corrugated PE Piping:
1. Pipe:
a. Comply with AASHTO M294.
b. Type: Smooth interior.
c. Inside Nominal Diameter: as shown on Drawings.
2. Fittings: PE.
3. Joints: Comply with AASHTO M294.

2.2 MANHOLES

A. As specified in Section 33 05 61 - Concrete Manholes.

2.3 INLETS AND CATCH BASINS

A. Precast

B. Shaft and Top Section:
1. Material: Reinforced precast concrete.
2. Joints: Lipped male/female.
3. Nominal Size: Two feet by four feet.

C. Grate and Frames:
a. Furnish materials according to Pennsylvania Department of Transportation standards.
2. Materials: Cast iron and steel.
3. Lid:
a. Bicycle safe.
b. Design: Checkerboard grill.

2.4 CONCRETE ENCASEMENT AND CRADLES

A. Concrete:
1. Description: Concrete, as specified in Section 03 30 00 - Cast-in-Place Concrete.
2. Compressive Strength: 3750 psi at 28 days, concrete, air-entrained rough troweled finish.

2.5 MATERIALS

A. Bedding and Cover:
1. Bedding and cover: AASTHO No. 57 or PennDOT 2A, as specified in Section 31 05 16 - Aggregates for Earthwork.
2. Soil Backfill from above Pipe to Finish Grade (paved areas): PennDOT 2A.
3. Soil Backfill from above Pipe to Finish Grade (non-paved areas): Suitable Backfill and Embankment Material as specified in Section 310513 - Soils for Earthwork.
4. Subsoil: No rocks more than 6 inches in diameter, frozen earth, or foreign matter.

2.6 MIXES

A. Grout: As specified in Section 03 60 00 - Grouting.

2.7 ACCESSORIES

A. Geotextile Filter Fabric: As specified in Section 31 05 19.13 - Geotextiles for Earthwork.

B. Underground Pipe Markers: As specified in Section 33 05 97 - Identification and Signage for Utilities.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 73 00 - Execution Requirements: Requirements for installation examination.

B. Verify that trench cut is ready to receive Work of this Section.

C. Verify that excavations, dimensions, and elevations are as indicated on Drawings.

3.2 PREPARATION

A. Section 01 73 00 - Execution Requirements: Requirements for installation preparation.

B. Correct over-excavation with coarse aggregate.

C. Remove large stones and other hard matter that could damage piping or impede consistent backfilling or compaction.

3.3 INSTALLATION

A. Excavation and Bedding:

1. Excavate trench to 12 inches below pipe invert, and as specified in Section 31 23 16.13 - Trenching.
2. Hand trim excavation for accurate placement of piping to indicated elevations.
3. Place bedding material at trench bottom.
4. Level materials in continuous layers not exceeding 6-inch compacted depth.
5. Maintain optimum moisture content of bedding material to attain required compaction density.
6. Level fill materials in continuous layers not exceeding 6-inches in depth and compact to 100 percent maximum density.
7. Place geotextile fabric over compacted bedding, where required.
8. Install pipe supports and anchors.

B. Piping:
1. Pipe, Fittings, and Accessories: Comply with ASTM D2321.
2. Seal joints watertight.
3. Place pipe on minimum 6-inch-deep bed of PennDOT 2A or AASHTO #57 aggregate.
4. Cradle bottom 20 percent of pipe diameter to avoid point load.
5. Install aggregate at sides and over top of pipe.
6. Install top cover to minimum compacted thickness of 12 inches and compact to 100 percent maximum density.
7. Backfilling and Compaction:
   a. As specified in Section 31 23 16.13 - Trenching.
   b. Do not displace or damage pipe while compacting.
8. Manholes: As specified in Section 33 05 61 - Concrete Manholes.
9. Connect to manholes and inlets.
10. Pipe Markers: As specified in Section 33 05 97 - Identification and Signage for Utilities.
11. Connect to subdrainage tile system piping as specified in Section 33 41 13 - Foundation Drainage.

C. Catch Basins and Cleanouts:
1. Form bottom of excavation clean and smooth, and to indicated elevation.
2. Form and place cast-in-place concrete base pad, with provision for storm sewer pipe end sections.
3. Level top surface of base pad.
4. Sleeve concrete shaft sections to receive storm sewer pipe sections.
5. Establish elevations and pipe inverts for inlets and outlets as indicated on Drawings.
6. Mount lid and frame level in grout, secured to top section to indicated elevation.

3.4 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Requirements for tolerances.

B. Maximum Variation from Indicated Pipe Slope: 1/8 inch in 10 feet.

3.5 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.

B. Request inspection by Engineer prior to and immediately after placing aggregate cover over pipe.

C. Inspection:
1. Request inspection by Engineer prior to and immediately after placing aggregate cover over pipe.
2. As specified in Section 33 01 30.11 - Television Inspection of Sewers.

D. Testing:
1. Compaction Test:
a. Comply with ASTM D698 and ASTM D6938.
b. Testing Frequency: one per 25 cy with minimum of 1 per lift for every 500 lf of trench.
2. Manholes: As specified in Section 330561 - Concrete Manholes.
3. Piping:
a. Infiltration and Exfiltration Testing: As specified in Section 33 05 05.33 - Infiltration and Exfiltration Testing.
b. Deflection Testing: As specified in Section 33 05 05.43 - Mandrel Testing.
4. If tests indicate that Work does not meet specified requirements, remove Work, replace, and retest.

3.6 PROTECTION

A. Section 01 73 00 - Execution Requirements: Requirements for protecting finished Work.

B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

END OF SECTION 33 4200

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SECTION 41 2200 - CRANES AND HOISTS

PART 1 GENERAL

1.1 SUMMARY

A. Work Includes:
   1. Electric hoist.

1.2 ACTION SUBMITTALS:

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Operation and Maintenance Materials, include the following:
   1. Assembly, installation, adjustment, and alignment instructions.
   2. Operating instructions.
   3. Maintenance instructions.
   4. Troubleshooting guide.
   5. Parts list.

1.4 QUALITY ASSURANCE

A. Installer shall be factory-trained and certified by hoist manufacturer.

B. Hoist shall be UL certified and listed to UL 1340 "Standard for Hoists"

C. Contractor shall adhere to OSHA, ANSI, CMAA, HMI specifications and standards, CMAA specification 74 or 70 as applicable, state, and local safety guidelines, laws, rules, and regulations.

D. All electric equipment shall be UL, CSA c/us or ETL labeled.

1.5 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace defective materials and workmanship at no cost to the Owner for a period of one year from the date of Substantial Completion.

PART 2 PRODUCTS

2.1 ELECTRIC CHAIN HOIST

A. EQ46, Basis-of-Design: Provide equipment indicated on Equipment Schedule or a comparable system by another manufacturer.

B. Hoist Characteristics, General:

1. Capacity: 1 tons (2,000 lbs).
2. Drum Size: BOD Manufacturer's -01 model, 4.5-inch diameter, typical weight 51 lbs.
3. Lifting Speed: 20 FPM; dual speed.
4. Hoist Lift: minimum 25 ft. Manufacturer shall field-verify exact dimensions.
5. Horse Power (HP): 1/2 HP.
6. Control: Pendant; 2 button (momentary contact) with emergency on/off.
7. Cable thickness: minimum 3/16-inch.
    a. Capacity: 213 feet.
8. Power supply Length: 30 feet; contractor to verify required length for maximum operational range prior to purchasing hoist.
9. NEMA listed controls.

C. Power Supply Characteristics:
1. Power supply for the hoist shall be 115/230-volt, 3 ph., 60 Hz. All power required for the operation of the hoist shall be developed from this source.
2. Pendant power supply shall 110V

PART 3 EXECUTION

3.1 INSTALLATION AND INSPECTION

A. Inspect structure and rail erection for conformance with reviewed shop drawings and contract documents prior to installation of equipment. Bring nonconforming work to the attention of the customer prior to proceeding with installation. Non-conforming structure or installation must be corrected prior to load testing of hoist.

B. Hoist shall be installed in conformance with manufacturer's instructions and inspected by a manufacturer's representative. Provide necessary accessories to make hoist complete, usable, and capable of meeting the operating requirements specified in the Operating Requirements. Test, adjust and clean equipment for acceptance by Owner.

3.2 TESTING

A. Hoist equipment shall be operated through a complete lift and lowering cycle to determine that the equipment shall perform smoothly and safely, and that wire cable length is sufficient to permit operation from desired floor levels. All tests shall be carried out with the hoist equipment loaded at 100 percent of capacity. The hoist provider shall provide the test weight loads. Defects shall be corrected by the hoist provider without expense to the Owner.

3.3 CLEANUP

A. Upon completion of work, area shall be cleaned and restored to original condition, acceptable to the Owner.

END OF SECTION 41 2200